ITEM #3

COMMUTER CONNECTIONS TRANSPORTATION DEMAND MANAGEMENT EVALUATION PROJECT

TRANSPORTATION EMISSION REDUCTION MEASURES (TERMS) REVISED EVALUATION FRAMEWORK JULY 2002 – JUNE 2005

DRAFT

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EXECUTIVE SUMMARY

The Commuter Connections Program of the Metropolitan Washington Council of Government (COG), in concert with program partners, is responsible for implementing six Transportation Emission Reduction Measures (TERMs) in support of the Washington region's efforts to meet the conformity requirements of federal transportation and clean air mandates. The TERMs include:

- Metropolitan Washington Telework Resource Center – Provides information and assistance to commuters and employers to further in-home and telecenter-based telecommute programs.
- Guaranteed Ride Home – Eliminates a barrier to use of commute alternatives by providing free rides home in the event of an unexpected personal emergency or unscheduled overtime to commuters who use commute alternatives.
- Integrated Rideshare – Improves the quality and delivery of alternative mode information and provides transit, park & ride, and telecenter information to all commuters who receive a matchlist.
- Employer Outreach – Provides regional outreach to encourage large, private-sector employers voluntarily to implement commute alternative 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 program and Metrochek/SmartBenefits sales.
- Employer Outreach for Bicycling – Provides regional outreach to encourage employers to implement strategies that could increase employees' use of bicycling for commuting.
- 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.

Commuter Connections also operates the Commuter Operations Center (COC), providing direct commute assistance services, such as carpool and vanpool matching through telephone and internet assistance to commuters. The COC is not an "official" TERM, however, it supports all other TERMs.

This report provides a framework and methodology for evaluating the transportation and air quality impacts of these TERMs. This methodology and numerous surveys and other data collection tools described later in this report have been developed to measure the TERMs' impacts for the period from July 2002 through June 2005. These impacts then will be compared against the goals established for each TERM by COG's National Capital Region Transportation Planning Board (TPB), the region's designated Metropolitan Planning Organization (MPO). The TERM evaluation framework and analysis reports are reviewed by the Commuter Connections Subcommittee and its TDM Evaluation Work Group.

At the early stages of the TERMs' implementation, Commuter Connections elected to undertake significant evaluation for each TERM. The TERM evaluation and analysis process has been ongoing since 1997. The objective of the evaluation process is to provide timely, useful, and meaningful information on the performance of the TERMs to decision-makers and other groups, including the TPB and other regional policy makers; COG program funders; Commuter Connections staff; TERM program partners, such as local jurisdictions and Transportation Management Associations (TMA); and employers and commuters who comprise Commuter Connections' clients.

Two previous evaluation frameworks have been prepared, the first for the January 1997 through June 1999 period (1997-1999) period and the second for the July 1999 through June 2002 period (1999-2002). The evaluation framework presented in this document builds on the framework used in the 1999-2002 analysis. Minor changes were made to that framework to enhance the analysis results for several TERMs.

But the major change from the 1999-2002 framework is the addition of the methodology for the Mass Marketing TERM. During the 2002-2005 evaluation period, the new Mass Marketing TERM will be evaluated to assess the impact of the campaign on awareness of Commuter Connections and its partners and services, to assess commuters' attitudes toward commuting, and to assess the impact of the campaign in convincing commuters to switch to alternative modes.

The evaluation process outlined here allows for both on-going estimation of program effectiveness and for annual and triennial evaluations. Two types of performance measures are included in the evaluation process to assess effectiveness. First, program awareness, participation, utilization and satisfaction and attitude measures are used to track recognition, output and quality. Second, program impact measures are used to quantify six key results. These program impacts include:

1) Vehicle trips reduced
2) Vehicle miles of travel (VMT) reduced
3) Emissions reduced (Volatile Organic Compounds (VOC) and Oxides of Nitrogen - NOx)
4) Energy reduction (fuel saving)
5) Consumer saving (commuting cost saving)
6) Cost effectiveness, in terms of cost per benefit obtained (e.g., cost per trip reduced)

The evaluation process uses several calculation factors derived from surveys of Commuter Connections' program applicants and/or the public-at-large. These factors include: 1) placement rate (percent of commuters who shift to commute alternatives), 2) vehicle trip reduction (VTR) factor (average daily trips reduced for each commuter placed), 3) average commute trip distance, and 4) proportion of ridesharers and transit users that drive alone to the location where they meet their carpool, vanpool, bus, or train.

These performance measures and 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) Calculate "placement rate" – Percentage of commuters in the population base who made a travel change as a result of the TERM
3) Estimate the number of new commute alternative placements – Multiply placement rate by the population base for the evaluation period
4) Calculate the vehicle trip reduction (VTR) factor for new placements (average trips reduced per placement)
5) Estimate vehicle trips reduced – Multiply number of placements by the VTR
6) Estimate VMT reduced – Multiply number of vehicle trips reduced by average commute distance
7) 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
8) Estimate NOx and VOC emissions reduced – Multiply adjusted vehicle trips and VMT reduced by emissions factors consistent with the regional planning process
9) Estimate the energy and commuter cost savings – Multiply VMT reduced by fuel efficiency and vehicle operating cost factors
10) Estimate cost effectiveness – Divide program or TERM costs by the program impact measures

The calculations outlined above have been embedded into a spreadsheet used by Commuter Connections and its partners to track estimated results by month. An annual summary of these results is included in Commuter Connections' Annual Report. The factors used in the spreadsheet are updated as new surveys relevant to each TERM are completed. At the end of the three-year evaluation period, a TERM Analysis Report is prepared to summarize periodic reductions in emissions and progress toward emission goals.

Throughout the three year period, additional reports are prepared to present results of major data collection efforts, such as the annual rideshare applicant placement survey, the "State-of-the-Commute" survey of regional commuting trends and attitudes, GRH Applicant survey, Metrochek/SmartBenefits employer survey, and others. These reports are distributed widely, to program partners, policy makers, and other with an interest in regional transportation.

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SECTION 1 OVERVIEW

This report provides a framework and methodology for evaluating the transportation and air quality impacts of six Transportation Emission Reduction Measures (TERMs) implemented by the Commuter Connections Program of the Metropolitan Washington Council of Governments (COG), in support of the Washington metropolitan region's efforts to meet the conformity requirements of federal transportation and clean air mandates. The TERMs include:

- Telework Resource Center – Provides information and assistance to commuters and employers to further in-home and telecenter-based telecommute programs.
- Guaranteed Ride Home – Eliminates a barrier to use of commute alternatives by providing free rides home in the event of an unexpected personal emergency or unscheduled overtime to commuters who use commute alternatives.
- Integrated Rideshare – Improves the quality and delivery of alternative mode information and provides transit, park & ride, and telecenter information to all commuters who receive a matchlist.
- Employer Outreach – Provides regional outreach to encourage large, private-sector employers voluntarily to implement commute alternative 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 program and Metrochek/SmartBenefits sales.
- Employer Outreach for Bicycling – Provides regional outreach to encourage employers to implement strategies that could increase employees' use of bicycling for commuting.
- 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 frustration about commuting.

Commuter Connections also operates the Commuter Operations Center (COC), providing direct commute assistance services, such as carpool and vanpool matching through telephone and internet assistance to commuters. The COC is not an "official" TERM, however, it supports all other TERMs.

The evaluation framework serves two purposes. First, it assesses Commuter Connections' progress in meeting the transportation and air quality goals established by COG's National Capital Region Transportation Planning Board (TPB) for the TERMs for the period July 2002 through June 2005. Second, it guides COG's future evaluation efforts to assess the effectiveness and cost effectiveness of the TERMs. The TERM evaluation framework and analysis reports are reviewed by the Commuter Connections Subcommittee and its TDM Evaluation Work Group. The framework describes an overall evaluation process for the program and specific evaluation techniques for each TERM.

This report represents an update to two previous evaluation framework documents developed in 1997 and 2001 to evaluate results and progress toward goals during the periods January 1997 through June 1999.[1] and July 1999 through June 2002[2], respectively. The evaluation seeks to quantify the impacts of these six TERMs, results which will be used in post calculations of the region's air quality conformity from the TERM Tracking Sheet. Commuter Connections had previously provided traditional ridematching ser-

[1] Commuter Connections Transportation Demand Management Evaluation Project: Transportation Control Measures Evaluation Framework, June 30, 1997.

[2] Commuter Connections, Transportation Demand Management Evaluation Project: Transportation Emission Reduction Measures (TERMs) Revised Evaluation Framework 1999-2002, MWCOG, March 20, 2001.

vices. These activities are included in the "baseline" of travel and air quality indicators for the purposes of assessing regional air quality conformity.

This evaluation framework report is organized into seven subsections, following this overview. Section 2 defines evaluation objectives and issues guiding the process. Section 3 enumerates performance measures to be used in assessing program effectiveness and cost effectiveness.

Section 4 discusses evaluation components specific to each TERM. It should be noted that there are two components for the Integrated Rideshare TERM (Kiosks and Software Upgrades) and two for the Employer Outreach TERM (Jurisdiction Sales Representatives, Metrochek/SmartBenefits). The Employer Outreach for Bicycling and Mass Marketing TERM are new additions to this updated evaluation framework, thus nine total methods are described in this evaluation framework.

Section 5 describes the data sources and data collection tools to be used to collect evaluation data. The next section, Section 6, outlines the method to calculate travel, air quality, energy, and consumer cost impacts of the TERMs. The last section presents recommendations for the evaluation schedule, responsibilities, and reporting of results to maintain and utilize information produced through the evaluation process.

SECTION 2 EVALUATION OBJECTIVES AND ISSUES

PURPOSE OF THE EVALUATION

The objective of the evaluation process is to provide timely, useful, and meaningful information on the performance of the TERMs to decision-makers and other groups, including the TPB and other regional policy makers; COG program funders; Commuter Connections staff; TERM program partners, such as local jurisdictions and Transportation Management Associations (TMA); and employers and commuters who comprise Commuter Connections' clients. This information includes travel and air quality impacts, such as vehicle trips and miles of travel reduced and emissions reduced from the six TERMs implemented by the Commuter Connections program.

