



**METROPOLITAN WASHINGTON COUNCIL OF
GOVERNMENTS
COMMUTER CONNECTIONS PROGRAM**

**TRANSPORTATION EMISSION REDUCTION MEASURE
(TERM)
ANALYSIS REPORT
FY 2005-2008**

Prepared for:



National Capital Region Transportation Planning Board
Metropolitan Washington Council of Governments
777 North Capitol Street, NE, Suite 300
Washington, DC 20002-4239

Prepared by:

LDA Consulting
Washington, DC
202-548-0205

In association with:

CIC Research, Inc., San Diego, CA
ESTC, San Diego, CA
Center for Urban Transportation Research, Tampa, FL

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EXECUTIVE SUMMARY

BACKGROUND

This report presents the results of an evaluation of five Transportation Emission Reduction Measures (TERMs), voluntary Transportation Demand Management (TDM) measures implemented by the National Capital Region Transportation Planning Board's Commuter Connections program at the Metropolitan Washington Council of Governments (COG) to support the Washington, DC metropolitan region's air quality conformity determination. This interim evaluation documents transportation and air quality impacts for the 30-month period between July 1, 2005 and December 31, 2007, for the following TERMS:

- Maryland and Virginia Telework – Provides information and assistance to commuters and employers to further in-home and telecenter-based telework programs.
- Guaranteed Ride Home – Eliminates a barrier to use of alternative modes by providing free rides home in the event of an unexpected personal emergency or unscheduled overtime to commuters who use alternative modes.
- Employer Outreach – Provides regional outreach to encourage large, private-sector employers voluntarily to implement commuter assistance strategies that will contribute to reducing vehicle trips to worksites, including the efforts of jurisdiction sales representatives to foster new and improved in-house trip reduction programs.
- Mass Marketing – Involves a large-scale, comprehensive media campaign to inform the region's commuters of services available from Commuter Connections as one way to address commuters' frustration about the commute.
- InfoExpress Kiosks – Involves self-service electronic kiosks located in the District of Columbia and in northern Virginia that offer information on commute options and allow for remote submittal of ridematch and GRH registration applications.

COG's National Capital Transportation Planning Board (TPB), the designated Metropolitan Planning Organization (MPO) for the Washington, DC metropolitan region, adopted these TERMS, among others, in recent regional Transportation Improvement Programs (TIP) to help the region reach emission reduction targets that would maintain a positive air quality conformity determination for the region. It is also important to note that the regional travel demand model was calibrated and validated against the year 2000 traffic counts and regional emission credits are only taken for TERM benefits that occurred after the year 2000 in the regional TERM tracking sheet and may not be consistent with results in this report.

COG's Commuter Connections program, which also operates an ongoing regional rideshare program, is the central administrator of the TERMS noted above. Commuter Connections elected to include a vigorous evaluation element in the implementation plan for each of the adopted TERMS to develop information to be used to guide sound decision-making about the TERMS. This report summarizes the results of the TERM evaluation activities and presents the transportation and air quality impacts of the TERMS and the Commuter Operations Center (COC).

This evaluation represents a quite comprehensive evaluation for these programs. It should be noted that the evaluation still remains conservative in the sense that it includes credit only for impacts that can be reasonably documented with accepted measurement methods and tools. However, we also note that many of the calculations used survey data from surveys that are subject to statistical error rates.

A primary purpose of this evaluation was to develop useful and meaningful information for regional transportation and air quality decision-makers, COG staff, COG program funding agencies, and state and local commute assistance program managers to guide sound decision-making about the TERMS. The results of this evaluation will provide valuable information for regional air quality conformity, improve the structure and implementation procedures of the TERMS themselves, and to refine future data collection methodologies and tools.

SUMMARY OF RESULTS

The objective of the evaluation is to estimate reductions in vehicle trips (VT), vehicle miles traveled (VMT), and tons of Nitrogen Oxides (NO_x) and Volatile Organic Compounds (VOC) resulting from implementation of each TERM and compare the impacts against the goals established for the TERMS. The impact results for these measures are shown in Table A for each TERM individually. Results for all TERMS collectively and for the Commuter Operations Center (COC) are presented in Table B.

As shown in Tables A and B, the TERMS combined met the goals for vehicle trips reduced (net of 4,712 trips reduced) and VMT reduced (8,581 VMT), but fell about two percent short of the goals for emissions reduced. Note that this calculation does not include the final six months of the evaluation period, thus it is highly likely that the TERMS will meet all goals when the full evaluation period is covered.

When the COC results were added to the TERM impacts, it made up the TERM deficits for reductions in VMT and emissions, such that the combined impacts exceeded the combined goals. The totals for all Commuter Connections programs, compared to the goals, were: +13,080 daily vehicle trips reduced, +314,595 daily VMT reduced, +0.111 daily tons of NO_x reduced, and +0.046 tons of VOC reduced.

Three of the five TERMS met their individual impact goals. Estimated impacts for Employer Outreach were about 50% over the goal for this TERM, due primarily to the strong worksite commute programs implemented. Impacts for Maryland and Virginia Telework were about twice the goal for the TERM. And the InfoExpress Kiosk TERM met its goal. The COC also exceeded its goal by about 40%.

Impacts for Guaranteed Ride Home were about 33% below the goals for this program. Mass Marketing also missed its estimated target, by a substantial amount. The impacts for these programs also are likely to be higher when the full evaluation period is included in the calculation, thus these deficits will decline. The reasons for the shortfalls from the goals vary by TERM and are discussed in individual report sections on each TERM.

Table A
Summary of Results for Individual TERMS (7/05– 6/08) and Comparison to Goals

TERM	Participation ²⁾	Daily Vehicle Trips Reduced	Daily VMT Reduced	Daily Tons NOx Reduced	Daily Tons VOC Reduced
Maryland and Virginia Telework ¹⁾					
2008 Goal		11,830	241,208	0.122	0.072
Impacts (7/05 – 6/08)	49,027	21,866	413,703	0.211	0.127
Net Credit or (Deficit)		10,036	172,495	0.088	0.055
Guaranteed Ride Home					
2008 Goal		12,593	355,135	0.177	0.097
Impacts (7/05 – 6/08)	8,269	8,465	221,788	0.104	0.055
Net Credit or (Deficit)		(4,128)	(133,347)	(0.073)	(0.042)
Employer Outreach – new / expanded employer services since July 2005					
2008 Goal	96	8,618	140,622	0.072	0.046
Impacts (7/05 – 6/08)	89	12,702	207,887	0.099	0.058
Net Credit or (Deficit)		4,084	67,265	0.026	0.012
Employer Outreach – Bike					
2008 Goal	61	130	567	0.0010	0.0005
Impacts (7/05 – 6/08)	28	58	351	0.0004	0.0002
Net Credit or (Deficit)		(72)	(216)	(0.0006)	(0.0003)
Mass Marketing					
2008 Goal		7,758	141,231	0.072	0.044
Impacts (7/05 – 6/08)	3,836	1,416	37,516	0.018	0.009
Net Credit or (Deficit)		(6,342)	(103,715)	(0.054)	(0.035)
InfoExpress Kiosks					
2008 Goal		1,778	46,755	0.023	0.013
Impacts (7/05 – 6/08)	8,627	2,840	52,638	0.027	0.016
Net Credit or (Deficit)		1,062	5,883	0.004	0.003

1) Impact represents portion of regional telecommuting attributable to TERM-related activities. Total telecommuting credited for conformity is higher than reported for the TERM.

2) Participation refers to number of commuters participating, except for the Employer Outreach TERM. For this TERM, participation equals the number of employers participating. The goal shown for Employer Outreach reflects the number of employers that have started or expanded commuter assistance programs since June 2005.

Table B
Summary of TERM and COC Results (7/05 – 6/08) and Comparison to Goals

TERM	Participation ¹⁾	Daily Vehicle Trips Reduced	Daily VMT Reduced	Daily Tons NOx Reduced	Daily Tons VOC Reduced
TERMS (all TERMS collectively)					
2008 Goal		42,577	924,951	0.4666	0.2717
Impacts (7/05 – 6/08)	69,759	47,289	933,532	0.4576	0.2650
Net Credit or (Deficit)		4,712	8,581	(0.009)	(0.007)
Commuter Operations Center					
2008 Goal		10,399	296,635	0.147	0.081
Impacts (7/05 – 6/08)	51,927	14,993	480,450	0.213	0.107
Net Credit or (Deficit)		4,594	183,815	0.066	0.026
Commuter Operations Center – Software Upgrades					
2008 Goal		2,370	62,339	0.031	0.017
Impacts (7/05 – 6/08)	7,200	3,773	121,198	0.054	0.026
Net Credit or (Deficit)		1,403	59,859	0.023	0.009
All TERMS plus COC					
2008 Goal		52,976	1,221,586	0.614	0.353
Impacts (7/05 – 6/058)	128,886	66,056	1,536,181	0.725	0.398
Net Credit or (Deficit)		13,080	314,595	0.111	0.046

1) Participation refers to number of commuters participating, except for the Employer Outreach TERM. For this TERM, participation equals the number of employers participating.

Table C shows comparisons of results from the 2002 and 2005 TERM analyses to the first 30 months of the 2008 results (July 2005 through December 2007). The 2008 impacts will be updated in a subsequent report to reflect the complete three-year 2005-2008 evaluation period. Note also that, as described in the footnotes to the table, the calculation for many of the TERMS changed from 2005 to 2008, as TERMS were restructured. For example, the 2008 Employer Outreach TERM impacts include only employers that started or expanded a worksite commute program since June 2005, while the 2005 results include both new and “maintained” employers that did not make changes since the 2002 TERM calculation. As another example, the 2008 Mass Marketing TERM included Bike to Work Day impacts. In 2005, BTW Day was captured under the Employer Outreach for Bicycling TERM. For these reasons, the comparisons between 2005 and 2008 will not be completely equivalent.

Table C
Summary of Results for Individual TERMS 7/05– 12/07 Compared to 7/02 – 6/05

TERM	Daily Vehicle Trips Reduced	Daily VMT Reduced	Daily Tons NOx Reduced	Daily Tons VOC Reduced
Maryland and Virginia Telework ¹⁾				
July 2005 – Dec 2007	21,866	413,703	0.211	0.127
July 2002 – June 2005	11,129	226,913	0.187	0.097
Change ²⁾	10,737	186,790	0.0240	0.0300
Guaranteed Ride Home				
July 2005 – Dec 2007	8,465	221,788	0.104	0.055
July 2002 – June 2005	11,847	334,088	0.239	0.105
Change ²⁾	(3,382)	(112,300)	(0.135)	(0.050)
Employer Outreach – new / expanded employer services since July 2005 ³⁾				
July 2005 – Dec 2007	12,702	207,887	0.099	0.058
July 2002 – June 2005	81,150	1,339,818	1.036	0.526
Change ²⁾	(68,448)	(1,131,931)	(0.937)	(0.468)
Employer Outreach – Bike ⁴⁾				
July 2005 – Dec 2007	58	351	0.0004	0.0002
July 2002 – June 2005	343	3,431	0.003	0.002
Change ²⁾	(285)	(3,080)	(0.003)	(0.002)
Mass Marketing ⁴⁾				
July 2005 – Dec 2007	1,416	37,516	0.018	0.009
July 2002 – June 2005	7,299	132,861	0.101	0.050
Change ²⁾	(5,883)	(95,345)	(0.083)	(0.041)
InfoExpress Kiosks				
July 2005 – Dec 2007	2,840	52,638	0.027	0.016
July 2002 – June 2005	3,197	62,655	0.052	0.027
Change ²⁾	(357)	(10,017)	(0.025)	(0.011)
All TERMS				
July 2005 – Dec 2007	47,289	933,532	0.4576	0.2650
July 2002 – June 2005	119,190	2,220,582	1.705	0.845
Change ²⁾	(71,901)	(1,287,050)	(1.247)	(0.580)
Commuter Operations Center ⁵⁾				
July 2005 – Dec 2007	14,993	480,450	0.213	0.107
July 2002 – June 2005	9,783	279,055	0.204	0.092
Change ²⁾	5,210	201,395	0.009	0.015

1) 2005 impacts included credit for Metropolitan Washington Telework Centers

2) Change in emissions is due in part to reduction in emission factors from 2005 to 2008.

3) 2008 impacts include only new/expanded employers; 2005 impacts included new and maintained EO employers

4) 2005 impacts included Bike-to-Work Day impacts; in 2008, BTW was included in Mass Marketing TERM

5) 2008 impacts included Integrated Rideshare Software Upgrades; 2005 impacts did not include this component.

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SECTION 1 INTRODUCTION

PURPOSE OF THE REPORT

This report presents the results of an evaluation of five Transportation Emission Reduction Measures (TERMs), voluntary Transportation Demand Management (TDM) measures implemented by the National Capital Region Transportation Planning Board's Commuter Connections program at the Metropolitan Washington Council of Governments (COG) to support the Washington, DC metropolitan region's air quality conformity determination. This evaluation documents transportation and air quality impacts for the 36-month period between July 1, 2005 and June 30, 2008, for the following TERMs:

- Maryland and Virginia Telework – Provides information and assistance to commuters and employers to further in-home and telecenter-based telework programs.
- Guaranteed Ride Home – Eliminates a barrier to use of alternative modes by providing free rides home in the event of an unexpected personal emergency or unscheduled overtime to commuters who use alternative modes.
- Employer Outreach – Provides regional outreach to encourage large, private-sector employers voluntarily to implement commuter assistance strategies that will contribute to reducing vehicle trips to worksites, including the efforts of jurisdiction sales representatives to foster new and improved in-house trip reduction programs.
- Mass Marketing – Involves a large-scale, comprehensive media campaign to inform the region's commuters of services available from Commuter Connections as one way to address commuters' frustration about the commute.
- InfoExpress Kiosks – Involves self-service electronic kiosks located in the District of Columbia and in northern Virginia that offer information on commute options and allow for remote submittal of ridematch and GRH registration applications.

The TPB, the designated Metropolitan Planning Organization (MPO) for the Washington, DC metropolitan region, adopted these TERMs in recent regional Transportation Improvement Programs (TIP) to help the region reach emission reduction targets that would maintain a positive air quality conformity determination for the region. The United States Environmental Protection Agency has designated the Washington, DC metropolitan region as a "moderate" ozone non-attainment area. No regional mandates have been adopted that would require the reduction of nitrogen oxides (NOx) or the implementation of any specific mitigation measure. But COG's Travel Management Subcommittee developed and analyzed regional TERMs and the TPB adopted these TERMs in annual TIPs.