EVALUATION OBJECTIVES

The ultimate goal of an evaluation is to provide sound, definitive, and useful information about the results of a program. Evaluations are not performed simply for the sake of documentation or reporting. Rather, they guide future decision-making about funding priorities, reinforce program users' participation, identify desirable program enhancements, and define the benefits of one program in relation to those of others. Evaluation activities have been tailored to support decision-making and activities that do not support decision-making have not been undertaken in the evaluation process.

For these reasons, there are clear and specific objectives for the evaluation of the TERMs. The evaluation has been proceeding for the past seven year with primary objectives of providing useful information to the following groups of decision-makers and others who need or desire evaluation information:

- Providing information to regional policy-makers on the effectiveness and cost effectiveness of TERMs in contributing to regional goals for reducing congestion, improving air quality, reducing energy consumption, and improving mobility and accessibility. This includes the development of policy reports that document TERM impacts in simple, clear language.

- For both regional policy-makers and TERM program staff, helping establish regional commute trends and attitudes and provide an indication of the collective effect of all Commuter Connections programs on regional traffic and air quality, including impacts that are not specifically assigned in the evaluation to one of the six TERMs.

- Providing information to program funders on the effectiveness and cost effectiveness of the TERMs being implemented via the Commuter Connections program.

- Providing information through monthly management information to Commuter Connections staff and program partners on potential program enhancements to increase effectiveness and efficiency.

- Providing information to employers and commuters, the consumers of program services, on the collective, regional impacts of individual participation. Evaluation information can also be useful in showing employers the types of trip reduction strategies that may be most cost effective.

Additionally, the evaluation process follows accepted and recognized evaluation techniques; and is rigorous, ongoing, resource efficient, unobtrusive for COG partners, and compatible with regional, state, and national practices.

EVALUATION ISSUES

Prior to discussing the specific evaluation approach for each TERM, it is worth discussing several key evaluation issues that are addressed in this framework, and methods recommended within, that should be kept in mind as COG utilizes and modifies the process over time.

Purpose of the Evaluation

- The evaluation uses common, quantitative performance measures for all evaluation components to allow for comparisons among TERMs and between TERMs and other strategies that could be implemented to address congestion and air quality concerns. A crucial function of this evaluation process is to estimate the combined impacts of TERMs to assess the overall effectiveness of the Commuter Connections Program. Consistent and comparable methodologies also enhance confidence in the results. These common measures are enumerated in Section 3.

- The evaluation framework allows for monthly activity reporting and benefits projection as a program management information tool. While assessment of travel and air quality benefits is the key purpose of the evaluation, the process must equally provide information to direct the day-to-day activities of the Commuter Connections program.

- The evaluation framework covers all current Commuter Connections TERMs, including new or enhanced TERMs such as the Employer Outreach for Bicycling TERM and the Mass Marketing TERM. The evaluation assures that the impacts of each TERM can be separated from one another to avoid double counting (as discussed below).

Separating Impacts of Program Elements

- It is also important to separate the impacts of various Commuter Connections programs to avoid double counting benefits. For example, carpools might be formed as a joint result of enhanced employer outreach and GRH program benefits. These impacts must either be wholly credited to one of the two TERMs or the impact divided between the TERMs. Program benefits are not necessarily additive.

- Similarly, the evaluation separates the baseline impacts of Commuter Operations Center "basic" services from the impacts of the new TERM programs. The method for attributing impacts to a specific TERM or service is discussed in Section 6. This will be critical for the new Mass Marketing TERM as impacts on commuters and air quality will be distributed to the advertising campaign or to other service components, such as the Commuter Operations Center or Guaranteed Ride Home, for example, that are promoted by Mass Marketing efforts.

- When possible, the evaluation recognizes and attempts to address the possible impacts of exogenous factors. Travel decisions also are influenced by the extent of congestion, work and home location, economic factors, fuel prices, and other factors. User surveys must carefully query commuters who shift to commute alternatives to define the relative importance of TERMs in influencing their mode choices. Data collected through the State-of-the-Commute survey, also should support this objective by suggesting exogenous factors that could have influenced travel changes and by identifying some "indirect" impacts of other commute assistance measures implemented in the region, such as the enhanced mass marketing effort.

Accounting for Prior Mode and Access Mode

- 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.

- Finally, 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.

Refining Assumptions Used in the Evaluation

- Experience gained during the 1999 and 2002 TERM analyses helped refine the assumptions and calculation steps developed for each TERM in this evaluation framework. The revisions included in this 2002-2005 evaluation framework update are presented later in this report for each TERM. Three key revisions from the 1999-2002 evaluation framework include: updating NOx and VOC emissions factors for the current evaluation period, estimating kiosk user impacts from the State of the Commute survey, and using the USEPA's COMMUTER model to estimate the impact of employer services programs.

Specific Evaluation Issues for Individual TERMs

In general, the TERM analysis approaches documented in the 2002 TERM Analysis Report are used as the basis for the TERM evaluation methods described in this framework. A sample of the TERM calculations for each TERM (except the new Mass Marketing TERM) are included in Appendices C through J and are derived from the 2002 TERM Analysis Report.

- Mass Marketing – The proposed evaluation approach for this new TERM is included in Section 4. The critical issues for this TERM is documenting and attributing changes in attitudes and behavior to the mass marketing campaign. This will be accomplished using a variety of data sources and will require careful attribution of impacts to Mass Marketing or other TERMs, as appropriate.

- 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 being implemented at each worksite, and from the Metrochek/SmartBenefits database maintained by the Washington Metropolitan Area Transit Authority (WMATA). The EPA COMMUTER model applies these empirical data to project the likely change in employee commuting behavior for given change in the employer's program. During the last evaluation period, COG compared the predictive accuracy of the COMMUTER model to that of the FHWA TDM Evaluation Model, which was used in the 1997-

1999 evaluation. That comparison showed that the COMMUTER model compared favorably to the FHWA model, but was easier to use.

- Employer Outreach for Bicycling – Similarly, the Employer Outreach for Bicycling TERM, added during the 1999-2002 evaluation period, uses empirical data from the ACT! database and models impact results for employer activities. Additionally, survey data from the regional "bike-to-work day" are used to estimate travel and emission impacts from this event.

- 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 already were ridesharing before they applied for GRH benefits, the most common benefit of GRH may be the continuation and extension of existing ride-sharing arrangements, rather than shifts from drive alone. Thus, the evaluation process outlined here will estimates the influence of GRH availability on both mode shifts and duration of rideshar-ing arrangements. Enhancements made as result of the 2002 TERM analysis include discounting of VMT reductions made outside the attainment area and the derivation of one placement rate for both GRH applicants and one-time exemptions.

- Telework Resource Center (TRC) – The TRC is a resource to help employers and program partners initiate telecommuting programs. In evaluating telecommuting, several travel changes need to be assessed, including: trip reduction due to telecommuting, the mode on non-telecommute days, and mode and travel distance to telework centers. Telework impacts are estimated from the State of the Commute survey, through special surveys and counts made at telecenters, by surveys conducted of employers directly requesting information from the TRC, and from results of telecommute pilot programs at worksites (when these programs are not included in other TERMs).

- Integrated Rideshare – Based on experience gained in the 2002 TERM analysis, the integrated ride-share program (software upgraded for enhanced transit information and kiosks) is evaluated using the rideshare applicant placement survey (software upgrades) and the State of the Commute survey (kiosks).

The evaluation framework described in the sections below elaborates on these issues.

SECTION 3 PERFORMANCE MEASURES

The previous evaluation frameworks established performance measures for each TERM. This framework updates and expands on those measures. Performance measures are measures of a program's success; how well the program is meeting its goals. Generally, we recommend that performance measures be established in the following two categories:

- Program awareness, attitudes, participation, utilization, and satisfaction
- Program impacts

Program awareness provides an indication of how well-known the Commuter Connections program and its service are to commuters. Awareness will assume a larger role in this evaluation period since awareness is a primary goal of the new Mass Marketing TERM. A related type of measure is *attitude*, that is commuters' attitudes toward their commute and toward various commute modes. These measures examine commuters' personal feelings about travel modes and their willingness to consider and try new modes of travel.

Participation, utilization, and satisfaction measures could include, for example, the number of commuter assistance requests, number of matchlists provided, the speed with which assistance is delivered, and users' satisfaction with the assistance. These measures are important for tracking funding, estimating staffing, and identifying program improvements.

They generally also are needed to calculate the ultimate performance measures, *program impacts*, such as changes in mode split, vehicle trips reduced, and emissions reduced. This section describes several common performance measures recommended for each TERM and for the program as a whole. Performance measures specific to each TERM are listed in Section 4.

AWARENESS AND ATTITUDES

- Awareness – Program awareness will be measured in the proportion of residents and commuters who recognize the Commuter Connections "branding" and the range of services it provides or facilitates and are aware of transportation facilities available to them. Awareness will be assessed by both unaided and prompted questions in surveys of the general driving public.

- Attitudes – A second area of exploration is attitudes toward commuting and solutions to congestion. Another goal of the Mass Marketing TERM is the ability to address growing frustration levels among commuters that congestion is worsening and that there are few alternatives to sitting alone in rush-hour traffic. The evaluation will work to measure changes in key attitudes over time, including: commute frustration levels, perceptions of congestion severity, and attitudes toward a range of possible alternatives. This information is currently captured in the State of the Commute survey and report and will now be tracked over time as more general population surveys are conducted.

PROGRAM PARTICIPATION, UTILIZATION AND SATISFACTION

These performance measures gauge program output, that is, services provided and the use of those services.

- Program Participation – Program participation refers to the number of clients who request services and the number who are assisted. Participation could include the numbers of new employer clients, GRH applicants, telecommuting employer sites, kiosk users, etc. A primary participation measure will be *number of applicants*, but other measures, specific to individual TERMs, also are described in Section 4.

- Utilization – Utilization is defined as the number of "placements," commuters actually shifting to alternative mode arrangements as a result of the Commuter Connections services. These commuters could be new carpoolers, vanpoolers, transit riders, telecommuters, etc. The primary utilization measure will be the *placement rate*, the ratio of the number of commute who make a mode change to an alternative to the number of total applicants for the TERM.

- Program Satisfaction – A qualitative, but important set of performance measures is suggested to assess client satisfaction, an important feedback mechanism to determine whether services are meeting customers' needs and their expectations. This is important for Commuter Connections to gauge satisfaction of all groups using its services: employers, commuters, GRH users, telecommuters, and kiosk users, for example.

PROGRAM IMPACTS

Program impact measures estimate the results of the programs implemented and are needed to assess the travel, air quality, energy, and commuter cost saving benefits of the TERMs. The six impact measures include: vehicle trips reduced, vehicle miles traveled (VMT) reduced, emissions reduced, energy saving, consumer cost saving, and cost-effectiveness.

- Vehicle Trips Reduced – The number of vehicle trips reduced is the first of two transportation impact measures. It estimates the number of daily vehicle trips removed from the road. This is a primary measure of congestion relief, as fewer vehicles on the road during peak hours could reduce delay, increase travel speed, reduce commute time, and improve service levels on roads. It is also a primary input (trip end emissions) to the air quality analysis.

  Vehicle trip reduction is estimated using a *vehicle trip reduction (VTR) factor*, the average number of vehicle trips reduced per day for each person placed into a commute alternative (placement). This rate accounts for shifts from drive alone to commute alternatives, for shifts among commute alternatives (e.g., from carpool to vanpool and from transit to carpool), and for increases in the frequency (days per week) that a commuter uses an alternative mode. Shifts from alternative modes to drive alone are not included in the VTR factor, since these changes are not the purpose of commuters' contact with Commuter Connections, but generally an unintended effect. Appendix A describes how the VTR factor is calculated. Appendix B shows a sample VTR factor calculation.

- Vehicle Miles of Travel (VMT) Reduced – VMT reduced, the second transportation impact measure, estimates the total miles of travel removed from the road daily. While less of a factor in congestion relief than trips reduced, VMT reduced is important to an air quality and energy evaluation.

- Emissions Reduced – Emissions reduced measures the decrease in mobile source (tailpipe) emissions that result from reductions in vehicle trips or VMT. The primary pollutants of concern in the Washington metropolitan area for these TERMs are Oxides of Nitrogen (NOx) and Volatile Organic Compounds (VOC). Daily reductions of NOx and VOC, expressed in terms of tons per day reduced, are the air quality performance measures of greatest interest to this evaluation process.

- Energy Saving – The energy saving, defined as the reduction in the number of gallons of gasoline used, results when commuters drive alone fewer miles.

- Consumer Cost Saving – A fifth measure of program impacts is the aggregate cost savings realized by commuters who shift from driving alone to a commute alternative.

- Cost-Effectiveness – Cost effectiveness, the final program impact measure, is calculated as the cost expended to achieve the benefits noted above, for example, the cost per vehicle trip reduced.

SECTION 4 EVALUATION COMPONENTS FOR INDIVIDUAL TERMS

Sections 2 and 3 stated the objectives and issues guiding the evaluation process and defined several common performance measures that will be used for all TERMs. This section details the specific evaluation approach for each of the six TERMs and for the Commuter Operations Center. For each TERM, the following information is provided:

- TERM description
- Goals defined by TPB for the TERM for 2005
- Nature of the evaluation
- Performance measures recommended for the TERM
- Data needed to measure TERM impacts and recommended data sources

Section 5 of this report provides a more detailed description of the surveys and other data sources enumerated in this section. Section 7 presents a schedule for the collection of data and recommends a party to be responsible for collecting the data. Included in the appendices are examples of how travel and emission impacts are calculated for each TERM. These are taken from the 2002 TERM Analysis Report to provide real examples of how the calculations were performed in the last evaluation period.. These calculation methods form the basis for the refinements included in this evaluation framework. An example for the Mass Marketing TERM is not included in the appendices since this a new TERM with a newly proposed evaluation approach, as described in this section.

The unique data required for each TERM to calculate vehicle trips reduced and VMT reduced are described in the individual TERM evaluation components shown below. Additionally, some common data are needed to calculate emissions, cost, and energy impacts of each TERM, including:

- Access mode and distance to meeting locations for alternative mode users (to perform air quality analysis)
- Regional emissions factors (to determine NOx and VOC reductions)
- Regional fuel economy data in average miles per gallon consumed (to calculate energy saving)
- Program costs (to derive cost effectiveness)

METROPOLITAN WASHINGTON TELEWORK RESOURCE CENTER TERM

Program Description

The Metropolitan Washington Telework Resource Center (TRC), working with numerous partners in the region, assists employers and commuters to form telecommuting programs and arrangements. Additionally, the TRC helps to promote telework centers administered by the U.S. General Services Administration. The TRC TERM is comprised of two components: TRC (established in 1997 and noted as M-92 in TERM tracking sheets) and expanded telecommuting (M-92V-M; established in 2002), which reflects additional outreach efforts targeted to large employers, primarily located in Maryland and Virginia.

Stated Goals for 2005

COG defined five regional goals for the TRC for 2005:

TRC (M-92)
- Create 179,200 new telecommuters (cumulative)
- Reduce 26,020 daily vehicle trips
- Reduce 852,415 daily miles of travel
- Reduce 0.6857 daily tons of NOx
- Reduce 0.3226 daily tons of VOC

Expanded Telecommuting (M-92V-M)
- Create 116,666 new telecommuters
- Reduce 16,933 daily vehicle trips
- Reduce 554,750 daily miles of travel
- Reduce 0.4462 daily tons of NOx
- Reduce 0.2099 daily tons of VOC

Combined TRC
- Create 295,866 new telecommuters (cumulative)
- Reduce 42,953 daily vehicle trips
- Reduce 1,407,165 daily miles of travel
- Reduce 1.1319 daily tons of NOx
- Reduce 0.5325 daily tons of VOC

Nature of Evaluation

The populations of interest for this TERM include four groups:

- All regional teleworkers
- Employees at worksites assisted by TRC
- Telecommute Pilot program teleworkers
- Teleworkers at Metropolitan Washington Telework Centers

The goal of the TRC is to increase the number of full-time or part-time home-based and telework center-based telecommuters in the region. The evaluation needs first to determine the number of new telecommuters in the region, their frequency of telecommuting, and how they commute on non-telework days. Placement rates are derived for home-based telecommuters and for those working at telecenters.

Second, the evaluation must attempt to separate the role TRC plays in encouraging telecommuting, through its employer and employee telecommute seminars, direct assistance to employers with telecommuting programs, and general promotion of telecommuting to the public-at-large. Thus, the evaluation will examine employers' and commuters' sources of information or assistance for telecommuting and the value of that information or assistance in their starting or expanding telecommuting programs. Finally, the evaluation will include the impacts from teleworking at Telecommute Pilot programs that are not included in another TERM.

Performance Measures

Performance measures recommended to evaluate the Telework Resource Center include:

Participation, Utilization, and Satisfaction Measures:

- Number of employers that receive telecommute information or assistance from the TRC
- Number of employers that implement/expand telecommute programs after receiving assistance
- Number of commuters who receive telecommute information or assistance from the TRC
- Number of commuters that begin telecommuting after receiving assistance
- Number of new telecommuters – home-based and telecenter based
- Frequency of telecommuting
- Telecommute placement rate
- Utilization of telework centers

Program Impact Measures:

- Vehicle trip reduction factor (daily vehicle trips reduced per telecommuter)
- Vehicle trips reduced (number of daily trips reduced)
- VMT reduced (in miles)
- Emissions reduced (in tons of pollutants)
- Energy savings (in gallons of fuel)
- Commuter cost savings
- Cost per unit of benefit (per new telecommuter, trip VMT, ton)

Data Needs and Sources

The following data are needed to assess TRC impacts. Each data source is described in Section 5.

Data Needs	*Data Source**
• Regional home-based telecommuters	State of the Commute (SOC) survey
• Non-home-based telecommuters	SOC survey
• Metropolitan Washington Telework Center (MWTC) telecommuters	MWTC survey
• TC Pilot program telecommuters	Pilot employer data
• Telecommute frequency (days/week)	SOC survey and MWTC Center survey
• Percent drive-alone on non-telecommute days	SOC survey
• Travel distance on non-telecommute days	SOC survey
• Travel distance to telework centers	SOC survey and MWTC Center survey
• Employers' source of telecommute information	TRC TW assistance survey
• Commuters' source of telecommute information	TRC TW assistance survey and SOC survey

* Proposed timing of data collection
SOC survey – winter/spring 2004
MWTC surveys – Data averaged from surveys conducted in spring 2004 and spring 2005
Pilot employer data – spring 2005
TRC Telework assistance survey – spring 2005

The travel and emissions impacts attributable to the Telework Resource Center TERM are subtracted from the Employer Outreach (Jurisdiction Sales Representative) impacts to avoid double counting.

GUARANTEED RIDE HOME TERM

Program Description

The Guaranteed Ride Home (GRH) program eliminates a real or perceived barrier to use of commute alternatives, the fear of being stranded without transportation in the event of an unexpected personal emergency. GRH provides free return transportation by taxi or rental car, depending on the distance the commuter needs to travel, in the event of an unexpected personal emergency or unscheduled overtime to commuters who use rideshare, use transit, or bike or walk to work at least two times per week on average. Commuters pre-register for GRH and may use the service up to four times per year. The program also allows "one-time exception" rides provided to non-registered commuters who used an alternative on the day a GRH trip was needed. Commuters who wish to use GRH in the future must then register.