COG's Commuter Connections program, which operates an ongoing regional rideshare program, was given responsibility for implementation of the five regional Transportation Demand Management (TDM) TERMs that are described in this report. Commuter Connections is the central administrator of the TERMs, but works with partner organizations, such as local jurisdiction commuter programs and transportation management associations (TMAs) to implement them. Commuter Connections directly provides some client services, such as the regional rideshare database matching service, which are most cost-effectively provided by a central agency. But other services are offered by local organizations and coordinated regionally by the Commuter Connections Subcommittee, a coordinating body comprised of state and local government agencies in the region, several large federal employers, a number of TMAs, and other partner organizations.

At the early stages of implementation of the TERMS, the Commuter Connections Subcommittee elected to include a vigorous evaluation element in the implementation plan for each of the adopted TERMS. The purpose of the evaluation was to develop timely, useful, and meaningful information to be used by regional transportation and air quality decision-makers, COG staff, COG program funders, and state and local commute assistance program managers to guide sound decision-making about the TERMS.

This report summarizes the results of the TERM evaluation activities and presents the transportation and air quality impacts of the TERMS. The report also documents impacts of the commuter assistance activities of the Commuter Operations Center, which COG operates to provide a basic level of commuter information and ridesharing assistance services throughout the Washington region. Results from this report will be included in the region's conformity analysis determination.

In June 1997, a consultant team was retained to assist Commuter Connections to define an evaluation methodology. This methodology was used for the first triennial evaluation of five TERMS. In 2001, 2004, and 2007, the consultants, along with Commuter Connections, expanded and enhanced the methodologies, data collection tools, and data sources to expand the coverage, corroborate assumptions, and enhance the reliability of the evaluation estimates. Section 3 presents highlights of the changes made to the methodology in this updated framework. Readers who desire additional details on the methodology are directed to the report entitled, "Commuter Connections' Transportation Demand Management Evaluation Project: Transportation Emission Reduction Measures (TERMs) Revised Evaluation Framework, July 2005 – June 2008." This document is available from COG's Information Center or on-line at www.commuterconnections.org.

The data collection activities recommended in the Evaluation Framework report were undertaken by COG or by data collection consultants retained by COG. This report summarizes the results of the evaluation activities and analysis. The report also summarizes the transportation and air quality impacts of commuter assistance activities of the Commuter Operations Center, which COG operates to provide a basic level of commuter information and ridesharing assistance services throughout the Washington region. The COC is not an adopted TERM, but is included in this analysis because its operation supports the operation of most of the TDM TERMS.

ORGANIZATION OF THE REPORT

This TERM Analysis Report is divided into nine sections following this Introduction section:

- Section 2 Overall Summary of Results
- Section 3 Highlights of Revised Evaluation Methodology
- Section 4 Maryland and Virginia Telework
- Section 5 Guaranteed Ride Home
- Section 6 Employer Outreach
- Section 7 Mass Marketing
- Section 8 InfoExpress Kiosks
- Section 9 Commuter Operations Center
- Section 10 Conclusions About TERM Impacts

Section 2 summarizes the overall results for each TERM individually and for all TERMS plus the Commuter Operations Center collectively. Section 3 presents highlights of the revised evaluation methodology developed in 2007 for the 2005-2008 evaluation period. Sections 4 through 8 present for the each individual TERM, a brief description of the TERM and its purpose, an overview of the methodology used to estimate the TERMS' impacts and the data used in the analysis, and a comparison of the measured impacts against the goals set for the TERM. Section 9 presents similar information for the Commuter Operations Center. The final section, Section 10, presents general conclusions from the analysis.

Summaries of the calculations of transportation and air quality impacts of individual TERMS also are included in appendices following the body of the report.

SECTION 2 OVERALL SUMMARY OF RESULTS

The objective of the evaluation was to estimate the reductions in vehicle trips, vehicle miles traveled (VMT), and tons of Nitrogen Oxides (NO_x) and Volatile Organic Compounds (VOC) resulting from the implementation of each regional Commuter Connections TERM between July 2005 and June 2008 and to compare these measured impacts against the goals established for the TERMS. The Revised Evaluation Framework document finalized in May 2007 also recommended that other performance measures be tracked for these TERMS to assess levels of program participation, utilization, satisfaction, and cost-effectiveness. These measures are tracked by Commuter Connections on a monthly and annual basis for the TERMS and are reported in other documents.

The objective of the evaluation is to estimate reductions in vehicle trips (VT), vehicle miles traveled (VMT), and tons of Nitrogen Oxides (NO_x) and Volatile Organic Compounds (VOC) resulting from implementation of each TERM and compare the impacts against the goals established for the TERMS.

The impact results for these measures are shown in Table 1 for each TERM individually. Results for all TERMS collectively and for the Commuter Operations Center (COC) are presented in Table 2. As shown, the TERMS combined met the goals for vehicle trips reduced (net of 4,712 trips reduced) and VMT reduced (8,581 VMT), but fell about two percent short of the goals for reductions in tons of emissions reduced. It's important to note, however, that this calculation does not include the final six months of the three-year evaluation period, thus it is highly likely that the TERMS will meet all goals when the full evaluation period is covered.

When the COC results were added to the TERM impacts, it made up the TERM deficits for reductions in VMT and emissions, such that the combined impacts exceeded the combined goals. The totals for all Commuter Connections programs, compared to the goals, were: +13,080 daily vehicle trips reduced, +314,595 daily VMT reduced, +0.111 daily tons of NO_x reduced, and +0.046 tons of VOC reduced.

Three of the five TERMS met their individual impact goals. Estimated impacts for Employer Outreach were about 50% over the goal for this TERM, due primarily to the strong worksite commute programs implemented. Impacts for Maryland and Virginia Telework were about twice the goal for the TERM. And the InfoExpress Kiosk TERM met its goal. The COC also exceeded its goal by about 40%.

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Table 1
Summary of Results for Individual TERMS (7/05– 6/08) and Comparison to Goals

TERM	Participation ²⁾	Daily Vehicle Trips Reduced	Daily VMT Reduced	Daily Tons NOx Reduced	Daily Tons VOC Reduced
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July 2005 – Dec 2007	58	351	0.0004	0.0002
July 2002 – June 2005	343	3,431	0.003	0.002
Change ²⁾	(285)	(3,080)	(0.003)	(0.002)
Mass Marketing ⁴⁾				
July 2005 – Dec 2007	1,416	37,516	0.018	0.009
July 2002 – June 2005	7,299	132,861	0.101	0.050
Change ²⁾	(5,883)	(95,345)	(0.083)	(0.041)
InfoExpress Kiosks				
July 2005 – Dec 2007	2,840	52,638	0.027	0.016
July 2002 – June 2005	3,197	62,655	0.052	0.027
Change ²⁾	(357)	(10,017)	(0.025)	(0.011)
All TERMS				
July 2005 – Dec 2007	47,289	933,532	0.4576	0.2650
July 2002 – June 2005	119,190	2,220,582	1.705	0.845
Change ²⁾	(71,901)	(1,287,050)	(1.247)	(0.580)
Commuter Operations Center ⁵⁾				
July 2005 – Dec 2007	14,993	480,450	0.213	0.107
July 2002 – June 2005	9,783	279,055	0.204	0.092
Change ²⁾	5,210	201,395	0.009	0.015

1) 2005 impacts included credit for Metropolitan Washington Telework Centers

2) Change in emissions is due in part to reduction in emission factors from 2005 to 2008.

3) 2008 impacts include only new/expanded employers; 2005 impacts included new and maintained EO employers

4) 2005 impacts included Bike-to-Work Day impacts; in 2008, BTW was included in Mass Marketing TERM

5) 2008 impacts included Integrated Rideshare Software Upgrades; 2005 impacts did not include this component.

SECTION 3 HIGHLIGHTS OF REVISED EVALUATION METHODOLOGY

BACKGROUND

In 1997, consultants selected by COG developed an evaluation framework to guide the collection and analysis of data to estimate the travel and air quality impacts of TDM TERMS adopted by COG's TPB. This methodology described evaluation objectives, performance measures for each TERM, data needs and data collection tools and sources, and analysis and calculation steps to be used to estimate travel, air quality, energy, and consumer cost impacts of the TERMS. The framework also presented recommendations for the evaluation schedule, responsibilities, and reporting of results to maintain and utilize information produced through the evaluation process.

The methodology developed in 1997 was designed to collect sufficient data, using recognized and accepted survey and tracking techniques, to allow TERM effectiveness to be measured with confidence. But it also was designed to be practical and efficient to undertake. The first TERM analysis, conducted in the summer of 1999, reinforced the well-established view that data collection and evaluation for TDM programs can be challenging, especially when the programs are voluntary. Reliable data can be difficult to assemble, assumptions may need to be made using little data, and many factors outside the TDM program can influence results.

The first evaluation made recommendations for several data collection changes that could enhance the accuracy, rigor, coverage, and reliability of future TERM evaluations. A revised methodology was prepared in 2001, reflecting these recommendations. In 2004 and 2007, following the second and third triennial evaluations, respectively of the TERMS, the methodology was updated again to enhance the analysis results for several TERMS.

This section identifies key enhancements that were made to the methodology since the 2005 TERM Analysis Report was completed and discusses the overall rigor of the evaluation framework as compared to other regions. Overall, the Transportation Demand Management evaluation process employed for this analysis is among the most rigorous and comprehensive in the U.S.

EVALUATION METHODOLOGY OVERVIEW

Evaluation Principles

Before discussing the methodology changes in the Revised Evaluation Methodology, it is useful to review several element of the methodology developed in 1997. The TERM evaluation process was founded on several key evaluation principles that formed the foundation for the Evaluation Framework that has guided the process since 1997. Some of those principles, which have since been adopted by other regions evaluating TDM programs, include:

- Provide sound, definitive, and useful information about the results of the program
- Assure objective evaluation by using a third-party (other than a funding or implementing agent)
- Avoid double counting by separating out the impacts of individual program elements or TERMS
- Report only those impacts associated with the TERMS, and not the combined impacts of the TERMS and the basic commuter services that have been in place since the 1970s

- Follow accepted and recognized evaluation techniques
- Be rigorous, ongoing, resource efficient, unobtrusive for COG partners, and compatible with regional, state, and national practices

Evaluation Methodology Steps

The evaluation of Commuter Connection’s TERM program impacts is based on a step-by-step calculation methodology that uses a series of “multiplier factors” to estimate several important program impact measures related to transportation and air quality benefits. The methodology calls for these multiplier factors, which are developed primarily from survey data, to be applied to a known number of commuters in the population that might be influenced or affected by the TERM to make a travel pattern change (population base”). The result of these step-by-step calculations is an estimate of the numbers of vehicle trips, VMT, and emissions reduced through the travel pattern changes made by commuters after contact with the TERM programs or services.

For most TERMS, the population base is commuters who participate in or use TERM services, although in a few cases, the population is broader, such as all regional commuters. Thus, this methodology requires first an accurate documentation of the participation of employers and commuters in each TERM program and an accurate count of other population bases. This is accomplished primarily by program participant tracking performed by Commuter Connections staff and survey results.

As noted earlier, the methodology uses several calculation factors derived from surveys of the populations of interest. The five major factors include:

- 1) Placement rate (percent of commuters in the population base who shifted to commute alternatives as a result of the TERM)
- 2) Vehicle trip reduction (VTR) factor (average number of vehicle trips reduced per day by each placement)
- 3) Average one-way commute trip distance
- 4) Drive alone access percentage (proportion of ridesharers and transit users that drive alone to the location where they meet their carpool, vanpool, bus, or train)
- 5) Drive alone access distance (distance commuters travel to rideshare/transit meeting points)

These factors are applied within the basic methodology steps listed below to calculate program impacts for each TERM.

- 1) Estimate commuter population “base” for the TERM (e.g., all commuters, GRH applicants, rideshare matching applicants, kiosk users, Employer Outreach employees, etc.)
- 2) Estimate the number of new commute alternative placements – Multiply placement rate by the population base for the evaluation period
- 3) Estimate vehicle trips reduced – Multiply number of placements by the Vehicle Trip Reduction (VTR) factor
- 4) Estimate VMT reduced – Multiply number of vehicle trips reduced by average commute distance
- 5) Adjust vehicle trips and VMT for access mode – Discount vehicle trips reduced and VMT reduced to account for commuters who drive alone to meet rideshare modes and transit

- 6) Estimate NO_x and VOC emissions reduced – Multiply adjusted vehicle trips and VMT reduced by emissions factors consistent with the regional planning process

These steps were established largely in the 1997-99 evaluation framework developed in 1997 and remained unchanged for the subsequent evaluations conducted for the 1999-2002, 2002-2005, and 2005-2008 evaluations. Two other issues should be noted as background, because they are critical to understanding the high level of rigor build into the evaluation process:

- Prior mode is an important variable in this evaluation; a shift of a commuter to commute alternative mode does not always mean the commuter reduced a vehicle trip. Vehicle trips are reduced only in three cases: 1) if the commuter previously drove alone, 2) if the commuter previously used a commute alternative but increased the frequency of use of this mode, or 3) if the commuter shifted to a higher occupancy commute alternative (e.g., from carpool to vanpool). Section 6 describes the development of vehicle trip reduction (VTR) factors that are used to translate the number of new commute alternatives placements into the number of vehicle trips reduced, taking into account the three change factors listed above.
- For air quality evaluation purposes, it is necessary to know the access mode of ridesharers and transit riders. Access mode refers to the travel mode carpoolers, vanpoolers, and transit riders use to travel from home to Park & Ride lots, to other places where they meet their rideshare partners, or to the bus stop or train station, if they do not walk or are not picked up at home. Access mode is less important for evaluating travel impacts, because access trips generally account for a small portion of the total trip and the alternative mode generally is used in the most congested and longest portion of the trip. However, from an air quality standpoint, a commuter who drives alone to the meeting point still makes a vehicle trip and accumulates some drive alone VMT, which must be subtracted from the total numbers of vehicle trips reduced and VMT reduced in the air quality analysis.

REVISED EVALUATION FRAMEWORK

In general, the TERM analysis approaches documented in the 2005 TERM Analysis Report were used as the basis for the TERM evaluation methods described used in the 2005-2008 evaluation. The 2005 TERM Analysis Report concluded with a few minor recommendations for each TERM regarding enhancements to future evaluations. These enhancements were included, for the most part, in the Revised Evaluation Framework for the current evaluation period (2005-2008). A brief summary of key methodology issues and approaches is presented below for each TERM. More details of each approach are presented in Sections 4 – 8 for each individual TERM.

- Maryland and Virginia Telework – Maryland and Virginia Telework (Telework TERM, previously named Telework Resources Center, TRC) is a resource service to help employers, commuters, and program partners initiate telework programs. In evaluating teleworking, several travel changes need to be assessed, including: trip reduction due to teleworking, the mode on non-telework days, and mode and travel distance to telework centers. Telework impacts are primarily estimated from the State of the Commute survey and by surveys conducted of employers directly requesting information from Commuter Connections.

In the 2002-2005 evaluation, the TRC TERM analysis included credit for Commuter Connections assistance to the Metropolitan Washington Telework Centers. This component was eliminated from the analysis, as Commuter Connections has largely eliminated this support. However, credit

for telecenter users who obtained telework information from Commuter Connections will continue to be counted.

- Guaranteed Ride Home (GRH) – The primary goal of GRH is to encourage commuters who drive alone to shift to ridesharing, transit, and bike/walk. However, since past evaluation results show that a sizeable portion of GRH applicants were ridesharing before they applied for GRH benefits, the TERM analysis also explores benefits from the continuation and expansion of existing ridesharing arrangements. Thus, the evaluation process estimates the influence of GRH availability on both mode shifts and frequency/duration of ridesharing. Enhancements made over the past several evaluation periods include discounting of VMT reductions made outside the COG non-attainment area and the derivation of one placement rate for both GRH applicants and one-time exemptions. No additional changes were made to the methodology for the 2005-2008 evaluation.
- Employer Outreach – Employer outreach applies a two-faceted approach employing empirical data on employer programs and modeled impacts. The empirical data come from the ACT! database of employer contacts, including information on the trip reduction strategies implemented at each worksite. The EPA COMMUTER model (v 2.0) applies these empirical data to project the likely change in employee commuting behavior for given change in the employer’s program.

Three changes were made to the methodology for this TERM for the 2005-2008 analysis. First, in the 2002-2005 evaluation, a separate calculation was performed to estimate impacts for employers that were not participating in Employer Outreach but that did offer Metrochek/Smart Benefits through the program administered by the Washington Metropolitan Area Transit Authority (WMATA). This credit was eliminated from the 2005-2008 calculation.

Second, in 2007-2008, the evaluation team reassessed the COMMUTER Model as the predictive tool for the analysis and compared it to other models that could be used. The decision following that analysis was to continue to use the COMMUTER model, but with a modified cost coefficient that better reflects the expected response of employees to financial incentives.

Third, in the 2002-2005 evaluation, a separate credit was estimated for impacts related to bicycle support implemented by employers participating in Employer Outreach (Employer Outreach for Bicycling TERM). In the 2005-2008 evaluation, this credit was captured in the Employer Outreach TERM. This did not result in a loss of benefits, since the Employer Outreach for Bicycling credit was subtracted from the Employer Outreach TERM credit in 2002-2005 to avoid double counting these credits.

- Mass Marketing – The critical issues for this TERM are documenting and attributing changes in attitudes and behavior to the mass marketing campaign. Two types of impacts are measured, “direct” impacts, for commuters who cite the regional marketing campaign as the reason for their commuting change and “referred” impacts generated when advertising encourages commuters to submit rideshare and GRH applications. This is explained further in Section 7. The evaluation was accomplished using a variety of data sources, including the State-of-the-Commuter survey and COC tracking data. It also required careful attribution of impacts to Mass Marketing or other TERMS, as appropriate.
- InfoExpress Kiosks – In the 2002-2005 evaluation framework, the InfoExpress Kiosk TERM was one of two components of the Integrated Rideshare TERM. It is now a separate TERM, with goals established for the TERM. The analysis of this TERM used State of Commute survey information

to identify changes in commute behavior related to the use of information kiosks. The kiosk evaluation assessed impacts only through January 31, 2007, the end date of the program.

- Commuter Operations Center (COC) – The evaluation of COC activities now includes the impacts of Software Upgrades improved transit information. This program was previously included in the Integrated Rideshare TERM.

NATURE OF THE EVALUATION APPROACH AS COMPARED TO OTHER REGIONS

The evaluation approach used in the Washington DC region to assess the impact of the TERMS implemented by Commuter Connection has become recognized as among the most comprehensive and rigorous in the nation. Several regions of a similar size and complexity have looked to this evaluation as a model and adopted similar approaches. For example:

- The evaluation of voluntary trip reduction strategies in Atlanta is using a similar “bottom-up” approach to measure the impact of various program elements individually and carefully sum the results while avoiding double counting from overlapping program influences. The TERM analysis has been held up as a model for this approach.
- A comprehensive evaluation of TDM services in Los Angeles County derived unique placement rates and VTR factors for the programs being evaluated and estimated the cost per person placed and cost per trip reduced of the overall TDM program. This evaluation also explicitly drew from the evaluation experience in Washington DC.

The only other regions that may have data and an evaluation approach comparable to MWCOG’s TERM Analysis are Washington State’s Commute Trip Reduction (CTR) program and the regional evaluation performed in the Atlanta, GA region. The CTR program performs its evaluation under a legislative mandate and uses data that regulated employers are required to provide. This shifts some of the effort of data collection to employers and allows full capture of data directly from employers, simplifying some data analysis tasks. In Atlanta, data are collected and analyzed to evaluate regional ridesharing, transit and vanpool subsidy programs, and marketing campaigns. The data collection and analysis methods used are similar to those used in the MWCOG evaluation.

The key characteristics of the evaluation approach used in metropolitan Washington that have elevated or enhanced the state of the practice in TDM evaluation include:

- The careful avoidance of double counting between program elements
- The derivation of unique placement rates for each program element and mode
- The inclusion of placement duration in the calculation of impacts
- The derivation of empirically-based Vehicle Trip Reduction (VTR) factors to avoid the document mistaken assumption that every new placement reduces a full vehicle trip every day
- The consideration of access mode to a shared ride arrangement to account for cold starts

For these reasons, the users of these evaluative results should feel confident that the reported impacts are as accurate and reliable as is reasonably possible and are based on what is widely accepted as one of the most comprehensive and rigorous evaluation approaches being used today in the US.

SECTION 4 MARYLAND AND VIRGINIA TELEWORK

BACKGROUND

The TPB adopted a telework-oriented TERM in the Fiscal Year 1995-2000 TIP and in June 1996, the Metropolitan Washington Telework Resource Center (TRC) was implemented. This TERM has been renamed as Maryland and Virginia Telework (Telework) when its scope was reduced to focus solely on Maryland and Virginia-based employers, but its purpose remains the same: to provide information, training, and assistance to individuals and businesses to further in-home and telecenter-based telework programs. Telework activities during the past few years have included employer and employee telework seminars, distribution of telework information included in a telework information kit, and ongoing marketing and outreach initiatives.

EVALUATION METHODOLOGY AND DATA SOURCES

The goal of Telework is to increase the number of home-based and telework center-based teleworkers in the region, whether full-time or part-time teleworkers. For 2005-2008, Telework impacts were evaluated by calculating the number of teleworkers in the region who used or were influenced by Telework services and estimating the number of vehicle trips and VMT they did not make, as a result of telecommuting, and the tons of emissions that were reduced by the trip and VMT reductions. Through this method, only impacts that could be traced directly to the Telework TERM were counted in the impacts for this TERM as the contribution of the Telework TERM to regional telecommuting. In other words, it was recognized that some telecommuting would have occurred even if the Telework TERM was not in place.

Two Telework components were evaluated, including:

- All regional teleworkers who are influenced by Maryland and Virginia Telework services / assistance to begin teleworking
- Telework employees at Maryland and Virginia worksites assisted by Commuter Connections

Data for impacts of these components were obtained from several sources. The sources and the evaluation data collected from each, are described briefly below:

Assisted Employer Telework Survey (new teleworkers at worksites assisted by Telework)

- Percentage of employers with telework programs before and after receiving Telework assistance
- Percentage of teleworkers at assisted sites before and after receiving assistance

State of the Commute Survey (regional commuters)

- Number of regional teleworkers and their frequency of teleworking
- Telework locations – the mix between home-based and non-home-based telework
- Average frequency of teleworking, teleworkers' commute modes on non-telework days, and commute distance they traveled on non-telework days
- Teleworkers travel patterns to telework locations outside the home
- Sources of information teleworkers had used to learn about teleworking

Using results from these surveys and records, the number of teleworkers who had either direct or indirect (through their employers) contact with the Telework TERM during the evaluation period were estimated

and divided into “home-based” and “non-home-based” groups. These numbers of teleworkers were then multiplied by average VTR factors, as identified by the appropriate survey data, to obtain the number of vehicle trips reduced by their teleworking.

For this TERM, VTR factors accounted for both the average telework frequency of the groups as well as their commute modes on telework days (non-home-based teleworkers) and non-telework days (all teleworkers). The VTR factor for home-based teleworkers was 0.45 daily trips reduced per teleworker, reflecting the part-time (1.5 days per week average) telework frequency and the elimination of vehicle trips for teleworkers who drove alone, carpooled, or vanpooled on non-telework days. The VTR factor was lower (0.31) for non-home-based teleworkers, because the majority of these teleworkers drove alone to these outside locations. Thus they did not reduce (and in some cases increased) the number of vehicle trips they made on an average day. However, the benefit of their teleworking was in the reduction of VMT on telework days at a location outside the home.

The VMT reduced by teleworking was calculated for home-based teleworkers by multiplying the number of daily vehicle trips reduced by the average commute distance. In the case of non-home-based teleworkers, the VMT reduced was calculated by multiplying the number of teleworkers on an average day by the reduction of VMT for a telework day (travel distance to main work location minus travel distance to the outside telework location).

Tons of emissions removed were calculated by multiplying vehicle trip and VMT reductions by 2008 emission factors developed for NO_x and for VOC for the region. Appendix 1 details the calculations made to estimate impacts for the Telework TERM.

MARYLAND AND VIRGINIA TELEWORK SUMMARY OF GOALS AND IMPACTS

The results of the calculations for Telework are shown in Table 4 below, along with the goals established for the TERM. The net credits or deficits, which were equal to the impacts minus goals, also are shown.

Table 4
Telework Goals, Estimated Telework TERM Impacts, and Estimated Regional Telecommute Impacts

	Regional TW Impacts	Telework Goal	Telework TERM Impact*
• Number of teleworkers	456,636	31,854	49,027
• Daily vehicle trips reduced	203,660	11,830	21,866
• Daily VMT reduced	3,853,246	241,209	413,703
• Daily tons NO _x reduced	1,962 T	0.122 T	0.211 T
• Daily tons VOC reduced	1.183 T	0.072 T	0.127 T

Impacts vs Goals

Participation Benefit (net over or (under) goal):	Telecommuters: 17,173
Transportation Benefit (net over or (under) goal):	Vehicle Trips: 10,036 VMT: 172,495 miles
Emission Benefit (net over or (under) goal):	NOx: 0.088 tons per day VOC: 0.055 tons per day)

As shown, in 2008, approximately 456,000 regional workers were telecommuting at least occasionally, about 17.4% of the total regional workforce and nearly 19% of all workers who are not self-employed, working only at home. This number of teleworkers represented an increase of 43% over the 2005 number of 318,130 teleworkers and several times the 1996 baseline of 150,900 teleworkers. Telecommute growth is likely the result of several factors, including the use of teleworking by employers to recruit and retain employees in a very competitive labor market. Increasing traffic congestion in the Washington region also might have prompted some commuters to work at home or at a telework center or employer satellite center to avoid fighting traffic. Finally, the desire of employees for a better balance of work and family, a trend occurring nationally, and greater affordability of sophisticated technology, also might have contributed to the growth in telecommuting.

The Telework TERM's expected contribution to regional teleworking is shown in the second column of Table 4 and the impacts are shown in the third column. The Telework TERM exceeded by more than 17,000 the goal for the number of teleworkers expected from Telework activities. The TERM also substantially exceeded the reduction goals established for vehicle trips, VMT, and emission reductions.

As shown in Table 4, the Telework TERM was responsible for a portion of, but not all of, the regional telecommuting. The TERM is credited with about one tenth of the number of teleworkers and regional telework impacts. One possible area in which the Telework TERM's contribution to the regional telework impacts could have been undercounted is in the area of regional telework advertising. The State of the Commute Survey indicated that about eight percent of teleworkers mentioned Commuter Connections or MWCOG as a source of their telework information. These teleworkers were credited to the Telework TERM contribution.

But an additional five percent said they learned of teleworking through "advertising," newspaper ads, or "other website." Although these sources were not necessarily controlled by Commuter Connections, Commuter Connections has advertised consistently and broadly about telework via radio, television, print media, and the internet. So this response likely indicates additional teleworkers who learned about teleworking from outreach and promotion conducted by Commuter Connections. Because the source of the advertising could not be clearly documented, only a share of these commuters (1.6% of total teleworkers) was credited to the Telework TERM. When added to the eight percent who mentioned telework directly, the total share of teleworkers assisted by the Telework TERM equaled 9.6%.

SECTION 5 GUARANTEED RIDE HOME

BACKGROUND

The regional Guaranteed Ride Home (GRH) program was adopted by the TPB in the Fiscal Year 1995-2000 TIP to eliminate a major barrier to using alternative modes, commuters' fear of being without transportation in the case of an emergency. The program provides up to four free rides home per year in a taxi or rental car in the event of an unexpected personal emergency or unscheduled overtime. When the program was implemented, it was offered to commuters who used alternative modes three or more times per week and who would register with Commuter Connections for GRH. In January 1999, to encourage additional participation, the program guidelines were changed to require use of alternative modes only two days per week. This new rule was in place throughout the entire 2005-2008 evaluation period.

EVALUATION METHODOLOGY AND DATA SOURCES

The transportation and emissions impacts of the GRH program were measured through data from the GRH survey conducted in the spring of 2007. This survey polled 1,000 commuters who had registered for GRH at some point between March 1, 2004 and March 15, 2007. Both commuters who were currently registered at the time of the survey and those who were "past registrants" were eligible to participate in the survey. Additionally, commuters who had not registered for the program, but had taken a "one-time exception trip" were included in the survey sample.

The survey asked detailed questions needed to define changes commuters made in their travel behavior during their participation in GRH and the influence of GRH on these changes. Information collected from all respondents, included, among other elements:

- Commute patterns: current mode and previous mode (if commuter made a mode shift), frequency of mode use, travel distance, access mode to rideshare/transit pick-up point, and pool occupancy
- Permanence of mode changes: whether change was continued (still in effect) or temporary (commuter had reverted to the original mode)
- Importance of GRH to commuters' decisions to start or continue use of alternative modes

Data from the GRH surveys were used to estimate the calculation multipliers needed to estimate vehicle trips, VMT, and emissions reduced as a result of GRH; placement rate, VTR factor, travel distance, and emission factors. These multipliers were estimated for two sub-groups in the GRH population. The first sub-group included respondents who both live and work within the Washington, DC Metropolitan Statistical Area (MSA); that is within the 11-jurisdiction area covered by the TERM evaluation. The second group included respondents who work within the MSA but live outside it.

This distinction was made because applicants who live outside the MSA traveled a portion of their VMT outside the MSA. During the evaluation, it was decided that the VMT for these "out of MSA" applicants should be discounted to credit VMT reduction only for the portion that occurred within the MSA. Approximately 32% of the total participants lived outside the MSA.