Stated Goals

COG defined the following regional goals for GRH for 2005:

- Register 43,200 GRH applicants
- Reduce 44,070 daily vehicle trips
- Reduce 661,150 daily vehicle miles of travel
- Reduce 0.5579 daily tons of NOx
- Reduce 0.3119 daily tons of VOC

Nature of Evaluation

GRH is intended to encourage SOV commuters to shift to commute alternatives. Additionally, GRH is expected to help maintain existing commute alternatives and increase frequency of use. The evaluation must measure the number of new alternative mode users who were influenced to shift because of GRH and GRH's impact on commuters who used alternatives before registering for GRH. Since commuters must use commute alternatives when they register for GRH, the impact of GRH on shifts from driving alone must be carefully assessed to determine the importance of GRH to travel changes.

Three populations are of interest for the GRH TERM evaluation:

- Commuters who registered for GRH
- One-time exception users – commuters who did not register for GRH but took an "exception" trip
- Commuters who did not register but said availability of GRH influenced their decision to use a commute alternative

Performance Measures

The following performance measures are used for GRH:

Participation, Utilization, and Satisfaction Measures:

- Number of commuters who request GRH information
- Number of GRH applicants
- Number of one-time exception users
- Number of commuters participating in other GRH programs (e.g., employer-sponsored)
- GRH placement rate (proportion of GRH applicants/one-time exception users who shift to commute alternatives)
- Number of GRH rides provided
- Satisfaction of GRH users with the service

Program Impact Measures:

- Vehicle trip reduction factor (daily vehicle trips reduced per new commute alternative user)
- Vehicle trips reduced (number of daily trips reduced)
- VMT reduced (in miles)
- Emissions reduced (in tons of pollutants)
- Energy savings (in gallons of fuel)
- Commuter cost savings
- Cost per unit of benefit (per placement, trip VMT, ton)

Data Needs and Sources

The following data are needed to estimate GRH impacts. Each data source is described in Section 5.

Data Needs	*Data Source**
• GRH applicants	Commuter Connections GRH database
• One-time GRH exception users	Commuter Connections GRH database
• Non-registrants using commute alternatives	State-of-the Commute (SOC) survey
• GRH Placement Rate and VTR Factor	
- Registrant and one-time exemption users	GRH Applicant survey
- Non-registered commuters using commute alternatives	SOC survey
• Average travel distance (trip length)	GRH Applicant survey and SOC survey

* Proposed timing of data collection
Commuter Connections database – ongoing
SOC survey – winter/spring 2004
GRH Applicant surveys – spring 2004

In the 2002 analysis, a single placement rate was used for both GRH applicants and one-time exemptions because the rates were so similar. This analysis will explore individual rates to see if this pattern holds for the current period. Double counting is avoided by discounting the Commuter Operations Center impacts by the portion of GRH credit based on the percentage of GRH applicants who also ask for rideshare information (13.3% in the 2002 TERM Analysis Report).

INTEGRATED RIDESHARE TERM

Program Description

The Integrated Rideshare program element focuses on improving information and the information delivery system for commuters. It includes two primary components:

- Ridematch Software Upgrades – Upgrades that integrate information on transit service options, Park & Ride locations, and telecenter locations into the Commuter Connections Ridematch Software System (information provided to all matchlist recipients).

- Kiosks – 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.

Stated Goals

The following goals were defined for the combined Integrated Rideshare program for 2005:

- Reduce 4,070 daily vehicle trips
- Reduce 100,300 daily vehicle miles of travel
- Reduce 0.0818 daily tons of NOx
- Reduce 0.0406 daily tons of VOC

Nature of Evaluation

The Integrated Rideshare TERM evaluation addresses the two components separately, because they deal with different populations. The population of interest for the Ridematch Software Upgrades is Commuter Connections applicants who remember receiving transit and/or Park and Ride information with their ridematching information. The Kiosk population of interest includes regional commuters who can be directly identified as having used the kiosks, as shown through the State of the Commute survey.

This program is aimed at improving the quality and availability of commute information and encouraging commuters to try transit and telecommuting for occasional and full-time use, even if they did not have these options in mind when they contacted Commuter Connections for assistance. Integration of transit and Park & Ride information into the computer system will be evaluated through the applicant placement rate survey, described in Section 5. From this survey, a separate placement rate can be derived for those who shifted to a commute alternative after receiving transit or Park & Ride information.

Evaluation of the kiosk users is more difficult, because the anonymous nature of kiosks makes it more difficult to follow-up with these users. To assess impacts for those users who obtain traveler information using kiosks, the evaluation will rely on the SOC survey. Since a sufficient number of survey respondents have used kiosks (based on the 2002 SOC survey), a placement rate and VTR factor will be developed for this population.

Performance Measures

To evaluate the Integrated Rideshare TERM, the following performance measures are proposed:

Software Upgrades - Participation, Utilization, and Satisfaction Measures:

- Number of applicants who remember receiving transit/P&R information on ridematch letter or email
- Number of applicants who contact a transit agency or use P&R information received
- Software upgrade placement rate (percentage of applicants who use the software upgrade information to shift to a commute alternative)

Kiosks - Participation, Utilization, and Satisfaction Measures:

- Number of kiosks operating in the region
- Number of kiosk users
- Number of users who access commute information
- Number of users who submit a ridematch application to Commuter Operations Center
- Number of users who obtain transit schedules or maps
- Kiosk user placement rate (percent of users who shift to a commute alternative)
- Kiosk user satisfaction

Program Impact Measures:

- Vehicle trip reduction factor (daily vehicle trips reduced per new commute alternative user)
- Vehicle trips reduced (number of daily trips reduced)
- VMT reduced (in miles)
- Emissions reduced (in tons of pollutants)
- Energy savings (in gallons of fuel)
- Commuter cost savings
- Cost per unit of benefit (per placement, trip VMT, ton)

Other Data Needs

The following data items will be used to calculate performance measures for Integrated Rideshare. Each data source is described in Section 5.

Data Needs	*Data Source**
Software Upgrades	
• Database applicants	Commuter Connections database
• Applicants who remember receiving transit and Park & Ride information	CC Applicant Placement survey
• Software Upgrade placement rate	CC Applicant Placement survey
• Software Upgrade VTR Factor	CC Applicant Placement survey
• Average travel distance	CC Applicant Placement survey
Kiosks	
• Kiosk users	Commuter Connections database
• Kiosk users' placement rate	SOC survey
• Kiosk VTR Factor	SOC survey
• Average travel distance (kiosk users)	SOC survey

* Proposed timing of data collection
Commuter Connections database – ongoing
CC Applicant Placement survey – Data averaged from surveys conducted in fall 2003, fall 2004, and fall 2005
SOC survey – winter/spring 2004

Double counting is avoided by subtracting the credit assigned to the software upgrades and kiosks from the impacts calculated for the Commuter Operations Center.

EMPLOYER OUTREACH TERM

Program Description

The Employer Outreach TERM is designed to encourage employers to implement new commute alternative programs and to expand the services they offer in existing programs. The Employer Outreach TERM includes two components: 1) jurisdiction sales representatives and 2) Metrochek/SmartBenefits program. In the first component, the sales representatives contact employers, educate them about the benefits commuter alternative programs offer to employers, employees, and the region and assist them to develop, implement, and monitor work site commute alternative programs. Commuter Connections assists the sales force with the following services, designed to enhance regional coordination and consistency:

- Computerized regional employer/employee contact database
- Marketing and information materials
- Employer outreach sales and service force training
- Annual evaluation program
- Support to Employer Outreach Ad-Hoc Group

Employer Outreach also includes the distribution and sales of Metrochek/SmartBenefits, transit fare payment media. Sales representatives from the Washington Metropolitan Area Transit Authority (WMATA), working with other regional transit and rail providers, promote Metrochek/SmartBenefits to employers and supply monthly vouchers to employers who distribute the vouchers to employees. Employees then redeem the vouchers for transit fare media. Employers also have the option to replenish monthly transit and vanpool fare media electronically through Metro's SmartBenefit program.

Stated Goals

COG has defined the following regional goals for Employer Outreach for 2005:

- Maintain number of participating private employers
- Reduce 13,100 daily vehicle trips
- Reduce 196,400 daily vehicle miles of travel
- Reduce 0.1657 daily tons of NOx
- Reduce 0.0927 daily tons of VOC

Nature of Evaluation

Employer Outreach is aimed at increasing the number of new private employers implementing work site commute alternative programs. Employer outreach is ultimately designed to encourage employees of client employers to shift from driving alone to commute alternatives. Two primary evaluation questions are thus important. First, how many employers start or expand commute alternative programs? And second, how many employees begin or expand their use of commute alternatives? The populations of interest for the Jurisdiction Sales component are employers that participate in Employer Outreach and the employees at those worksites. The populations of interest for the Metrochek/SmartBenefits component are employers who participate in the Metrochek/SmartBenefits program and employees at these worksites.

Performance Measures:

To help answer these questions, the following performance measures are recommended:

Jurisdiction Sales Representatives – Participation, Utilization, and Satisfaction Measures:

- Number of employer clients (employers with commute alternative programs)
- Number of employees at worksites with commute alternative programs
- Level/extent of employers' commute alternative programs
- Commute alternative mode split at worksites with commute alternative programs
- Employer satisfaction with outreach assistance and services

Metrochek/SmartBenefits – Participation, Utilization, and Satisfaction Measures:

- Number of private-sector employers participating in Metrochek/SmartBenefits
- Number of employees at worksites with Metrochek/SmartBenefits
- Average transit discount provided
- Extent of other commute services offered by Metrochek/SmartBenefits employers
- Commute alternative mode split at worksites with commute alternative programs
- Employer satisfaction with Metrochek/SmartBenefits program

Program Impact Measures:

- Vehicle trip reduction factor (daily vehicle trips reduced per new commute alternative user)
- Vehicle trips reduced (number of daily trips reduced)
- VMT reduced (in miles)
- Emissions reduced (in tons of pollutants)
- Energy saving (in gallons of fuel)
- Commuter cost saving
- Cost per unit of benefit (per placement, trip VMT, ton)

Data Needs and Sources

The following data items will be used to calculate program impacts. Each data source is described in Section 5.