For both sub-groups of survey respondents, the GRH placement rate, that is, the percentage of respondents who registered for GRH and made a mode shift to an alternative mode was calculated. The duration

of alternative mode placement was 45 months, longer than the entire evaluation period. Thus, for purposes of the analysis, all placements were considered “continued placements,” that is they made a shift to an alternative mode and did not return to the previous mode. Overall, the continued placement rate for GRH was calculated for the two sub-group populations as follows:

- Within MSA 33.9%
- Outside MSA 44.9%

To determine the number of commuters placed in alternative modes between July 2005 and June 2008, these placement rates were multiplied by the total number of commuters who participated in GRH during that time period, 22,099, divided into the two sub-groups: 15,027 within the MSA and 7,072 outside the MSA. This calculation resulted in 5,094 placements from within the MSA and 3,175 placements from outside the MSA.

These placement figures were then multiplied by GRH VTR factors derived from the survey data to estimate the number of vehicle trips reduced. The VTR factors for the two sub-groups were as follows:

- Within MSA 0.92 vehicle trips reduced per placement
- Outside MSA 1.19 vehicle trips reduced per placement

As noted earlier, VTR factors represent the average number of vehicle trips reduced by a new alternative mode placement. They combine the vehicle trip reduction contributions of various types of mode changes, such as from transit to rideshare, drive alone to transit, and drive alone to carpool, each of which reduces a different number of vehicle trips per day, into one number. VTR factors of 0.92 and 1.19 indicate a significant number of the changes were to higher occupancy modes, such as transit, and/or were shifts from drive alone to alternative modes. The calculation of vehicle trips reduced produced a total of 8,465 trips reduced; 4,687 from commuters within the MSA and 3,778 from commuters outside the MSA.

Next, VMT reduced by GRH was calculated by multiplying the numbers of vehicle trips reduced by the average trip length for GRH commuters who made a shift to an alternative mode. The one-way trip distance for the within MSA respondents was 26.2 miles. The actual one-way distance for the outside MSA respondents was an average of 47.0 miles. To discount the distance credited to the outside MSA respondents, their one-way travel distance was set equal to that of the distance for the within MSA respondents. This resulted in a loss of 20.8 one-way miles per trip for each outside-MSA respondent. The VMT calculation reflected the following:

$$\begin{aligned} & (4,687 \text{ within MSA trips reduced} + 3,778 \text{ outside MSA trips reduced}) \times 26.2 \text{ miles per trip} \\ & = 221,788 \text{ VMT reduced} \end{aligned}$$

Estimates of NO_x and VOC reductions were calculated using regional emission factors, as described for the Telework TERM. Details of these calculations are shown in Appendix 2.

GUARANTEED RIDE HOME SUMMARY OF GOALS AND IMPACTS

Table 5 presents the transportation and emission impact results for GRH and compares the results against the goals established for the TERM.

Table 5
Guaranteed Ride Home Goals and Estimated Impacts

	TERM Goal	Estimated Impacts
• Number of GRH participants*	36,992	22,099
• New applicants during evaluation period	N/A	12,661
• Daily vehicle trips reduced	12,593	8,245
• Daily VMT reduced	355,136	221,136
• Daily tons NOx reduced	0.177 T	0.103 T
• Daily tons VOC reduced	0.097 T	0.055 T

* Number of participants currently enrolled in GRH

Impacts vs Goals

Participation Benefit (net over or (under) goal):	Participants: (14,893)
Transportation Benefit (net over or (under) goal):	Vehicle Trips: (4,128) VMT: (133,347 miles)
Emission Benefit (net over or (under) goal):	NOx: (0.073 tons per day) VOC: (0.042 tons per day)

The number of commuters participating in GRH in December 2007 was considerably lower than the participant goal, and the vehicle trip reduction, VMT, and emissions impacts were correspondingly short of the goals for these measures. Participation in GRH has dropped markedly since 2005, perhaps due to reduced level of Commuter Connections program advertising and outreach for GRH. The 2007 State of the Commute survey found that only 26% of respondents said they knew a regional GRH program existed, compared to 59% who said they knew about the program in the 2004 SOC survey.

Finally, note that the GRH results were adjusted to eliminate double counting due to overlap between GRH and the Mass Marketing TERM. As described in Section 7 (Mass Marketing), a portion of the GRH impacts were assigned to the Mass Marketing TERM to recognize that some GRH applicants were influenced to contact Commuter Connections and apply for GRH after they heard a Mass Marketing ad.

Only about one percent of the total new GRH applicants were assigned to Mass Marketing, however, because the analysis of GRH applications in response to ad campaigns suggested a much lower connection in 2005–2008 than occurred in the 2002–2005 period. But to avoid double counting impacts, this MM share was subtracted from the base GRH impacts. The impacts shown in Table 5 account for the adjustment and reflect the net GRH impacts.

SECTION 6 EMPLOYER OUTREACH

BACKGROUND

The Employer Outreach TERM was adopted by the TPB in the Fiscal Year 1995-2000 TIP. This program provides regional outreach to encourage private sector employers voluntarily to implement TDM strategies that will contribute to reducing vehicle trips to their worksites.

The program was designed to increase outreach efforts in ten jurisdictions located in the region. Seventy percent of the funds received by COG for the Employer Outreach program element is passed-through to the jurisdictions for implementation of the program. Commuter Connections assists the sales force with the following services, designed to enhance regional coordination and consistency:

- Computerized regional employer contact database
- Marketing and information materials
- Employer outreach sales and service force training
- Annual evaluation program
- Support to Employer Outreach Committee

EVALUATION METHODOLOGY AND DATA SOURCES

Two variables are important for assessing the impacts of a TDM employer outreach program. First is the number of employers offering TDM services and the level of effort and commitment by the employer; that is the extent of the TDM programs they implement. Second is the level of employee participation in alternative modes as a result of the program. These two variables are strongly linked, as other TDM effectiveness research has shown. Higher levels of employer effort can be expected to offer greater incentive to employees to use alternative modes, leading to reductions in vehicle trips, VMT, and emissions.

Employer Participation in Commute Programs

The first of these variables was assessed through data collected by Commuter Connections from sales and outreach contacts with employers. Employer Outreach jurisdiction sales representatives documented the levels of programs implemented by their employer clients in the ACT! contact management database maintained by Commuter Connections. The Employer Outreach program specified services employers offered, for example, transit subsidy, information/promotions, Guaranteed Ride Home, etc.

The Employer Outreach program defined four levels of employer effort: Bronze (Level 1), Silver (Level 2), Gold (Level 3), and Platinum (Level 4), distinguished by the expected increasing trip reduction effectiveness of the services offered and the commitment of the employer, as shown below.

- **Bronze (Level 1) programs** offer only commute information.
- **Silver (Level 2) programs** offer the services of an Employee Transportation Coordinator (ETC) and information, and include one or more of: preferential parking, carpool/vanpool formation meetings, bike racks or lockers, transportation fairs, informal telework, and alternative work hours.

- **Gold (Level 3) programs** include, in addition to the Silver services, services such as financial incentives or parking “cash out,” formal telework programs, parking fees, on-site ridematching, shuttles to transit stations, showers and lockers for bikers, and company vanpools.
- **Platinum (Level 4) programs** include two or more of the Gold program components and actively promote the program.

In June 2008, the ACT! database included approximately 900 employers with programs that met the Level 3 or 4 definitions. At the time this interim calculation was performed, Commuter Connections was able to verify that 89 of these employers were either new to the Employer Outreach Program since June 2005 (40 employers) or had expanded commute program services since 2005 (49 employers). These Level 3 and 4 employers served as the employer population on which the interim impact of Employer Outreach was based.

Level 1 and 2 employers were not included in the original regional impact calculation because their level of impact would be very small due to the lack of incentives or enhanced commute alternatives. Further, Level 3 and 4 employers that had been in the Employer Outreach program in June 2005 and that had not changed their commute program were not counted in this interim evaluation. The Employer Outreach TERM was considered fully implemented in June 2005, thus the 2008 evaluation assumed continued involvement of these employers and goals were set for 2008 to reflect impacts only from new and expanded programs.

Commuter Connections is attempting to verify new / expanded status for additional employers that could not be reached in time for this interim analysis. The final calculation for Employer Outreach will include impacts for all new / expanded employers in the ACT! database for which a program can be verified. The calculation also will include impacts for “maintained” employers that participated in Employer Outreach in June 2005 and that did not change their program since that time.

Employee Participation in Commute Programs

The second variable in the impact evaluation, employees’ response to the services offered, was more difficult to obtain. Starting mode split data were available for about 500 employers that had conducted a baseline commuter survey prior to implementing the TDM program. But as is typical for voluntary programs, only a few had conducted a follow-up survey by the time the evaluation data were being collected. Because baseline data were available, but post-program survey data were not, the researchers elected to estimate employee behavior changes using the US EPA’s COMMUTER Model, which estimates worksite mode shifts from inputs on starting mode split and TDM program components.

This was the same methodology as was used in the 2005 evaluation, except that a new version of the COMMUTER model replaced the version used in the 2005 evaluation. Additionally, as noted earlier, the cost coefficient was adjusted in the model, to reflect a more conservative estimate of employees’ responses to financial incentive strategies. Readers who are interested in additional details on the model adjustments may contact Commuter Connections staff for additional documentation of the model analysis process and results.

Starting Mode Split – The COMMUTER model requires several “scenario” inputs, including the type of employer (primarily office or non-office) and the starting mode split. For employers that had conducted a baseline, “pre-program” survey, the actual mode split from the survey was used as the input. But for em-

employers that had not conducted a survey, a starting mode split was assigned that reflected the average mode split that would be likely for employers with similar location and employee work conditions.

These average mode splits were calculated by aggregating employers in the ACT! database that had conducted baseline surveys into six groups, based on two employer/site variables that are known to influence mode choice: 1) type of employer / work performed, either office or non-office, and 2) availability of transit service: low, moderate, or high. Low transit was defined as limited bus service within ½ mile of the worksite. Moderate transit included a higher level of frequency and route availability. To be designated as a “high transit” employer, the site had to be within ½ mile of a Metrorail station and have access to a significant level of bus service.

For each of the six combinations of these two variables, for example, non-office employers with high transit and office employer with moderate transit, an average mode split was calculated from the baseline survey data of employers in that employer group that had conducted commuter surveys. Additionally, the Average Vehicle Ridership (AVR) was calculated for each group.

Program Definition – Employers included in the TERM analysis also were classified by the specific elements offered in their commute program. The COMMUTER model permits direct analysis of strategies, such as transit subsidies, that change the travel cost of one or more modes, and strategies that change the travel time (duration of a trip).

The model also has the capability to predict impacts of telework and compressed work schedules (CWS), when certain parameters of the work hours arrangements are known. The ACT! database indicated employers that had a telework program and, in most cases, the number of employees who were teleworking. Employers that offered telework, but for which participation numbers were not available were assumed to have telework rates equal to the regional average calculated from the 2007 State of the Commute survey. The ACT! database also noted employers that offered CWS, but no participation data were included for any of these employers, so default percentages were calculated from the SOC survey.

Other commute strategies, such as GRH, flextime, information support, and preferential parking, all are treated by the model as elements in a “support package.” They are not modeled separately. Rather the level or extent of the support service package is modeled and the higher the number of these strategies offered, the higher the level of support that is modeled.

The strategy package assigned to an employer was thus comprised of the following potential actions:

- Amount of financial incentives (transit, carpool, vanpool)
- Participation in telework and number of teleworkers (if known)
- Participation in CWS and assumed percentage of employees participating
- Level of transit/rideshare commuter support offered
- Level of bicycle services offered

The COMMUTER model was run in a batch format that allowed each employer’s program components to be modeled separately. The analysis thus calculated for each employer, the final mode split with the program in place. By comparing the starting and ending mode splits, the percentage trip reduction that would be expected following implementation of the program elements was calculated. This trip reduction was then applied to the number of employees at the worksite to estimate the number of vehicle trips reduced for that employer.

Because travel distance was not available for either individual employees or employers in the ACT! database, the number of VMT reduced was estimated by multiplying the vehicle trips reduced for an employer by the average regional one-way trip lengths for each mode, as measured through the 2008 State of the Commute Survey. Emissions reduced were calculated by multiplying trips and VMT reduced by 2008 regional emission factors. Finally, the individual results for each employer were aggregated to estimate the combined impact of all employers in the TERM. Appendix 3 provides details of the calculations of impacts for Employer Outreach.

EMPLOYER OUTREACH SUMMARY OF GOALS AND IMPACTS

The impacts calculated as described above, were compared against the TERM goals. The total goals and impacts are shown in Table 6.

Table 6
Employer Outreach Goals and Estimated Impacts

	EO Goal	Estimated Impacts
Employer Outreach Base (all programs)		
• Employers participating	581	N/A
– Maintained from 2005	424	N/A
– New/expanded programs	96	89
– Employers with bike programs	61	28
Total Program		
• Daily vehicle trips reduced	64,644	N/A
• Daily VMT reduced	1,065,851	N/A
• Daily tons NOx reduced	0.5485 T	N/A
• Daily tons VOC reduced	0.343 T	N/A
New / Expanded Programs		
• Daily vehicle trips reduced	8,618	12,702
• Daily VMT reduced	140,622	207,887
• Daily tons NOx reduced	0.072 T	0.099 T
• Daily tons VOC reduced	0.046 T	0.058 T
Bike Program Strategies		
• Daily vehicle trips reduced	130	58
• Daily VMT reduced	567	351
• Daily tons NOx reduced	0.001 T	0.0004 T
• Daily tons VOC reduced	0.0005 T	0.0002 T

Impacts vs Goals**New / Expanded Employer Programs**

Participating Employers (net over or (under) goal):	Employers: (7)
Transportation Benefit (net over or (under) goal):	Vehicle Trips: 4,084 VMT: 67,265 miles
Emission Benefit (net over or (under) goal):	NOx: 0.026 tons per day VOC: 0.012 tons per day

New / Expanded Employer Programs – Bike Services

Participating Employers (net over or (under) goal):	Bike Employers (33)
Transportation Benefit (net over or (under) goal):	Vehicle Trips: (72) VMT: (216 miles)
Emission Benefit (net over or (under) goal):	NOx: (0.0005) tons per day VOC: (0.0003) tons per day

As shown, the number of employers with new or expanded commute programs (89) came very close to the goal of 96 for this measure. As with other TERMS, the number of employers is expected to rise when the final six-months of the evaluation period are added to the impacts. Additionally, the impacts calculated here include only employers that could be reached by phone during an independent effort by a contractor hired by Commuter Connections to verify the strategies reported in the ACT! database. The contractor is continuing to attempt contacts with additional employers, some of which are likely to be added to the calculation when the analysis update is performed during summer 2008.

But the trip reduction and VMT reduction impacts for Employer Outreach were about 50% higher than the goals for these measures. This was because all the employers included in the analysis had implemented substantial programs, most of them including several of the services that research has shown are likely to produce high levels of trip reduction (e.g., transit and rideshare subsidies, compressed work schedules, telecommuting). Emissions reduced were calculated by multiplying trips and VMT reduced by 2008 regional emission factors. Details of the calculation are presented in Appendix 3.

We note that Employer Outreach overlaps with the Maryland and Virginia Telework TERM. Some employers counted in Employer Outreach could also be counted in the Telework TERM's "assisted employer" category. To avoid double counting credits, employers that offered telework strategies that also had received assistance from the Telework TERM were included in the comprehensive Employer Outreach impact calculation, but impacts from the telework components of their programs were removed from Employer Outreach impacts and assigned to Telework.

To estimate the extent of the overlap, the COMMUTER model was run for these employers with and without telework. The collective impact (vehicle trips, VMT, and emissions) for these employers' programs when telework was excluded was subtracted from the impact when telework services were included. The difference was considered to be the overlap. This impact was assigned to the Telework

TERM and subtracted from the total Employer Outreach impact. The results presented in Table 6 show the adjusted impacts with the overlap removed.

A similar exercise was performed to estimate the contribution of bike strategies to the overall Employer Outreach program impacts. The impacts for employers that offered bicycle strategies were modeled both “with bicycling” and “without bicycling.” The difference in vehicle trips reduced between these two cases was determined to be the bike strategies’ share of the impacts. It was assigned to the Employer Outreach for Bicycling component of Employer Outreach.

The VMT reduced for bicycling was estimated by multiplying the vehicle trips reduced by an average regional one-way trip length for bicycle commuters, of 6.0 miles, calculated from the 2007 State of the Commute (SOC) Survey. This was a change from the 2005 evaluation, which used a one-way trip distance of 10.0 miles, calculated from Bike-to-Work Day survey data. This change was made because the SOC distance was deemed to be a more realistic distance for bicyclists region-wide who bicycled on a regular basis.

SECTION 7 MASS MARKETING

BACKGROUND

In July 2003, Commuter Connections embarked on an ambitious effort to educate the region about alternatives to stress-filled solo commuting and to raise awareness of commute assistance services available through Commuter Connections and its partners. This effort, captured in the Mass Marketing TERM, employs radio, television, direct mail, and other mass media to create a new umbrella level of public awareness and to provide a call to action to entice commuters to switch to alternative modes. The objectives of the Mass Marketing TERM are to:

- Raise regional awareness about the Commuter Connections brand
- Address commuters' frustration with congestion
- Induce commuters to try and adopt alternative commute modes

In the 2008 analysis, one additional program component was added to the Mass Marketing TERM analysis. Commuter Connections provides support to the annual Bike-to-Work Day event. In the 2005 evaluation, impacts of BTW Day were captured under the Employer Outreach for Bicycling TERM. But Commuter Connections' role in this event is primarily promotional in nature. Thus, when Employer Outreach for Bicycling was absorbed into the Employer Outreach TERM, this program was moved for the 2008 evaluation to Mass Marketing.

EVALUATION METHODOLOGY – UMBRELLA ADVERTISING CAMPAIGN

The Mass Marketing TERM has three populations of interest:

- 1) All commuters in the Commuter Connections service area
- 2) Commuter Connections rideshare and GRH applicants who were influenced by the marketing campaign to request Commuter Connections services
- 3) Commuters who participate in the Bike-to-Work Day event

This TERM presents two challenges not encountered in most of the other TERMS. First, it is more difficult to assess influence on the general commuting public than it is to identify and track program participants. Second, when commuters who changed travel behavior can be identified, it is still necessary to identify what motivated their change – the media campaign or another influence.

The Mass Marketing evaluation method examines impacts from two types of change, which are measured separately. The first is “*directly*” influenced change. These are mode shifts that are made when the ads motivate commuters to change mode with no intermediate contact with Commuter Connections. An example of this type of change would be a carpool formed when a commuter hears the ad and asks a co-worker to carpool. Direct influences can only be assessed through a regional survey of commuters that asks about mode change and the reasons for the changes. If a shift occurred and the shift can be attributed to a message that is part of the Mass Marketing campaign, the associated trip, VMT, and emissions reductions can be credited to the campaign.

The second is “referred change.” These are mode shifts that occur among commuters who are influenced to contact Commuter Connections by the ads. This change would include, for example, a commuter who hears the ad, requests a ridematch list from Commuter Connections, then forms a new carpool as a result.

Referred influences are best measured by tracking changes in the volume of requests of information and services through two Commuter Connections' traditional programs: the Commuter Operations Center and GRH. A comparison of the volumes of requests received during periods of media activity to periods without media activity can provide an estimate of the change in requests as a result of the ads. A pro-rated share of the impacts of these other TERM impacts then can be assigned to Mass Marketing.

Evaluation of Direct Influence

Directly influenced change is measured for this evaluation through the regional 2007 State of the Commute survey, which included questions related to the following:

- Ad awareness – Were commuters aware of commute advertising and the specific messages conveyed?
- Changes made after hearing the ads – How many commuters who recalled the ads shifted to alternative modes after hearing the ads and how were they traveling before making the change?
- Reasons for change – Did the ads influence the commuters to make the change?
- Other commute services used – Did the commuters use any commute services provided by Commuter Connections?

The results for these questions were used to estimate the number of total regional commuters who were influenced by ads to change mode without any contact with Commuter Connections. The survey results were as follows:

Percentage of commuters who:

- | | |
|--|--------------|
| • Recalled commute message | 35% |
| • Shifted to an alternative mode after hearing the ads | 0.1% |
| • Said the ad influenced their decision to shift | 100% |
| • Did not use any other commute service | 100% |
| • Resulting influence percentage | 0.04% |

Thus, 0.04% of regional commuters were directly influenced to make a change. This percentage was multiplied by the average number of regional commuters (2,426,248) to estimate the number of alternative mode placements.

Further analysis of the survey respondents who had made a change showed that 19% continued using the new mode and 81% were temporary users and these commuters reduced on average 1.00 and 1.70 trips per placement respectively. These factors, and the 31.2 mile per trip distance calculated from the State of the Commute data were applied to the total number of new alternative mode placements to obtain the numbers of vehicle trips and VMT reduced by direct influence.

Evaluation of Referred Influence

Indirect influences were estimated through comparison of the numbers of new Commuter Operations Center and GRH applications received:

- In months between July 2005 and June 2008 when MM ads were aired
- In months between July 2005 and June 2008 when MM ads were NOT aired

As a first step, this analysis calculated the average numbers of applications received during “with MM” and “without MM” periods and compared the numbers. An increase in requests observed during the “with MM” periods could be assumed to result from the ads and other marketing efforts performed during the same time periods. Thus, the analysis also calculated volumes of requests that were received under “with ad” and “without ad” scenarios. The analysis indicated the following:

	<u>Increase in Applications</u>		
	<u>All CC Inquiries</u>	<u>RS Apps</u>	<u>GRH Apps</u>
• With ads compared to no ads	14%	14%	1%

These results suggest that ads increase rideshare applications by about 14% and increase GRH applications by about 1%. When taken as a percentage of total new applications, these increases translate to about 12% of total rideshare applications (14/114) and 1% of total GRH applications (1/101). The impact resulting from these increases was assigned to Mass Marketing.

Evaluation Methodology – Bike to Work Day Event

Impacts for the second component of this TERM, Bike-to-Work Day (BTWD) Event, were calculated using data obtained from a survey of BTWD participants conducted following the 2007 BTW Day event. The survey included questions regarding participants’ use of bicycling for commuting before and after the event, and their ongoing level of bicycle commuting.

The impact methodology estimated the trip reduction impacts of new ridership by calculating the number of commuters who started riding to work after the event or who increased the number of days per week they rode to work and the average number of “new” bike days per week. Two periods of time were examined: 1) spring/summer/fall following the event and 2) winter following the event. From these data the number of new “seasonal” use and “continued winter” use days were calculated for a year. This number was then translated to a daily figure.

The number of vehicle trips reduced by new bicycling was estimated by multiplying the percentage of participants who said they drove alone or carpooled on non-cycling days (49%) by the number of daily bicycle trips. VMT reductions were estimated by multiplying the vehicle trip reduction by the average commute distance of these participants (10.4 miles). Emissions reduced were calculated as for other TERMS.

MASS MARKETING SUMMARY OF GOALS AND IMPACTS

Shown in Table 7 are the shows the results for the TERM, compared to the goals established for Mass Marketing. Individual goals were not established for any of the four elements that comprised the Mass

Marketing TERM (direct influence, indirect ridematch influence, indirect GRH influence, and BTW Day event).

Table 7
Mass Marketing Goals and Estimated Impacts

	MM Goal	Estimated Impacts
Total Mass Marketing		
• Commuter placements	11,023	3,836
• Daily vehicle trips reduced	7,759	1,416
• Daily VMT reduced	141,231	37,516
• Daily tons NOx reduced	0.072 T	0.018 T
• Daily tons VOC reduced	0.044 T	0.009 T

Impacts vs Goals

Transportation Benefit (net over or (under) goal): Vehicle Trips: 6,342
VMT: 103,715 miles

Emission Benefit (net over or (under) goal): NOx: (0.054 tons per day)
VOC: (0.035 tons per day)

MM reached about a third of the goal for commuter placements, but fell farther short of the goals for vehicle trips and VMT reduced, meeting 19% and 27% respectively of these two goals. Emissions also fell short, by similar percentages. The shortfall for this TERM was largely in the areas of ad-prompted GRH referrals, which were considerably under the referrals counted in the 2005 evaluation, and in the much lower level of “direct influence” credits compared to 2005. Only one percent of the credit for GRH applications was assigned to Mass marketing in this evaluation, compared to 13% of the credit assigned in 2005. Similarly, a higher percentage of direct influence from ads was measured in the 2004 State of the Commute survey and in the 2005 Mini-Household survey compared to that measured for ad influence in the 2007 SOC survey.

Details of the calculation for Mass Marketing are presented in Appendix 4. Appendix 4 also shows the calculations for Bike-to-Work Day.

SECTION 8 INFOEXPRESS KIOSKS

BACKGROUND

The fifth TERM, InfoExpress Kiosks, was adopted by the TPB in the FY1995-2000 TIP. This TERM involved installation of InfoExpress traveler information kiosks in the District of Columbia and in Northern Virginia and was designed to improve the quality and delivery of alternative mode information products to commuters.

The InfoExpress traveler kiosks were launched in January 1998. Kiosks were placed permanently at two locations in the District of Columbia and at nine locations in Northern Virginia. Two mobile kiosks, one in the District of Columbia and one in Northern Virginia were been temporarily installed at various sites. In addition, Fairfax County placed Commuter Connections' ridematch applications on its Community Residence Information System kiosks.

The kiosks offered self-service transit schedules and maps and other commute information. Commuters also could apply for ridematching and for the regional GRH program through the kiosk. Requests for ridematches and other information offered by Commuter Connections but not immediately available through the kiosks were then e-mailed directly to the Commuter Operations Center for service delivery.

The kiosks also offered information on weather, real-time traffic, and maps & guides and kiosks located at retail locations in Fairfax County additionally provided local county information. Kiosks located at retail centers also offer retail information such as maps and lists of special events occurring at the sites. Since they were installed, several design improvements have been made to enhance the ease of use and attractiveness of the displays.

The InfoExpress Kiosk program ended on January 31, 2007, thus the daily impacts of this TERM are calculated only for the period July 1, 2005 through January 31, 2007.

EVALUATION METHODOLOGY AND DATA SOURCES

It is technologically easy to track the number of kiosk users for various information screens, but very difficult to follow-up with users to determine their use of the information they received because kiosk use is largely anonymous. Commuter Connections had contact names and phone numbers for only tiny fraction of kiosk users recorded between July 2005 and June 2008, those who had submitted an on-screen Commuter Connections application for a ridematch and/or GRH or who completed an on-line survey, including their names and phone numbers.

For analysis of other TERMS, Commuter Connections conducted surveys of commuters who had used TERM services. But because the kiosks allow users to obtain some information, notably transit schedules and maps, without any further contact with Commuter Connections, kiosk use and mode change information for these commuters was captured through questions included in the 2007 State of the Commute survey.

This survey asked commuters about the following information:

- Use of the InfoExpress kiosks to obtain travel or commute information
- Changes in travel pattern or trial use of alternative mode after receiving information
- Mode used prior to making the change and duration of the change
- Commute distance

About 10% of the commuters surveyed in the State of the Commute survey said they had seen a kiosk and 11% of these commuters had used a kiosk to obtain transportation information. This represented approximately 243,200 commuters region-wide. About 30% of these commuters said they tried or started using an alternative mode with information they received from the kiosk (placement rate). About a quarter of these commuters continued using the new mode; the rest were temporary placements. Analysis of the changes made by these commuters produced VTR factors of 0.54 for continued placements and 1.55 for those who made temporary changes. The relatively high VTR factors, relative to factors for many other TERMS, were due to the substantial use of the kiosks to obtain and use transit information.

Because the InfoExpress Kiosks program ended in January 2007, about half-way through the three-year evaluation period, these VTR factors were discounted to credit only 53% of the total impact (19 months / 36 months) for the time the Kiosks were in place. This resulted in effective VTR factors of 0.29 for continued placements and 0.82 for temporary placements.

Vehicle trips reduced through the use of the kiosk was calculated by multiplying these kiosk VTR factors by the number of kiosk placements. Finally, as with Telework and GRH, daily VMT reduced was calculated by multiplying the number of vehicle trips reduced by average trip distances calculated from the kiosk survey (24.0 miles per one-way trip for continued placements and 17.3 miles for temporary placements). Emission reduction was calculated by multiplying vehicle trips and VMT reduced by the 2005 regional emission factors. Calculation details for kiosk impacts are presented in Appendix 5.

INFOEXPRESS KIOSKS SUMMARY OF GOALS AND IMPACTS

Shown in Table 8 below are the evaluation results for InfoExpress Kiosks. As shown, the TERM met its individual goals for all impact measures.

Table 8
InfoExpress Kiosks Goals and Estimated Impacts

	TERM Goal	Estimated Impacts
• Daily vehicle trips reduced	1,178	2,840
• Daily VMT reduced	46,755	52,638
• Daily tons NOx reduced	0.023 T	0.027 T
• Daily tons VOC reduced	0.013 T	0.016 T

Impacts vs Goals**Transportation Benefit** (net over or (under) goal):

Vehicle Trips: 1,062

VMT: 5,883 miles

Emission Benefit (net over or (under) goal):

NOx: 0.004 tons per day

VOC: 0.003 tons per day

SECTION 9 COMMUTER OPERATIONS CENTER

BACKGROUND

Since the 1970's, COG has offered basic commute information and assistance, such as regional ride-matching database, to commuters living and/or working in the Washington metropolitan region. Prior to 1995, when Commuter Connections was established, these services were provided by COG's RideFinders program. Because these services, now provided through the Commuter Operations Center (COC), were available when the emissions baseline was developed for regional conformity, the Center was not established as a TERM, but was included in the region's TIP as an ongoing program.