Data Needs	*Data Source**
Jurisdiction Sales Representatives	
• Employers participating in Employer Outreach Program	ACT! database
• Employer characteristics	ACT! database
• Level of commute alternative program at worksite	ACT! database
• Starting Average Vehicle Ridership (AVR)	Employee baseline surveys
• Ending AVR (est.)	EPA COMMUTER model
• Average travel distance	SOC survey

Metrochek/SmartBenefits

- Metrochek/SmartBenefits employers and employees — WMATA files
- Average transit discount provided — WMATA files
- Other commute services offered by Metrochek/SmartBenefits employers — Metrochek/SmartBenefits employer survey
- Starting Average Vehicle Ridership (AVR) — Employee baseline surveys
- Ending AVR (est.) — EPA COMMUTER model
- Average travel distance — SOC survey

* Proposed timing of data collection
ACT! database - ongoing
Employee baseline surveys – ongoing
SOC survey – winter/spring 2004
WMATA files – ongoing
Metrochek/SmartBenefits employer survey – ongoing

The Employer Outreach TERM is unique in that it is the only TERM for which placement rates and VTR factors are not used to determine the number of new participants, vehicle trips reduced, or VMT reduced. This is because employee survey data cannot feasibly be collected to assess employees' post-program travel behavior. These missing evaluation elements are modeled using the EPA COMMUTER Model.

For both the sales representatives and Metrochek/SmartBenefits component, employers' starting mode shares and commute alternative program strategies are input into the COMMUTER Model and the model estimates mode split and average vehicle ridership with the program in place. The FHWA TDM Model was used in the 1999 evaluation, but for the 1999-2002 evaluation period, the evaluation team used the COMMUTER model developed by the U.S. Environmental Protection Agency because it is more efficient, includes more alternative mode strategies, and is an equally accurate means of projecting the impact of employer commute alternative programs supported by Employer Outreach.

The experience of the 2002 TERM analysis suggested several methodological enhancements, in addition to the use of the COMMUTER model, for the current evaluation period. First, the evaluation looked at all private employer worksites, not just those the with 100 or more employees. Second, only Level 3 and 4 programs were evaluated, meaning that only programs with the most aggressive TDM programs were modeled. The results obtained with only these employers is more conservative than considering all types (levels) of employer program changes.

EMPLOYER OUTREACH FOR BICYCLING TERM

Program Description

This program provides regional outreach to encourage employers to implement worksites strategies that will encourage employees to use bicycling for commuting. Additionally, the annual regional Bike-to-Work Day event is implemented by Jurisdiction sales representatives who are administered under the general Employer Outreach TERM.

Stated Goals

COG has defined the following regional goals for Employer Outreach for Bicycling for 2005:

- No goal for newly participating employers
- Reduce 130 daily vehicle trips
- Reduce 567 daily vehicle miles of travel
- Reduce 0.0006 daily tons of NOx
- Reduce 0.0005 daily tons of VOC

Nature of Evaluation

The Employer Outreach for Bicycling TERM consists of two components: ongoing work with employers to implement strategies to encourage bicycle commuting and participation in the annual regional Bike-to-Work Day event. Each component requires a different evaluation approach. In this case, the populations of interest for these two components are, respectively: 1) employees at worksites that have been influenced by outreach staff to implement or improve a bicycle program, and 2) participants in the annual regional Bike to Work Day event.

The ongoing outreach efforts are evaluated using the COMMUTER Model whereby changes to employer worksite bicycle programs are modeled using baseline and program data from the ACT! contact management database, in a similar fashion to the approach used for the Employer Outreach TERM. Again, modeling is necessary because "after" data on employee travel behavior is generally not available for the worksites. The model predicts what the mode shares will be if program enhancements are made to encourage bicycle commuting. Modeling is performed "with" and "without" the bicycling element, and the difference in mode shares between the two form the basis for trip reduction. An average trip distance for bicycle commuting, derived from the State of the Commute survey, was used to calculate VMT reduction.

The impacts of the regional Bike-to-Work Day event are calculated using participation data (how many participated) as well as from a survey of Bike to Work Day participants that examines bicycle use before, during and after the event. Commuting behavior was compared from before to after the event to assess mode changes and this was used to estimate trip reduction. VMT reduction used the average commute distance of the Bike to Work Day participant survey.

Performance Measures:

The following performance measures are recommended:

Employer Outreach for Bicycling by Bicycle Outreach Staff – Participation, Utilization, and Satisfaction Measures:.

- Number of employer clients with bicycle programs
- Number of employees at worksites with bicycle programs
- Commute alternative mode split (AVO) at worksites with bicycle programs
- Employer satisfaction with outreach assistance and services

Bike to Work Day – Participation, Utilization, and Satisfaction Measures:

- Number of riders participating in Bike to Work Day events (2002, 2003 and 2004)
- Mode split of participants before and after Bike to Work Day events

Program Impact Measures:

- Vehicle trips reduced (number of daily trips reduced)
- VMT reduced (in miles)
- Emissions reduced (in tons of pollutants)
- Energy saving (in gallons of fuel)
- Commuter cost saving
- Cost per unit of benefit (per placement, trip VMT, ton)

Data Needs and Sources:

The following data items will be used to calculate program impacts. Each data source is described in Section 5.

Data Needs	*Data Source**
EO for Bicycling – Bicycle Outreach Staff	
• Number of employers participating with Bicycle Program (and employees)	ACT! database
• Employer characteristics	ACT! database
• Level of commute program at worksite	ACT! database
• Starting Average Vehicle Ridership (AVR)	Employee baseline surveys
• Ending AVR (est.)	EPA COMMUTER Model
• Average travel distance (trip length)	SOC Survey
Bike to Work Day (BTWD)	
• Number of BTWD participants	BTWD survey
• Before and after travel behavior	BTWD survey
• Average travel distance	BTWD survey

* Proposed timing of data collection
ACT! database - ongoing
Employee baseline surveys – ongoing
SOC survey – winter/spring 2004
Bike-to-Work Day (BTWD) event survey – Data averaged from surveys conducted in 2003, 2004, and 2005

MASS MARKETING TERM

Program Description

The Regional Mass Marketing TERM constitutes a new direction for the Commuter Connections program and for the evaluation framework. Commuter Connections has embarked on an ambitious effort to educate the region's commuters about alternatives to stress-filled solo commuting and to raise awareness of commute assistance services available through Commuter Connections and its partners. Radio, televisions, direct mail, and other media are being used to create a new 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

Stated Goals

COG has defined the following regional goals for Mass Marketing for 2005:

- Induce 15,547 commuters to switch modes
- Reduce 25,575 daily vehicle trips
- Reduce 375,975 daily vehicle miles of travel
- Reduce 0.3178 daily tons of NOx
- Reduce 0.1787 daily tons of VOC

Nature of Evaluation

The Mass Marketing TERM has two populations of interest: 1) all commuters in the Commuter Connections service area and 2) Commuter Connections program clients (e.g., rideshare applicants, GRH applicants) who may have been influenced by the marketing campaign to act or request Commuter Connections services. The Mass Marketing TERM requires a rather different approach than most other TERMs. First, assessing the influence on the general commuting public is more difficult than tracking program participants. Second, even if individuals who have changed their travel behavior can be found, via a general population survey such as the State of the Commute survey, directly attributing the change to the media campaign is difficult. Many factors influence travel behavior change and the media campaign may only be one part.

Thus, the "easiest" way to assess influence of the campaign is to track changes in the volume of requests of information and services through Commuter Connections' traditional programs (e.g., Commuter Operations Center, GRH registrations, etc.). Comparing requests during a period of media activity to the same period one year before without the ads is a very straightforward way of assessing the impact of the campaign. Increases in service provision are expected to result in increased placements and increased vehicle trip, VMT, and emissions reductions.

However, some commuters are likely to be influenced by the marketing campaign to make a commute change without contacting Commuter Connections or participating in a worksite commute program sponsored by an employer participating in the Employer Outreach TERM. These influenced commuters, often called "indirect" placements, are difficult to measure.

To remain rigorous and conservative in the overall evaluation approach, we recommend that Mass Marketing influence on the general commuting population also be probed through the State of Commute sur-

vey. These questions will examine the incidence of mode shifting in the region and probe *WHY* commuters who made a mode shift have done so. If they cite a specific message that is part of the Mass Marketing campaign, then the associated trip, mileage and emissions reductions can be credited to the campaign. If they cite both the advertisement and another TERM service offered by Commuter Connections, we recommending assigning "contributory" credit to the Mass Marketing campaign, even though the actual impacts will be shown in another TERM.

The Mass Marketing TERM will, therefore, use both data from a modified State of the Commute survey as well as ongoing tracking data from the Commuter Operations Center. To track changes in awareness, attitudes and behavior change over time, interim surveys (referred to later as a "mini-household" survey) will be conducted to assess ongoing trends.

Performance Measures

The Mass Marketing campaign represents a different type of TERM in that it involves a hierarchy of actions that may lead a commuter to change their travel behavior. The six levels of possible effects include:

1. Increase Awareness – Did the campaign capture and retain the attention of commuters? This can be measured as the proportion of commuters aware of Commuter Connections, of the campaign, its messages, and specific advertisements and the change in this proportion over time.
2. Change Attitude – Did it influence commuter's opinion of traffic and frustration levels? Did it create a willingness and desire to try an alternative mode? This can be measured as levels of and changes in opinions on key issues related to traffic, frustration, and perceptions on possible solutions.
3. Provide Information – Did it adequately convey information on the available information, services and resources on commute alternatives? This can be measured as commuter recall of specific services offered by Commuter Connections and its partners.
4. Prompt Contact – Did it influence commuters to contact Commuter Connections and ask for information or access services? This can be measured by tracking increase in call volumes, web hits, registrants, and even increases in employer worksites requesting outreach services.
5. Encourage Trial Use – Did it influence commuters to try an alternative mode? This can be measured as trial use among all commuters and its resulting trip, VMT and emission reduction.
6. Encourage Permanent Behavior Change – Did campaign influence commuters to permanently shift to an alternative mode? Again, this will be measured using the common measures of trip, VMT, and emissions reductions.