The function of the Commuter Operations Center is to increase commuters' awareness of alternative modes, through regional and local marketing and outreach programs and to encourage and assist commuters to form ridesharing arrangements. Encouraging commuters who drive alone to shift to alternative modes is a priority for the COC, but the COC also assists commuters who now use alternative modes to continue to do so, by offering ridematching and transit assistance when carpools break up or commuters' travel patterns change and disrupt existing alternative mode arrangements.

Commuter Connections program services include: carpool and vanpool matchlists, transit route and schedule information, information on Park & Ride lot locations and HOV lanes, telework information, commute program assistance for employers, GRH, and bicycling and walking information. Commuters obtain services by calling a toll-free telephone number or by submitting a ridematch application obtained from COG, an employer, a local partner assistance program, a transportation management association (TMA), or through the internet or one of the InfoExpress Kiosks described in Section 8.

EVALUATION METHODOLOGY

In past years, the Commuter Operations Center has enhanced the services it offers to commuters and expanded its marketing of alternative modes to raise public awareness of and interest in alternatives. These efforts were designed to increase the number of commuters placed in alternative modes and generate trip, VMT, and emission reduction benefits for the region. Further, the activities of the COC support the implementation of the TERMS administered by Commuter Connections. Thus, although it is not an adopted TERM, the COC is included in this evaluation.

The impacts of the COC were measured using data from a Commuter Connections placement survey conducted in November 2005. This survey interviewed a sample of commuters assisted by Commuter Connections in the three-months prior to the survey and collected data to estimate placement rates, VTR factors, drive alone access percentages, and travel and access distances. As was done for GRH, these multipliers were estimated for two sub-groups of applicants. The first sub-group included respondents who both live and work within the Washington, DC Metropolitan Statistical Area (MSA); that is within the 11-jurisdiction area covered by the TERM evaluation. The second group included respondents who work within the MSA but live outside it.

This distinction was made because applicants who live outside the MSA traveled a portion of their VMT outside the MSA. During the evaluation, it was decided that the VMT for these "out of MSA" applicants should be discounted to credit VMT reduction only for the portion that occurred within the MSA. Approximately 31% of the total participants lived outside the MSA.

For each sub-group of survey respondents, the placement rate, that is, the percentage of respondents who switched to an alternative mode, was calculated. Two rates were calculated, a “continued” rate, including respondents who switched and remained in the new alternative mode until the placement survey was conducted, and a “temporary” rate, including respondents who made a switch, but returned to their original mode before the survey. The two sub-group populations had the following placement rates:

	Continued	Temporary
• Within MSA	25.0%	15.7%
• Outside MSA	31.1%	13.2%

To determine the number of commuters placed in alternative modes between July 2005 and June 2008, these placement rates were multiplied by the total number of commuters who received assistance from Commuter Connections during that time period, 154,147, divided into the two sub-groups: 106,361 within the MSA and 47,786 outside the MSA. This calculation resulted in a total of 64,458 placements, with 41,452 placements from within the MSA and 23,006 placements from outside the MSA.

These placement figures were then multiplied by VTR factors derived from the survey data to estimate the number of vehicle trips reduced. The VTR factors, expressed in terms of average vehicle trips reduced per placement, for the two sub-groups were as follows:

	Continued	Temporary
• Within MSA	0.44	0.61
• Outside MSA	0.48	0.45

VTR factors combine the vehicle trip reduction contributions of various types of mode changes, such as from transit to rideshare, drive alone to transit, and drive alone to carpool, each of which reduces a different number of vehicle trips per day, into one number. VTR factors of less than 0.50 indicate a significant number of the changes were to lower occupancy shared modes, such as carpool and/or were shifts from one alternative mode to another.

The vehicle trip reductions for temporary placements also were discounted to reflect their short duration of 6.6 weeks of the year (12%). The calculation of vehicle trips reduced produced a total of 20,459 trips reduced; 18,833 from commuters within the MSA and 1,626 from commuters outside the MSA.

Next, VMT reduced was calculated by multiplying the numbers of vehicle trips reduced by the average trip length for commuters who made a shift to an alternative mode. The one-way trip distance for the within MSA respondents was 32.2 miles for continued placements and 31.1 miles for temporary placements. The actual average one-way distances for the outside MSA respondents were 54.4 miles for continued placements and 57.9 miles for temporary placements. To discount the distance credited to the outside MSA respondents, their one-way travel distance was set equal to that of the distance for the within MSA respondents, resulting in a loss of more than 22 one-way miles per trip for each outside-MSA respondent. The VMT calculation resulted in a total of 656,990 VMT reduced.

Emission reduction for the COC was calculated using trip-based and VMT-based regional emission factors for 2005. Details of these calculations are presented in Appendix 6.

Software Upgrades

The 2005 evaluation included a “Software Upgrade” component as part of the Integrated Rideshare TERM. This service involves upgrading and maintaining the regional ridematching system to include integrated transit information, information on HOV lanes, Park & Ride lots, and telecommuting, to provide full-service commuter information through traveler information kiosks. By providing transit and telework information to all commuters who received a matchlist, the service is expected to encourage commuters to try transit and park & ride lots, even if they did not have these options in mind when they requested assistance from Commuter Connections. The software upgrade portion of the TERM was implemented in October 1998. In the 2008 evaluation, this component was merged into the COC impacts. But they were calculated separately, using the following method.

Impacts of the software upgrades were assessed using data from the November 2005 rideshare placement survey. This survey assessed changes commuters made after receiving a ridematch or other commute service from Commuter Connections. Respondents were asked if they remembered receiving transit and/or park & ride (P&R) information on a matchlist and if they used the information to make any travel changes. Changes to transit influenced by use of transit information and changes to rideshare or transit influenced by P&R information were captured in this COC component.

The surveys showed that 4.3% of applicants who lived inside the MSA and 5.9% of applicants who lived outside the MSA used the transit and/or P&R information to shift to an alternative mode. Most said they continued using the alternative mode. The placement rates and VTR factors for this calculation were:

	<u>Continued</u>	<u>Temporary</u>
Placement Rates		
• Within MSA	2.7%	1.6%
• Outside MSA	5.0%	0.9%
VTR factors		
• Within MSA	0.65	0.64
• Outside MSA	0.75	0.60

To estimate vehicle trips reduced, placement rates were multiplied by the 154,147 commuters who applied to Commuter Connections or received follow-up assistance from Commuter Connections during the evaluation period and by the VTR factors derived from the placement surveys for commuters who used the information provided.

VMT reductions were estimated by multiplying the number of trips by the average trip lengths calculated from the placement surveys (32.3 miles for continued placements and 33.8 miles per trip for temporary placements). As was explained in the descriptions for both the GRH TERM and the COC, these distances were used for both within MSA and outside MSA respondents. Emission reduction was calculated using trip-based and VMT-based 2008 regional emission factors. Calculation details for the software upgrade are shown in Appendix 7.

COMMUTER OPERATIONS CENTER SUMMARY OF GOALS AND IMPACTS

Shown below are the evaluation results for the COC and the goals established for the Center.

Table 9
Commuter Operations Center Regional Goals and Estimated Impacts

	Regional Goal	Estimated Impacts
Commuter Operations Center (basic services)		
• Total commuters (new and re-apply)	152,356	154,147
• Daily vehicle trips reduced	10,399	14,993
• Daily VMT reduced	296,635	480,450
• Daily tons NOx reduced	0.147 T	0.213 T
• Daily tons VOC reduced	0.081 T	0.107 T
Software Upgrades (additional to Basic COC)		
• Daily vehicle trips reduced	2,370	3,773
• Daily VMT reduced	62,339	122,198
• Daily tons NOx reduced	0.031 T	0.0054 T
• Daily tons VOC reduced	0.017 T	0.0027 T

Impacts vs Goals

Applicant Number (net over or (under) goal): Applicants: 1,791

Basic COC

Transportation Benefit (net over or (under) goal): Vehicle Trips: 4,594
VMT: 183,815 miles

Emission Benefit (net over or (under) goal): NOx: 0.066 tons per day
VOC: 0.026 tons per day

Software Upgrades

Transportation Benefit (net over or (under) goal): Vehicle Trips: 1,403
VMT: 59,859 miles

Emission Benefit (net over or (under) goal): NOx: 0.023 tons per day
VOC: 0.009 tons per day

As shown, the COC fulfilled more than applicant goal during the three year period. About a quarter of the requests were from new applicants or re-applicants, who comprised 35,500 applicants. The COC also provided follow-up assistance to more than 118,600 commuters. This assistance included providing additional match names for existing carpools and vanpools that needed or wanted a new or additional rider. Some of this assistance likely helped maintain existing ridesharing arrangements. The COC substantially exceeded the goals for vehicle trips, VMT, and emissions reduced.

The results shown in Table 9 were adjusted results that eliminated double counting due to overlap between the COC and individual TERMS. As was explained previously, a portion of the Commuter Operations Center's impacts were assigned to the Software Upgrades component. Additionally, a small portion of the COC's impacts resulted from applications received through the kiosks (0.1% of total applications). And about one in ten new CC applicants requested both GRH and other information (5.7% of total COC assisted commuters). Finally, the impacts for a portion of new COC applicants were assigned to the Mass Marketing TERM, to reflect the impact of this TERM in influencing commuters to contact CC for travel-assistance services.

To avoid double counting of impacts, the impacts of these other TERMS were subtracted from the COC base impacts to determine the net impacts attributable solely to the COC and to account for those impacts covered by TERMS and those attributable to the base operations. These adjustments are shown in Table 10 below. The "Net COC" impacts shown in Table 10 were used in Table 9 as the impacts attributable only to the COC and not to any TERM.

Table 10
Adjustment for Double Counting Among COC and TERMS

<u>Evaluation Measure</u>	<u>COC Base</u>	<u>Mass Marketing</u>	<u>Kiosks</u>	<u>Software Upgrade</u>	<u>GRH</u>	<u>Net COC</u>
Placements	64,458	1,685	69	7,200	3,578	51,927
VT reduced	20,459	535	22	3,773	1,136	14,993
VMT reduced	656,990	17,172	700	122,198	36,470	480,450
Tons of NO _x reduced	0.291	0.008	0.0003	0.054	0.016	0.213
Tons of VOC reduced	0.145	0.004	0.0002	0.027	0.008	0.107

Notes:

- Mass Marketing – new applicants influenced by ads to contact CC, see Section 7
- Kiosks - 0.1% of new COC applications received through kiosks
- Software upgrades – see description in this section
- GRH – 10% of new/re-applicants ask for GRH and other commute information = 5.5% of COC total after Mass Marketing adjustment

SECTION 10 CONCLUSIONS ABOUT TERM IMPACTS

The preceding sections of this report documented estimated impacts for individual TERMS and for the Commuter Operations Center. As noted in an earlier section, the combined set of programs administered by Commuter Connections did not meet the goals set for the five TERMS collectively, although several of the TERMS did meet or exceed their individual goals.

Many of the TERMS met goals established for participation, vehicle trip, VMT, and emissions reductions. Commuters and employers, as appropriate, apparently are aware of and utilizing the services. Where shortfalls did occur against the goals, they appeared to be related to the less aggressive marketing campaigns implemented for GRH and Mass Marketing during 2006 and the early part of 2007. But COG revised the goals for each TERM following the 2005 analysis, so the 2008 goals reflect more closely the impacts from actual types of behavior changes that commuters make than did the 2005 goals.

It also should be noted that many of the impact calculations in this report used data from surveys that are subject to statistical error rates. So the impact numbers should be considered estimates of impacts that could be somewhat higher or lower than are shown. Additionally, this interim evaluation covers only the first 30 months of the 36-month evaluation period. TERMS such as GRH, COC, Mass Marketing, and Employer Outreach, whose impacts are tied to levels of commuter or employer participation in Commuter Connection programs, are likely to experience an increase in impacts when the final six months are included in the calculations.

Individual sections of this report have discussed factors that affected the achievement of goals. Below are presented highlights of those discussions for the five TERMS and the COC.

MARYLAND AND VIRGINIA TELEWORK

The incidence of telework continues to grow in the Washington region. In 1996, about 150,000 regional workers were telecommuting. By 2005, the number had grown to more than 318,000, and increase of 165,000 and the 2007 State of the Commute survey estimates regional teleworkers at 456,600 or about 19% of regional commuters.

About 10% of the teleworkers can be attributed to the efforts of the Telework TERM, either directly through information distributed to commuters, through regional advertising to the public-at-large, or through assistance to employers that want to start a telework program. This number of new teleworkers exceeded the goal set for the Telework TERM.

The Telework TERM exceeded the goals for trip, VMT, and emission reductions assigned to the TERM. The goals were revised following the 2005 analysis and now more closely represent the actual telework patterns existing in the region; primarily the average frequency of 1.5 days per week and the 29% non-drive alone mode share of teleworkers on non-telework days. These two factors have a substantial impact on the total trip reduction generated by teleworking.

It is possible the Telework TERM's contribution could be slightly underreported. About five percent of regional teleworkers said they learned of telecommuting through "advertising," newspaper ads, or "other website." Although these sources were not necessarily controlled by Commuter Connections, Commuter Connections has advertised consistently and broadly about telework via radio, television, print media, and

the internet. So this response likely indicates additional teleworkers who learned about telework from outreach and promotion conducted by Commuter Connections. Because the source of the advertising could not be clearly documented, only a small share of these commuters (1.9% of total teleworkers) was credited to the Telework TERM.

GUARANTEED RIDE HOME

Unlike the Telework TERM, the GRH TERM did not meet the adopted goals, falling 33% short in the number of vehicle trips reduced and about 37% short of the VMT goal.

The shortfall primarily resulted because the number of new GRH registrants dropped substantially in 2006 and 2007 from annual registration counts of previous years. COG adjusted the goals for this TERM after the 2005 evaluation to reflect the actual travel patterns of typical GRH applicants and the fact that a sizeable share of GRH registrants were ridesharing or using transit prior to registering. These changes resulted in the vehicle trip and VMT calculations more accurately measuring the trip reduction per new GRH registrant, but the lower participation levels results in correspondingly lower results for vehicle trip and VMT reduction goals.

Finally, note that a very small share of GRH impacts were assigned to the Mass Marketing TERM to recognize that some GRH applicants were influenced to contact Commuter Connections and apply for GRH after they heard a Mass Marketing advertisement. Approximately one percent of the total new GRH applicants were assigned to Mass Marketing. This accounted for less than one percent of the GRH impacts.