Data Needs

Assess changes in awareness, attitudes, information:

Population-at-large:

- In the modified State of Commute (SOC) survey the goal will be to capture awareness and recall of specific marketing messages and awareness of regional commuter assistance services, particularly Commuter Connections as an information/assistance source

Commuter Connections clients (e.g., COC applicants, GRH applicants):

- Ask the referral source at time of contact (where they heard about these services).
- In surveys of Commuter Connections clients (e.g., rideshare applicant placement survey, GRH survey), ask about awareness and relative influence of the marketing campaign

Assess increase in contacts:

Population-at-large/Commuter Connections clients:

- Monitor inquiry contact volumes to program information sources (phone, internet) corresponding to mass marketing advertisement waves
- Ask callers about referral source and attitudes toward travel/alternative modes
- In SOC survey, ask about use of regional services in SOC survey that might correspond to awareness of the Mass Marketing campaign

Assess trial and permanent behavior change:

Population-at-large:

- In SOC survey, assess travel behavior changes among commuters who recall hearing message and cite influence of marketing campaign. Also compare incidence of change with and without TERM influence. Need to correct for double counting with commuters who also cite influence of other TERMs on change.
- Track changes in call and internet email request volumes to COC and assign incremental increase in placements to the Mass Marketing TERM.

Data Needs	*Data Source**
• Proportion aware of campaign and message	SOC survey
• Attitudes of commuters	SOC survey
• Proportion knowledgeable about services	SOC survey
• Proportion contacting COC or others	SOC survey and COC tracking
• Trial use (# and type)	SOC survey and COC tracking
• Permanent shift (# and type)	SOC survey and COC tracking

* Proposed timing of data collection
SOC survey – winter/spring 2004
Commuter Operations Center (COC) tracking – ongoing

The Mass Marketing TERM evaluation may require some enhancements over the course of the assessment period as the ability to glean needed information from the State of the Commute versus Commuter Operations Center becomes clearer with experience. Given that the Mass Marketing TERM is being implemented at the same time that other Commuter Connections services are being provided (e.g., GRH, ridematching, etc.) it will be important to carefully consider the means to avoid double counting. This can be accomplished several ways. If a commuter that has changed modes cites both an advertisement and a specific service as the reason for switching modes, the evaluation can either assign all the "credit" to one TERM or another, or distribute the credit in some logical fashion. Based on the experience during 2003 of using State of the Commute and COC tracking data, we will develop and recommend the most appropriate means for avoiding double counting. These methods will be documented in the 2005 TERM Analysis Report.

COMMUTER OPERATIONS CENTER

Program Description

For many years COG has offered basic commute information and assistance, such as ridematching, 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 and Commuter Club programs. Because these services, now provided through the Commuter Operations Center, were available when the emissions baseline was developed for regional conformity, only benefits above this 1997 baseline are included as a TERM.

The function of the Commuter Operations Center is to increase commuters' awareness of commute alternatives, 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 commute alternatives is a priority for the Center, but the Center also assists commuters who now use commute alternatives to continue to do so, by offering ridematching and transit assistance when carpools break up or commuters' travel patterns change and disrupt existing commute alternative 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 information kiosks described earlier.

Stated Goals

COG has defined the following goals for the Commuter Operations Center for 2005:

- Reduce 2,720 daily vehicle trips
- Reduce 83,204 daily vehicle miles of travel
- Reduce 0.0671 daily tons of NOx
- Reduce 0.032 daily tons of VOC

Nature of Evaluation

Since the basic Commuter Connections ridematching and information services are covered in the conformity baseline, this evaluation component seeks to credit the program with any increases in effectiveness due to program enhancements not covered by other TERMs. Thus, the basic approach is to determine the total transportation and air quality impacts for all Commuter Connections services and subtract out impacts assigned to Integrated Rideshare, GRH, and any other TERM that overlaps with the Center. The balance of impacts equals the impacts of the Commuter Operations Center. There may also be some subtraction of the impacts associated with Mass Marketing as described earlier.

Performance Measures

The following performance measures are proposed for the Commuter Operations Center:

Participation, Utilization, and Satisfaction Measures:

- Number of commuter applicants to the COC
- Percent of applicants who receive matchnames on their matchlist
- COC placement rate (number of commuters who shift to commute alternatives after receiving information/assistance from COC)
- Applicant satisfaction with COC service

Program Impact Measures:

- Vehicle trip reduction factor (daily vehicle trips reduced per new commute alternative user)
- Vehicle trips reduced (number of daily trips reduced)
- VMT reduced (in miles)
- Emissions reduced (in tons of pollutants)
- Energy savings (in gallons of fuel)
- Commuter cost savings
- Cost per unit of benefit (per placement, trip VMT, ton)

Data Needs and Sources:

The following data items will be used to calculate program impacts for the Commuter Operations Center. Each data source is described in the next subsection.

Data Needs	*Data Source*
• Commuter Connections (CC) applicants	Commuter Connections database
• CC placement rate	CC Applicant Placement survey
• CC VTR Factor	CC Applicant Placement survey
• Average travel distance (all applicants)	CC Applicant Placement survey
• Vehicle trips and VMT assigned to other TERMs	Results of other TERM evaluations

* Proposed timing of data collection

Commuter Connections database – ongoing

CC Applicant Placement survey – Data averaged from surveys conducted in fall 2003, fall 2004, and fall 2005

SECTION 5 DESCRIPTION OF DATA SOURCES

Much of the data needed to perform the evaluation outlined in this framework is available from two basic sources. Data on program participation will be available from ongoing monitoring activities of COG and its partners in the form of application records, GRH registration forms, etc. The other basic source of travel impact and attitudinal information comes from annual or triennial surveys of applicants, service users or the public-at-large. Most of these surveys have been used in past years; a few are new or modified for the 2002-2005 period. The data sources and surveys can be divided into three groups as follows:

Ongoing Monitoring

- ACT! Employer Contact database
- Metrochek/SmartBenefits employer data records/Metrochek/SmartBenefits sales information
- Telework (TRC) employer contact records
- Bike to Work Day participant records
- Commuter Connections applicant database (COC, GRH, kiosk, internet applicants)
- Commuter Operations Center activity tracking

Existing/Ongoing Surveys

- Commuter Connections applicant Placement Rate survey
- Telework center occupancy and telecenter users travel patterns surveys
- GRH survey
- State of the Commute survey
- Metrochek/SmartBenefits employer survey
- Employee commute surveys (voluntarily administered by employers)
- TRC assisted employer follow-up survey
- Bike-to-Work Day participant survey

New Surveys

- Mini-household survey

Each data source and survey is described below, noting the TERM or TERMs for which it collects evaluation data. Table 1 serves as a quick reference for the proposed uses of each data source. In general, the data are used for either or both of two purposes. The first, TERM tracking, monitors use of and user satisfaction with the TERMs. The second purpose, conformity analysis, refers to the calculation of transportation, air quality, energy, and cost impacts of the TERM. This evaluation framework document deals primarily with the second of the purposes.

Table 1
Data Collection and Reporting Activities
Use of the Data

Evaluation Activity/Tool	Applicable TERM	Use of Data
Ongoing Monitoring		
• ACT! Employer Contact Database	Employer Outreach	TERM tracking, conformity analysis
• Metrochek/SmartBenefits Employer Database	Employer Outreach	Conformity analysis
• Bike to Work Day participant records	EO for Bicycling	TERM tracking, conformity analysis
• Commuter Connection Applicant Database	Integrated Rideshare	TERM tracking, conformity analysis
• Telecenter occupancy count	TRC	TERM tracking
• Commuter applicant database	Mass Marketing	TERM tracking, conformity analysis
Existing/Ongoing Surveys		
• Commuter Connections Applicant Placement Rate Survey	Integrated Rideshare, TRC, COC, Mass Marketing	TERM tracking, conformity analysis
• State of the Commute Survey	TRC, Integrated Rideshare, Mass Marketing	Commute trend analysis, conformity analysis
• GRH Applicant Survey	GRH	Conformity analysis
• Bike to Work Participant Survey	EO for Bicycling	TERM tracking, conformity analysis
• Metrochek/SmartBenefits Employer Survey	Employer Outreach	TERM tracking, conformity analysis
• Employee Commute Surveys	Employer Outreach	TERM tracking, conformity analysis
• Telecenter user travel patterns surveys	TRC	TERM tracking, conformity analysis
New Periodic Surveys		
• Mini-household survey	Mass Marketing	Conformity analysis
Evaluation Results Reporting		
• CC monthly “Report Card”	All TERMs	TERM tracking
• CC Program Annual Report	All TERMs	TERM tracking
• TERM Analysis Report	All TERMs	Conformity analysis

ONGOING MONITORING

Program activity and utilization tracking is an ongoing function already performed by COG staff and regional partners. Included here are records of services provided (e.g., number of employers contacted and GRH rides provided) and information on requests received (e.g., number of ridematch applications and kiosk "hits"). It is important to track these activities by program element, especially for activities within TERM programs.

The information gathered in the ongoing tracking process is summarized in a monthly Commuter Connections "report card." The monthly summary reports participation and utilization data and estimates travel, air quality, energy and consumer savings benefits using the factors generated from the most recent surveys. This tool is used primarily by Commuter Connections staff and staff of regional partner programs as a frequent check of progress in various activity and program areas. Annual or triennial evaluation results are then reported to the COG Transportation Planning Board and other policy-makers and program partners.

- Commuter Operations Center Activity Tracking – Ongoing tracking of telephone and internet information requests, GRH registration, and ridematching applications received for processing. *(Used for GRH, Integrated Rideshare, and Mass Marketing TERMS and Commuter Operations Center)*

- ACT! Employer Client Database – Tracks the number of employers participating in Employer Outreach Program and the commute alternative services they offer in worksite programs. Sales representatives who assist employers to begin and maintain commute alternatives programs update the database when new employers join the program and when employers already participating in EO change their commute alternative programs. The database includes information on employer characteristics (e.g., size, location, type of employer) and on the strategies (e.g., transit subsidies, GRH, preferential parking, telecommuting) employers include in their programs. *(Used for Employer Outreach TERM and Employer Outreach for Bicycling)*

- Metrochek/SmartBenefits Employer Database – Tracks the number of employers that provide Metrochek/SmartBenefits to employees, the Metrocard value provided, and the number of employees who receive the benefit. Metrochek/SmartBenefits sales representatives update the database when new employers join the program and when employers already participating change the value of the benefit they offer or the number of passes they distribute. WMATA annually provides a summary list by employer to COG and produces interim lists as requested. *(Used for Employer Outreach TERM)*

- Telework Seminar Records – Tracks the number of and contact information for employers who attend a TRC information seminar. This information may be used to identify employers to be sent a follow-up survey. *(Used for Metropolitan Washington Telework Resource Center TERM)*

- Telecenter Occupancy Counts – Establishes the number of teleworkers at each telecenter for the purposes of determining telecenter utilization. *(Used for Metropolitan Washington Telework Resource Center TERM)*

- Bike to Work Day Records – Provides information on commuters who register to participate in Bike to Work Day and the employer for whom they work.

EXISTING/ONGOING SURVEYS

Seven surveys are currently conducted by Commuter Connections to follow-up with program applicants and to assess user satisfaction. All of these surveys provide data used to estimate program impacts. Some of the surveys, such as the Applicant Placement survey and GRH Survey, also provide information to be used by Commuter Connections staff to fine tune programs.

- Commuter Connections Applicant Placement Rate Survey – Since May 1997, Commuter Connections has conducted commuter applicant placement surveys to assess the effectiveness of the Commuter Operations Center and other program components. These surveys have been used to derive placement rates and other evaluation variables needed to calculate program impacts. The surveys also assess users' perceptions of and satisfaction with the services provided. This survey is conducted annually, at the same time each year in the fall.

  Data from the applicant placement survey are used to calculate placement rates for the Commuter Operations Center and for the Software Upgrade TERM. Additionally, Vehicle Trip Reduction factors are derived from this survey. For the 2005 TERM analysis, the results of the three surveys conducted during the evaluation period (fall 2003, fall 2004, and fall 2005) will be averaged to obtain these calculation variables.

  Results of the surveys conducted during this evaluation period will be presented in annual survey reports. Reported results are primarily for internal use by program and technical staff, but results also can be summarized for policy makers, such as the TPB, the TPB's Technical Committee, and other regional policy makers. In the future, selected results may also be summarized for distribution to the media, employers, commuters, and the public-at-large. *(Used for Integrated Rideshare TERM and Commuter Operations Center)*

- GRH Applicant Survey – Commuters who register with the GRH program or use a one-time exception trip are surveyed to establish how the availability and use of GRH influenced their decision to use an alternative commute mode and to maintain that mode. Satisfaction with GRH services also is polled. Some data collected in the survey, such as current and previous mode, travel distance, and access mode, are used to develop the GRH placement rate and VTR factor. *(Used for GRH TERM).*

- State of the Commute Survey – A major addition to the evaluation framework for the last evaluation period (1999-2002) was the State of the Commute (SOC) survey, a random sample survey of employed adults in the Washington metropolitan region. The SOC survey serves several purposes. First, it establishes trends in commuting behavior, such as commute mode and distance, and awareness and attitudes about commuting and about specific services, such as HOV lanes and public transportation, available to commuters in the region. To this end, it will be compared to the 2001 State of the Commute Survey.

  The SOC survey also helps to estimate the impacts of TERMs that have a possible influence on the population-at-large. Specifically, the survey generates information on kiosk use and telecommuting, two TERMs that have broad application and for which it is not possible to identify all users from any Commuter Connections database. The survey also is used to assess awareness and penetration of the regional GRH program.

  Finally, by querying respondents about commuters' sources of information on commute alternatives and their reasons for choosing commute alternatives, the survey will also suggest how other commute

alternative programs and marketing efforts influence commuting behavior in the region. In this way, it will also help to establish the influence of the Mass Marketing advertising messages on mode switching and use of Commuter Connections services.

The State of Commute survey is a triennial survey, but a mini-household survey is planned for the third year of the evaluation period to continue to examine trends in marketing awareness, familiarity with Commuter Connections programs, and travel behavior change. *(Used for Telework Resource Center, GRH, Employer Outreach, and Integrated Rideshare TERMs)*

- Employee Commute Surveys – Some employers also conduct baseline survey of employees' commute patterns, before they develop commute alternative programs. The results of these surveys also are available through the database. COG reviews the results quarterly. *(Used for Employer Outreach TERM)*

- Metrochek/SmartBenefits Employer Survey – Employers that participate in the Metrochek/SmartBenefits program but that are not included in the ACT! database are surveyed to identify other commute alternative program services they offer, in addition to Metrochek/SmartBenefits. The Metrochek/SmartBenefits database currently includes information only on employers' distribution of Metrochek/SmartBenefits, but it is known that some of these employers also offer other commute alternative services. Data from this survey is used to estimate the greater program impacts these broader commute alternatives programs likely would generate than does Metrochek/SmartBenefits alone. *(Used for the Employer Outreach TERM)*

- Teleworker Travel Survey – Telecommuters who use one of the regional Metropolitan Washington Telework Centers (MWTC) are surveyed to establish their basic commute travel patterns, such as distance from home to the telecenter, mode used, and distance to their usual (non-telecenter) place of work. *(Used for Telework Resource Center TERM)*

- Employer Telework Assistance Follow-up Survey – Sent to employers who have attended a TRC information seminar or received other TRC assistance to determine if and how they used the information they received. Specifically, the survey asks if the employer has begun a telecommute program since attending the seminar and if the seminar was helpful. This information is used to estimate the number of telecommuters directly influenced by the TRC to start telecommuting. *(Used for Telework Resource Center TERM)*

- Bike-to-Work Day Participant Survey – A survey among registered participants in the Bike to Work Day event is undertaken to assess travel behavior before and after the Bike to Work Day, along with other questions about commute distance, etc. For the 2005 TERM analysis, the results of two surveys conducted during the evaluation period (2003, 2004 and 2005) will be averaged. *(Used for Employer Outreach for Bicycling TERM)*

NEW SURVEYS

One new survey will be developed for the 2002-2005 evaluation period: a mini-household survey of the population-at-large.

- Mini-Household Survey – This survey, a short version of the State of the Commute survey is planned for 2005 to examine regional travel trends and to estimate impacts of the Mass Marketing TERM as it matures. Both the sample size and length of the survey are expected to be smaller than the SOC Survey, but the intent is to gather sufficient data to estimate the impact of the Mass Marketing TERM as the message is repeated over multiple seasons.

SECTION 6 BASIC METHOD FOR CALCULATING PROGRAM IMPACTS

This section presents the methodology for calculating and quantifying the travel, air quality, energy and commuter cost impacts of the TERMs. Following are the basic calculation steps common to all TERMs (except Employer Outreach, which uses a modeled method and Mass Marketing, which uses information from the State of the Commute and COC activity tracking to assess mode change due to the campaign). Specific examples of the evaluation calculations and unique methodological elements for each TERM are included in Appendices C through I:

- Appendix C – Telework Resource Center
- Appendix D – Guaranteed Ride Home
- Appendix E – Integrated Rideshare – Software Upgrade
- Appendix F – Integrated Rideshare – Kiosk
- Appendix G – Employer Outreach – Jurisdiction Sales Representatives
- Appendix H – Employer Outreach – Metrochek/SmartBenefits
- Appendix I – Employer Outreach for Bicycling
- Appendix J – Commuter Operations Center

DOCUMENTING PROGRAM PARTICIPATION AND UTILIZATION

The evaluation of program impacts requires first an accurate documentation of the participation of employers and commuters in each TERM program. Commuter Connections staff and local jurisdiction program partners will need to consistently and continuously track the number of participants or users of each TERM. Specifically, we propose that the following be counted:

- Private employers participating in the Employer Outreach TERM.

- Employers and employees participating in Metrochek/SmartBenefits.

- Commuters who request Commuter Connections assistance also will be tracked, as will the type of information requested (e.g. ridematching, transit information, telework assistance, bicycle information, etc.) and information on where they heard about Commuter Connections (advertisement, employer, friend, etc.). Using the results of the applicant placement survey and other surveys conducted under this project, separate placement rates will be developed for Integrated Rideshare and the Commuter Operations Center.

- GRH registrants and one-time exception users should be tracked as a group, separately from all applicants. A GRH placement rate and VTR factor will be developed from the GRH survey.

- Employers participating in telework pilot programs should be tracked independently of other assessments of regional telecommuting experience. This information will be needed to estimate the unique role of these pilot programs above and beyond the impact the TRC plays in fostering worksite telecommute programs.

- Employers participating in TRC activities should be tracked through the TRC's contact records. Telecommute placement rates (proportion of employees at the worksites who become telecommut-

ers) and a corresponding VTR factor will be developed from data collected in the TRC follow-up survey.

- Commuters that receive transit and Park & Ride information through the Software Upgrade portion of the Integrated Rideshare TERM also should be tracked separately from those requesting such information. Again, a separate placement rate and VTR factor will be developed for all commuters receiving the Software Upgrade enhanced information.

- Finally, the number of kiosk users in total and those requesting specific follow-on information should be tracked. Using the results of the SOC survey, placement rates and VTR factors will be estimated for regional kiosk users.

- Commuters participating in Bike to Work Day should be tracked to determine the total number of participants

The purpose of this tracking process is to determine the "population base" to be used to quantify impacts and then to credit those impacts back the TERM from which they were derived. Other program information, in addition to participation and utilization, also should be tracked and documented for use in program refinement.

Information on participation and utilization will be included in monthly and annual program summaries. The intent is for Commuter Connections and its partners to input participation results, credited to each TERM, into a form that allows for the calculation of impacts. This is accomplished with a simple spreadsheet that includes the factors discussed below.