EMPLOYER OUTREACH

Impacts for Employer Outreach (new or expanded program impacts) were well above the goal for this TERM. Both the vehicle trip reduction and VMT reduction were nearly 50% over their respective goals. This result was due to the large number of employees at these worksites and the aggressiveness of the worksite programs. Only Level 3 and 4 employers were included in the calculation and these employers have implemented highly effective commute strategies to encourage use of alternative modes, including financial subsidies, telecommuting, compressed work schedules and packages of commute support services.

We note that Employer Outreach overlaps with the Maryland and Virginia Telework TERM. Some employers counted in Employer Outreach could also be counted in the Telework TERM's "assisted employer" category. To avoid double counting credits, employers that offered telework strategies that also had received assistance from the Telework TERM were included in the comprehensive Employer Outreach impact calculation, but impacts from the telework components of their programs were removed from Employer Outreach impacts and assigned to the Telework TERM.

MASS MARKETING

MM reached about a third of the goal for commuter placements, but fell farther short of the goals for vehicle trips and VMT reduced, meeting 19% and 27% respectively of these two goals. Emissions also fell short, by similar percentages. This TERM estimates impacts for three primary groups of commuters,

- 1) “Directly influenced” commuters who had no contact with Commuter Connections other than through hearing or seeing the ads
- 2) Indirectly influenced commuters, who were influenced by the ads to contact Commuter Connections for rideshare or GRH assistance
- 3) Commuters who participated in Bike to Work Day events

Directly influenced commuters accounted for about 45% of commuters placed, indirect placements accounted for about 48% of the total, and the balance of nine percent was contributed by Bike to Work Day.

The shortfall for this TERM was largely in the areas of ad-prompted GRH referrals, which were considerably under the referrals counted in the 2005 evaluation, and in the much lower level of “direct influence” credits compared to 2005. Only one percent of the credit for GRH applications was assigned to Mass Marketing in this evaluation, compared to 13% of the credit assigned in 2005. Similarly, a higher percentage of direct influence from ads was measured in the 2004 State of the Commute survey and in the 2005 Mini-Household survey compared to that measured for ad influence in the 2007 SOC survey.

INFOEXPRESS KIOSKS

The InfoExpress Kiosk TERM met its goals for all impact measures. Because the InfoExpress Kiosks program ended in January 2007, about half-way through the three-year evaluation period, the impacts for this TERM were discounted to credit only 53% of the total impact (19 months / 36 months) for the time the Kiosks were in place.

COMMUTER OPERATIONS CENTER

The Commuter Operations Center is not an adopted TERM, but was included in this evaluation because it supports the success of several of the TERMS, including GRH, Integrated Rideshare, and Employer Outreach. The COC fulfilled more than 154,000 requests during the 30-month period from July 2005 through December 2007. About 35,500 of the requests were from new applicants or re-applicants.

But the COC also provided follow-up assistance to more than 118,000 commuters. This assistance included providing additional match names for existing carpools and vanpools that needed or wanted a new or additional rider. Some of this assistance likely helped maintain existing ridesharing arrangements. The COC substantially exceeded the goals for vehicle trips, VMT, and emissions reduced, by a factor of two or three, depending on the impact measure.

The base results for the COC were adjusted to eliminate double counting due to overlap between the COC, GRH, and the Mass Marketing TERM. The overlap with GRH results because some commuters request both GRH and ridematch assistance. The overlap with Mass Marketing reflects the impact of this TERM in influencing commuters to contact the COC for travel-assistance services.

The COC impacts also were adjusted to separate the impact of the software upgrades implemented previously under the Integrated Rideshare TERM. In this 2008 evaluation, impacts for this program were reported under the COC, but its individual impacts were shown separately. The software upgrades met all the goals defined for the program.

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APPENDIX 7 - CALCULATION OF SOFTWARE UPGRADE IMPACTS

APPENDIX 1 – CALCULATION OF MARYLAND AND VIRGINIA TELEWORK IMPACTS

Populations of Interest

- All regional teleworkers (TW) 456,636 (from SOC survey)
- Employees at worksites 127,161 (from TW assistance survey)
assisted by TW

Telecommute Placement Rates

- Directly assisted TW 9.6% (% of TW assisted by TW, from SOC survey)
- Assisted worksites 4.1% (% of new TW at sites, from TW assistance survey)

Placements

Mixed home and Non-home based

- Directly assisted TW 43,762 (regional TW x directly assisted placement rate)
- TW at TW asst. sites 5,264 (employees at assisted sites x asst site placement rate)

Total assisted TW 49,027

Breakdown of placements by Location (home-based and telecenter-based)

- % Home-based TW 95% (from SOC survey)
- % Non-home (NH)-based TW 5% (from SOC survey)
- Home-based TW 46,575 (total assisted TW x % Home-based TW)
- NH-based TW 2,451 (total assisted TW x % NH-based TW)

Daily Vehicle Trips Reduced

VTR Factors

- Home-based factor 0.45 (from SOC survey)
- NH-based factor 0.31 (from SOC survey)
- Home-based VT reduced 21,097 (HB TW x HB VTR factor)
- NH-based VT reduced 769 (NH-based TW x NH VTR factor)

Total Daily Vehicle Trips Reduced 21,866

Appendix 1, continued

Daily VMT Reduced**Ave one-way trip distance (mi)**

- Home-based TW 18.5 (SOC survey)

Telecenter reductions (TC days) – other than MWTC

- VMT reduction – Non-home days 19.4 (SOC survey)
- Ave. days/wk at TC 1.0 (SOC survey)
- VMT reduction – home TW days 31.8 (SOC survey)
- Ave. days/wk at home 0.9 (SOC survey)
- Total weekly VMT reduction 47.8
- Daily reduction per teleworker 9.6

VMT reductions on TW days

- Home-based VMT reduced 390,290 (HB VT reduced x ave trip distance)
- NH-based VMT reduced 23,412 (NH-based TW x daily miles reduced)

Total Daily VMT Reduced 413,702

Daily Emissions Reduced

NOx reduced	08 Emission		08 Emission		Tot gm	Tot ton
	Trips	Factor	VMT	Factor		
• Cold start	21,866	0.6291			13,756	0.0152
• Running (40 mph)			413,703	0.4287	177,355	<u>0.1955</u>
Total NOx reduced (tons)						0.211

VOC reduced	08 Emission		08 Emission		Tot gm	Tot ton
	Trips	Factor	VMT	Factor		
• Cold start	21,866	1.7569			38,416	0.0423
• Running (40mph)			413,703	0.1856	76,783	<u>0.0846</u>
Total VOC reduced (tons)						0.127

APPENDIX 2 – CALCULATION OF GUARANTEED RIDE HOME IMPACTS

Populations of Interest

• GRH registrants	12,661	(GRH database)
• Registrants	9,114	
• One-time exceptions	<u>324</u>	(GRH database)
Total GRH base	22,099	
Within MSA	68%	15,027
Outside MSA	32%	7,072

GRH Placement Rates

(continued rates only)

• Within MSA placement rate	33.9%	(GRH survey)
• Outside MSA placement rate	44.9%	(GRH survey)

Placements (continued only)

• Within MSA	5,094	(Within MSA base x within MSA placement rate)
• Outside MSA	3,175	(Outside MSA base x outside MSA placement rate)

Daily Vehicle Trips Reduced

VTR Factors (continued only)

• Within MSA	0.91	(GRH survey)
• Outside MSA	1.19	(GRH survey)

VT Reduced (continued only)

• Within MSA	4,687	(Within MSA placements x within MSA VTR factor)
• Outside MSA	3,778	(Outside MSA placements x outside MSA VTR factor)

Total Daily VT Reduced

8,465

Daily VMT Reduced

• Ave one-way trip distance (mi)		
• Within MSA	26.2	(from GRH survey)
• Outside MSA	26.2	(discounted from actual 47.0 miles from GRH survey)

VMT reduced

• Within MSA	122,792	(Within MSA VT reduced x trip distance)
• Outside MSA	98,996	(Outside MSA VT reduced x trip distance)

Total Daily VMT Reduced

221,788

Appendix 2, continued

Trip and VMT Adjustment for SOV Access to HOV Modes (reduce VT and VMT for AQ analysis)

Inside MSA

- Non-SOV access percentage 50% (GRH survey)
- SOV access distance (mi) 4.8 (GRH survey)

Outside MSA – not applicable – all access outside MSA

VT Reduction

- No SOV access 6,122 (VT x non-SOV access %)

Total VT for AQ analysis 6,122**VMT Reduction**

- No SOV access 160,392 (VT x SOV % x trip distance)
- With SOV access 50,148 (VT x SOV % x (trip distance – access distance))

Total VMT for AQ analysis 210,540**Daily Emissions Reduced**

	08 Emission		08 Emission			
NOx reduced	Trips	Factor	VMT	Factor	Tot gm	Tot ton
• Cold start + hot soak	6,122	0.6291			3,851	0.0042
• Running			210,540	0.4287	90,258	<u>0.0995</u>
Total NOx reduced (tons)						0.104

	08 Emission		08 Emission			
VOC reduced	Trips	Factor	VMT	Factor	Tot gm	Tot ton
• Cold start + hot soak	6,122	1.7569			10,755	0.0119
• Running			210,540	0.1856	39,076	<u>0.0431</u>
Total VOC reduced (tons)						0.0055

Correction for Overlap with MM TERM

Total GRH apps FY 06, 07, 08	22,099	
New GRH apps FY 06, 07, 08	12,985	59%
Estimated MM share of new GRH	1%	
Estimated MM share of GRH impact	0.3%	

	GRH base	MM	Net GRH
Placements	8,269	24	8,245
VMT reduced	8,465	25	8,440
VMT reduced (mi)	221,788	652	221,136
NOx reduced (T)	0.104	0.0001	0.103
VOC reduced (T)	0.055	0.0001	0.055

APPENDIX 3 – CALCULATION OF EMPLOYER OUTREACH

Populations of Interest (new / expanded programs)

- Sites 100+ with Level 3-4 program 40 (ACT! database)
- Sites <100 with Level 3-4 program 49 (ACT! database)
- **Total TERM base employees 52,694** (ACT! database)

Average Vehicle Occupancy (AVO)

- Starting (pre-program) 1.26 (employee survey data)
- Ending (with program) 1.50 (COMMUTER model runs)

Daily person trips

- Starting (pre-program) 105,388 (total employees x 2 one-way trips per day)
- Ending (with program) 105,388 (total employees x 2 one-way trips per day)

Daily vehicle trips

- Starting (pre-program) 83,545 (total employees / starting AVO)
- Ending (with program) 70,428 (total employees / ending AVO)

Total Daily Vehicle Trips Red. 13,117 (starting vehicle trips – ending vehicle trips)

Daily VMT Reduced

- One-way trip dist (mi) 16.3 (SOC survey, mode averages)

Total Daily VMT Reduced 214,128 (vehicle trips reduced x average trip distance)

Trip and VMT Adjustment for SOV Access to HOV Modes (reduce VT and VMT for AQ analysis)

- Non-SOV access percentage 71% (from SOC survey)
- SOV access distance (mi) 3.1 (from SOC survey)

VT Reduction

- No SOV access (cont) 9,313 (VT reduced x non-SOV access %)

Total VT for AQ analysis 9,313

VMT Reduction

- No SOV access 152,031 (VT reduced x SOV % x trip distance)
- With SOV access 50,305 (VT reduced x SOV % x (trip dist – access dist))

Total VMT for AQ analysis 202,336

Appendix 3, continued

Daily Emissions Reduced

	08 Emission		08 Emission		Tot gm	Tot ton
	Trips	Factor	VMT	Factor		
NOx reduced						
• Cold start + hot soak	9,313	0.6291			5,859	0.0065
• Running			202,336	0.4287	86,741	<u>0.0956</u>
Total NOx reduced (tons)						0.102

	08 Emission		08 Emission		Tot gm	Tot ton
	Trips	Factor	VMT	Factor		
VOC reduced						
• Cold start + hot soak	9,313	1.7569			16,362	0.0180
• Running			202,336	0.1856	37,554	<u>0.0414</u>
Total VOC reduced (tons)						0.0594

Correction for Overlap with EO-Bike and TW TERMS

	EO base	EO-bike	TW	Net EO
Vehicle Trips Reduced	13,117	158	357	12,702
VMT Reduced (miles)	214,128	351	5891	207,887
NOx Reduced (tons)	0.102	0.0002	0.003	0.099
VOC Reduced (tons)	0.059	0.0001	0.002	0.058

APPENDIX 4 - CALCULATION OF MASS MARKETING IMPACTS

4 impact components

- Part 1 - Commuters influenced by ads to change mode – no contact CC
- Part 2 – Commuters influenced by ads to contact CC
- Part 3 – GRH credit
- Part 4 – Bike to Work Day

PART 1

Populations of Interest – commuters influenced by ads to change mode – no contact CC

Total commuters in region	2,426,248	(SOC)
• % recall commute message	35%	(SOC)
• % chg to alt mode after ads	0.1%	(SOC)
• % chg influenced by ad	100%	(SOC)

Placements – no contact with CC **628** (COC – monthly applicant analysis)

Placement Rates

- Continued placement rate 19% (SOC)
- Temporary placement rate 81% (SOC)

Placements

- Continued placements 119 (Placements x continued placement rate)
- Temporary placements 509 (Placements x temporary placement rate)

Daily Vehicle Trips Reduced

VTR Factors

- Continued VTR factor 1.00 (SOC)
- Temporary VTR factor 1.70 (SOC)

- Continued VT reduced 119 (Continued placements x continued VTR factor)
- Temporary VT reduced 399 (Temporary placements x temporary VTR factor x 0.46 discount for temporary use)

Total Daily Vehicle Trips Reduced **518**

Daily VMT Reduced

- Ave one-way trip dist (mi) 31.2 (SOC)

Total Daily VMT Reduced **16,175**

Trip and VMT Adjustment for SOV Access to HOV Modes (reduce VT and VMT for AQ analysis)

- Non-SOV access percentage 72% (from CC placement survey)
- SOV access distance (mi) 3.1 (from CC placement survey)

Appendix 4, continued

PART 1 (cont.)

VT Reduction

• No SOV access	373	(VT x non-SOV access %)
Total VT for AQ analysis	373	

VMT Reduction

• No SOV access	11,646	(VT x SOV % x trip distance)
• With SOV access	<u>4,079</u>	(VT x SOV % x (trip dist – access dist))
Total VMT for AQ analysis	15,725	

Daily Emissions Reduced – Part 1

NOx reduced	08 Emission		08 Emission		Tot gm	Tot ton
	Trips	Factor	VMT	Factor		
• Cold start + hot soak	373	0.6291			235	0.0003
• Running			15,725	0.4287	6,741	<u>0.0074</u>
Total NOx reduced (tons)						0.0077

VOC reduced	08 Emission		08 Emission		Tot gm	Tot ton
	Trips	Factor	VMT	Factor		
• Cold start + hot soak	373	1.7569			656	0.0007
• Running			15,725	0.1856	2,919	<u>0.0032</u>
Total VOC reduced (tons)						0.0039

PART 2

Populations of Interest – commuters influenced by ads to contact CC

New CC apps (does not include re-apply or follow-up)

• FY 2006	13,479	(CC database)
• FY 2007	11,364	(CC database)
• FY 2008	<u>6,149</u>	(CC database)
Total applicants	30,992	

Commuters influenced by ads to contact CC 13% (COC – monthly applicant analysis)

New apps 06-08 as % of total 20% (new apps FY04, 05 / total CC apps)
 % all apps influenced by ads 2.6%

CC Impacts – FY 06-08	Total	MM Share
• CC placements	64,458	1,685
• CC Vehicle trips reduced	20,459	535
• CC VMT reduced	656,990	17,172

Appendix 4, continued

PART 2 (cont.)

CC Impacts – FY 05-08 – Discounted for AQ Analysis

	Total	MM Share
• CC Vehicle trips reduced	11,831	309
• CC VMT reduced	598,940	15,655

Daily Emissions Reduced – Part 2**Daily Emissions Reduced**

	08 Emission		08 Emission		Tot gm	Tot ton
	Trips	Factor	VMT	Factor		
NOx reduced						
• Cold start + hot soak	309	0.6291			195	0.0002
• Running			15,655	0.4287	6,711	<u>0.0074</u>
Total NOx reduced (tons)						0.0076

	08 Emission		08 Emission		Tot gm	Tot ton
	Trips	Factor	VMT	Factor		
VOC reduced						
• Cold start + hot soak	309	1.7569			543	0.0006
• Running			15,655	0.1856	2,905	<u>0.0032</u>
Total VOC reduced (tons)						0.0038

PART 3 – GRH Credit

From GRH Analysis

Total GRH apps FY 06, 07, 08	22,099	
New GRH apps FY 06, 07, 08	12,985	59%
Estimated MM share of new GRH	0.5%	
Estimated MM share of GRH impact	0.3%	

	GRH base	MM
Placements	8,269	24
VT reduced	8,465	25
VMT reduced	221,788	652
NOx reduced (T)	0.104	0.0003
VOC reduced (T)	0.055	0.0002

Appendix 4, continued

Part 4 - Bike to Work Day Credit**Participants' riding percentage and frequency**

Number of riders	6,846	(BTWD registration data, 2005, 2006, 2007)
% biking to work before event	78.9%	(BTWD survey)
% new riders	9.6%	(BTWD survey)
Number of new riders	657	
% who increase riding days	12.3%	
Number of increased riders	842	
Total new + increased riders	1,499	Placement

Change in Bike Days

Pre-Event		
% biking before event	78.9%	
Ave days riding before event	2.5	(BTWD survey)
Weekly bike days before	13,342	

Summer Biking

% biking after event	88%	(BTWD survey)
Ave days riding after event	2.6	(BTWD survey)
Weekly bike days after	15,596	

Fall Biking

% new riders biking late fall	76%	(BTWD survey)
Weekly bike days late fall	1.04	(BTWD survey)
Weekly new bike days fall	518	
% increased riders biking late fall	72%	(BTWD survey)
Weekly new bike days late fall	0.92	(BTWD survey)
Weekly increased bike days	555	

New Bike Days

• New wkly bike days summer	2,254	(riders x % new after event x ave days summer)
• New wkly bike days fall	1,073	(riders x % new riders x still ride winter x ave days)
• Total new bike days summer	63,124	(wkly summer days x 28 wks – Apr-Oct)
• Total new bike days winter	23,601	(wkly winter days x 22 wks – Nov-Mar)
• Total new bike days-year	86,725	(summer bk days + winter bk days)
• New bike trips - year	173,450	(annual bike days x 2)

New Bike Trips and VT Reduction

• Ave new daily bk trips	694	(Annual new bike trips / 250)
• % DA/RS on non-bike days	49%	(BTWD survey)
• Daily vehicle trips reduced	<u>338</u>	(daily new bike trips x DA %)

BTWD Daily Vehicle Trips Reduced 338

Appendix 4, continued

Daily VMT Reduced

- Ave trip distance (mi) 10.4 (BTWD survey)

BTWD Daily VMT Reduced 3,518 (vehicle trips reduced x average trip distance)

Total Daily Vehicle Trips Reduced 338 (Bike program VT reduced + BTWD VT reduced)

Total Daily VMT Reduced 3,518 (Bike program VMT reduced + BTWD VMT reduced)

Daily Emissions Reduced

NOx reduced	08 Emission		08 Emission		Tot gm	Tot ton
	Trips	Factor	VMT	Factor		
• Cold start + hot soak	338	0.6291			213	0.0002
• Running			3,518	0.4287	1,506	<u>0.0017</u>
Total NOx reduced (tons)						0.0019

VOC reduced	08 Emission		08 Emission		Tot gm	Tot ton
	Trips	Factor	VMT	Factor		
• Cold start + hot soak	338	1.7569			594	0.0007
• Running			3,518	0.1856	653	<u>0.0007</u>
Total VOC reduced (tons)						0.0014

Mass Marketing**Total – PART 1, PART 2, PART 3, AND PART 4**

	No Contact	CC Contact	GRH	BTWD	Total MM
Placements	628	1,685	24	1,499	3,836
VT reduced	518	535	25	338	1,416
VMT reduced	16,175	17,172	652	3,518	37,516
NOx reduced (T)	0.008	0.008	0.0003	0.002	0.018
VOC reduced (T)	0.004	0.004	0.0002	0.001	0.009

APPENDIX 5 - CALCULATION OF INFOEXPRESS KIOSK IMPACTS

Populations of Interest – Regional Commuters who used Kiosks to obtain commute information

- Regional kiosk users 27,627 (SOC survey)

Kiosk Placement Rates

- Continued placement rate 6.6% (SOC survey)
- Temporary placement rate 24.6% (SOC survey)

Placements

- Continued placements 1,829 (Kiosk users x continued placement rate)
- Temporary placements 6,798 (Kiosk users x temporary placement rate)

Total placements 8,627

Daily Vehicle Trips Reduced

VTR Factors

- Continued VTR factor 0.54 (SOC survey) x 53% (reduced kiosk period)
- Temporary VTR factor 1.55 (SOC survey) x 53%

- Continued VT reduced 523
- Temporary VT reduced 2,316 (Temporary placements x temporary VTR factor x 42% discount for temporary use)

Total Daily Vehicle Trips Reduced 2,840

Daily VMT Reduced

- Continued one-way trip dist (mi) 24.0
- Temp trip dist (mi) 17.3 (from SOC survey)
- Continued VMT reduced 12,563
- Temp VMT reduced 40,075 (Temp VT reduced x Temp trip distance)

Total Daily VMT Reduced 52,638

Daily Emissions Reduced

NOx reduced	08 Emission		08 Emission		Tot gm	Tot ton
	Trips	Factor	VMT	Factor		
• Cold start + hot soak	2,840	0.6291			1,787	0.0020
• Running			52,638	0.4287	22,566	<u>0.0249</u>
Total NOx reduced (tons)						0.0269

VOC reduced	08 Emission		08 Emission		Tot gm	Tot ton
	Trips	Factor	VMT	Factor		
• Cold start + hot soak	2,840	1.7569			4,990	0.0055
• Running			52,638	0.1856	9,770	<u>0.0108</u>
Total VOC reduced (tons)						0.0163

APPENDIX 6 - CALCULATION OF COMMUTER OPERATIONS CENTER IMPACTS

Populations of Interest – Commuter Connections Rideshare Applicants

New, Reapply, Transit/other, follow-up requests

- FY 2006 63,358 (CC database)
- FY 2007 58,221 (CC database)
- FY 2008 32,568 (CC database)

Total assisted commuters 154,147

Within MSA (69%) 106,361

Outside MSA (31%) 47,786

COC Placement Rates	In MSA	Out MSA
• Continued rate	25.0%	31.3%
• Temporary rate	15.7%	13.2%
• Total	40.7%	44.3%

Placements

- Continued 26,590 14,861 (Apps x cont. rate)
- Temporary 16,699 6,308 (Apps x temporary rate)
- **Total placements 64,458**

Daily Vehicle Trips Reduced

VTR Factors

- Continued 0.44 0.48
- Temporary 0.61 0.45
- Temporary discount 12.7% 11.7%

- Continued trips reduced 11,700 7,133 (Placements x cont. VTR factor)
- Temporary trips reduced 1,294 332 (Placements x temp VTR factor)

Total VT reduced 20,459

Daily VMT Reduced

Ave one-way trip distance (mi)

- Continued 32.2 32.2 (Actual Outside dist. 54.4 miles)
- Temporary 31.1 31.1 (Actual Outside dist. 57.9 miles)

- Continued VT reduced 376,732 229,696 (Vehicle trips x ave distance)
- Temporary VT reduced 40,233 10,328

Total VMT Reduced 656,990

Appendix 6, continued

Trip and VMT Adjustment for SOV Access to HOV Modes (reduce VT and VMT for AQ analysis)

	In MSA	Out MSA	
• Non-SOV access % -Continued	67%	0%	(CC placement survey)
• SOV access dist (mi) – Continued	6.6	0.0	(CC placement survey)
• Non-SOV access % - Temporary	61%	0%	(CC placement survey)
• SOV access dist (mi) – Temporary	8.0	0.0	(CC placement survey)

VT Reduction

• No SOV access (cont + temp)	4,366	7,465	(VT x non-SOV access %)
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Total VT for AQ analysis 11,831

VMT Reduction

• No SOV access (cont + temp)	140,013	240,024	(VT x SOV % x (dist – access dist))
• SOV access (cont + temp)	218,903	0	

Total VMT for AQ analysis 598,940

Daily Emissions Reduced

NOx reduced	08 Emission		08 Emission		Tot gm	Tot ton
	Trips	Factor	VMT	Factor		
• Cold start + hot soak	11,831	0.6291			7,443	0.0082
• Running			598,940	0.4287	256,766	<u>0.2830</u>
Total NOx reduced (tons)						0.2912

VOC reduced	08 Emission		08 Emission		Tot gm	Tot ton
	Trips	Factor	VMT	Factor		
• Cold start + hot soak	11,831	1.7569			20,786	0.0229
• Running			598,940	0.1856	111,163	<u>0.1225</u>
Total VOC reduced (tons)						0.1454

Correction for Overlap with Integrated Rideshare and GRH TERMS

	COC base	MM	Kiosk	Soft Upg	GRH	Net COC
Placements	64,458	1,685	69	7,200	3,578	51,927
Vehicle Trips Reduced	20,459	535	22	3,773	1,136	14,993
VMT Reduced (miles)	656,990	17,172	700	122,198	36,470	480,450
NOx Reduced (tons)	0.291	0.008	0.0003	0.0538	0.016	0.213
VOC Reduced (tons)	0.145	0.004	0.0002	0.0267	0.008	0.107

Notes:

MM influenced commuters – from MM analysis, Appendix 9

Kiosk – 0.1% of COC base applications obtained through kiosks

GRH – 11% of new apps/reapps ask for GRH and other info = 5.7% of COC total after MM adjustment

APPENDIX 7 - CALCULATION OF SOFTWARE UPGRADE IMPACTS

Populations of Interest – Commuter Connections Rideshare Applicants

New, Reapply, Transit/other, follow-up requests

- FY 2006 63,358 (CC database)
- FY 2007 58,221 (CC database)
- FY 2008 32,568 (CC database)

Total assisted commuters 154,147

Within MSA (69%) 106,361

Outside MSA (31%) 47,786

COC Placement Rates	In MSA	Out MSA
• Continued rate	2.7%	5.0%
• Temporary rate	1.6%	0.9%
• Total	4.3%	5.9%

Placements

- Continued 2,872 2,389 (Apps x cont. rate)
- Temporary 1,702 430 (Apps x temporary rate)
- **Total placements 7,393**

Daily Vehicle Trips Reduced

VTR Factors

- Continued 0.65 0.75
- Temporary 0.64 0.60
- Temporary discount 17.0% 12.0%

- Continued trips reduced 1,867 1,792 (Placements x cont. VTR factor)
- Temporary trips reduced 185 31 (Placements x temp VTR factor)

Total VT reduced 3,875

Daily VMT Reduced

Ave one-way trip distance (mi)

- Continued 32.3 32.3 (Actual Outside dist. 56.9 miles)
- Temporary 33.8 33.8 (Actual Outside dist. 57.2 miles)

- Continued VT reduced 60,293 57,880 (Vehicle trips x ave distance)
- Temporary VT reduced 6,258 1,047

Total VMT Reduced 125,478

Appendix 7, continued

Trip and VMT Adjustment for SOV Access to HOV Modes (reduce VT and VMT for AQ analysis)

	In MSA	Out MSA	
• Non-SOV access % -Continued	85%	0%	(CC placement survey)
• Non-SOV access % - Temporary	86%	0%	(CC placement survey)
• SOV access dist (mi) – Continued	6.6	0.0	(CC placement survey)
• SOV access dist (mi) – Temporary	8.0	0.0	(CC placement survey)

VT Reduction

• No SOV access (cont + temp)	306	1,823	(VT x non-SOV access %)
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Total VT for AQ analysis 2,129

VMT Reduction

• No SOV access (cont + temp)	9,920	58,927	(VT x SOV % x (dist – access dist))
• SOV access (cont + temp)	44,885	0	

Total VMT for AQ analysis 113,732

Daily Emissions Reduced

NOx reduced	08 Emission		08 Emission		Tot gm	Tot ton
	Trips	Factor	VMT	Factor		
• Cold start + hot soak	2,129	0.6291			1,339	0.0015
• Running			113,732	0.4287	48,757	<u>0.0537</u>
Total NOx reduced (tons)						0.0552

VOC reduced	08 Emission		08 Emission		Tot gm	Tot ton
	Trips	Factor	VMT	Factor		
• Cold start + hot soak	2,129	1.7569			3,740	0.0041
• Running			113,732	0.1856	21,109	<u>0.0233</u>
Total VOC reduced (tons)						0.0274

Correction for Overlap with MM TERM

Total CC applications FY 06, 07, 08	154,147	
New CC applications FY 06, 07, 08	30,992	20%

Estimated MM share of new CC	14%
Estimated MM share of IR impact	2.8%

	SU Base	MM	Net SU
Placements	7,393	193	7,200
VT reduced	3,875	101	3,773
VMT reduced	125,478	3,280	122,198
NOx reduced (T)	0.055	0.001	0.054
VOC reduced (T)	0.027	0.001	0.027