CALCULATING PROGRAM IMPACTS

The following subsection provides an example of how program impacts will be calculated for the five TERM programs. As each of these services has become fully operational, tailored surveys have been developed to produce unique placement rates and VTR factors for each TERM.

The calculation method is designed to:

- Quantify the benefits of the program
- Compare projected impacts to actual results
- Be simple to understand and apply
- Be inserted into simple spreadsheet program for monthly and semi-annual reporting

Ten basic steps are used to calculate program impacts. These steps are described below. A hypothetical numerical example of the steps is presented in Figure 1 for one TERM.

TERM Evaluation
Basic Program Impact Calculation Methodology Steps

1. Estimate commuter "population base" for the TERM	= e.g., all commuters, GRH applicants, CC applicants, Kiosk users, EO employees, Metrochek/SmartBenefits employees, etc.
2. Calculate placement rate (from commute survey data)	= Proportion of commuters who made a travel change as a result of the TERM
3. Estimate number of "placements"	= Population base x placement rate
4. Estimate VTR factor (from commute survey data)	= Average daily vehicle trips reduced per placement
5. Estimate vehicle trips (VT) reduced	
- GRH, kiosks, COC, Software, TRC	= placements x VTR factor
- Employer Outreach	= Modeled method
6. Estimate VMT reduced	= Vehicle trips reduced x avg. trip length
7. Adjust VT and VMT for SOV access	
- Adjusted vehicle trips reduced	= Total vehicle trips – SOV access trips
- Adjusted VMT reduced	= Total VMT – SOV access VMT
8. Estimate emissions reduced	= Vehicle trips x "trip end" emission factors = VMT x "running" emission factor
9. Estimate energy and commuter savings	= VMT reduced x average fuel consumption = VMT reduced x average vehicle operating cost
10. Estimate cost-effectiveness	= total annual TERM budget ÷ annual emissions reduced by TERM

Figure 1

Example of Basic Program Impact Calculation Methodology Steps for a TERM

(Caution: this is a hypothetical example. The factors used and results generated from this example should not be used for actual evaluation purposes)

1. Estimate TERM "population base"	= 8,000 commuters
2. Calculate placement rate (from survey data)	= 20%
3. Estimate number of "placements"	= 8,000 x 0.2 =1,600 commuters placed
4. Estimate VTR factor (from survey data)	= 0.7 vehicle trips reduced per placement
5. Estimate vehicle trips (VT) reduced	= 1,600 x 0.7 trips reduced per placement = 1,120 vehicle trips reduced
6. Estimate VMT reduced	= 1,120 vehicle trips reduced x 25 miles/trip = 28,000 VMT reduced
7. Adjust VT and VMT for SOV access	(assume 60% of placements have SOV access and drive 5 miles to meeting point)
- Adjusted vehicle trips reduced	= 1,120 trips – 0.6 x 1,120 = 1,120 - 672 = 448 vehicle trips (without SOV access)
- Adjusted VMT reduced	= 28,000 VMT – (0.6 x 1,120 x 5 miles) = 28,000 – 3,360 = 24,640 VMT
8. Estimate emissions reduced	
VOC	= 448 trips x 1.6358 gm/trip = 733 gm = 24,640 VMT x 0.2901 gm/VMT = 7,148 gm = (733 gm +7,148 gm) / 907,185 gm/ton = 0.0087 tons VOC reduced
NOx	= 448 trips x 0.9905 gm/trip = 444 gm = 24,640 VMT x 0.6881 gm/VMT = 16,955 gm = (444 gm + 16,955 gm) / 907,185 gm/ton = 0.019 tons NOx reduced

9. Estimate energy and commuter savings

Energy saving (gallons of fuel)	= 28,000 daily VMT / 23.8 mpg = 1,176 gallons per day x 250 work days/yr = 294,100 gallons saved per year
Commuter cost saving ($)	= 28,000 VMT x $0.144/mile = $4,032 per day x 250 work days/year = $1,008,000 saved per year / 1,600 placements = $630 saved per placement per year

Step 1 – Determine Commuter Population Base

It is important first to establish the population base, or population of interest, relevant to the TERM specific. This is the population that potentially could have been influenced by the TERM. Depending on the TERM being evaluated, this could be all commuters, GRH applicants, kiosk users, all telecommuters, telework center telecommuters, or some other population. In the example shown in Figure 1, the population base is 8,000 commuters.

Step 2 – Calculate Placement Rate

The next step in determining program impacts is to calculate the placement rate for the population base exposed to the TERM. The placement rate is equal to the percentage of commuters in the population base who shift to a commute alternative (carpool, vanpool, public transportation, walk/bike, telecommute) after receiving assistance under the TERM. Placement rates are calculated from survey data.

Two separate placement rates are calculated for each TERM, to account for the length of time the commuter uses the commute alternative after shifting: continuing rate (did not shift back to original mode), temporary (tried new alternative mode but shifted back to original mode within the evaluation period).

For simplicity, Figure 1 shows only one placement rate, 20%. This means that 20% of the commuters in the population base made a change to a commute alternative as a result of the TERM. The placement rates for one TERM will not necessarily be the same as the placement rates for any other TERM.

Step 3 – Estimate Number of New Placements

Step 3 estimates the number of new commuter placements in commute alternatives. This is the actual number of commuters who are expected to have made the shift to a commute alternative as a result of the TERM. It is calculated by multiplying the placement rate (calculated in Step 2 from a survey of a sample of commuters in the population base) by the total population base. In our example in Figure 1, the calculation of placements is as shown below:

Placements = 8,000 commuters (population base) x 0.2
= 1,600 placements

Step 4 – Estimate VTR Factor

From the same survey data used to calculate placement rate, the Vehicle Trip Reduction (VTR) factor is next calculated. This is equal to the average daily vehicle trips reduced per placement. As described in

Section 3, not all commuter placements will reduce the same number of trips. Three types of commute shifts are captured in the VTR factor:

1) Drive alone applicants shifting to a commute alternative
2) Current commute alternative users shifting to different alternative modes (e.g., carpool to transit)
3) Current commute alternative users increasing the number of days they use commute alternatives

The number of trips a commuter reduces also depends on the number of days per week that he or she now use the commute alternative, compared to the number of days he or she used it before. The VTR factor combines the varied trip reduction results of all commuter placements to develop an average reduction per placement. An explanation of how the VTR Factor is calculated is provided in Appendix A and a numeric example is shown in Appendix B. As for placement rate, VTR factors might be different for different TERMs.

As shown in Figure 1, the VTR factor for the TERM in our hypothetical example is 0.70. This means that each of the placements for this TERM reduces, on average, 0.7 vehicle trips per day.

Step 5 – Estimate Vehicle Trips Reduced

The number of vehicle trips reduced for the TERM is then estimated by multiplying the number of commuter placements from Step 3 by the VTR factor, the average number of trips reduced per placement, calculated in Step 4. The calculation of vehicle trips reduced for the example shown in Figure 1 would be as follows:

Vehicle trips reduced = 1,600 placements x 0.7 trips reduced per placement
= 1,120 vehicle trips reduced

Step 6 – Estimate VMT Reduced

The total daily VMT reduced is calculated by multiplying the number of vehicle trips reduced (Step 5) by the average commute distance for the population of interest. The average distance for the population is calculated from the same survey data used to calculate the placement rate and VTR factor. The example in Figure 1 assumes that the average distance is 25 miles per one-way trip. Using this distance, the total VMT reduced for 1,120 vehicle trips is:

VMT reduced = 1,120 vehicle trips reduced x 25 miles per trips
= 28,000 VMT reduced

Step 7 – Adjust Vehicle Trips and VMT for SOV Access

Because a basic purpose for implementing the TERMs is to meet regional air quality standards and resulting emission reduction targets, single occupant vehicle (SOV) access to commute alternatives must be considered. Emission reduction, as explained in Step 8, is calculated by multiplying vehicle trips reduced and VMT reduced by emission factors. But because commuters who drive-alone to meet a carpool, vanpool, bus, or train do create a "cold start," their trips must be subtracted from the vehicle trip reduction to assess the air quality impact of TERMs. Additionally, the distance they travel to the meeting point must be subtracted from the VMT reduced to obtain an accurate VMT count. It is these "adjusted" vehicle trips reduced and VMT reduced, rather than the initial totals, that are used to calculate emissions reduced.

In our example, it is assumed that 60% of the commuter placements drives alone to the rideshare or transit meeting point and that the average distance to this point is 5 miles. Using these figures, the "adjusted" vehicle trips reduced and VMT reduced are shown below:

Adjusted vehicle trips reduced = 1,120 trips – (1,120 x 0.6 with SOV access)
= 1,120 trips – 672 trips
= 448 vehicle trips reduced (for emissions calculation)

Adjusted VMT reduced = 28,000 VMT – (1,120 trips x 0.6 SOV access x 5 miles)
= 28,000 – 3,360
= 24,640 VMT reduced (for emissions calculation)

Step 8 – Estimate Emissions Reduced

As noted in Step 7, emissions reduced are estimated by applying two regional emission factors, a "trip end emissions" factor and a "running emissions" factor, respectively, to the number of vehicle trips or "trip ends" reduced and to the VMT reduced to determine the pollutants (in this case NOx and VOC) reduced as result of the program. The trip end emissions factor accounts for the emissions created from a "cold start," when a vehicle is first started, and a "hot soak," that occur when the vehicle is later turned off. The running emission factor accounts for the emissions generated per mile of travel by a warmed-up engine.

For 2005, the 2002-2005 TERM Analysis target year, the emission factors are:

Emission Factor	NOx	VOC
• Trip end *(grams per one-way vehicle trip)*	0.9905	1.6358
• Running *(grams per mile)*	0.6881	0.2901

To estimate total emissions, the trip end emission factor is multiplied by the adjusted daily vehicle trips reduced (Step 7) and the running factor is multiplied by the adjusted daily VMT reduced (Step 7). These two products are then added to determine total annual NOx and VOC reductions in grams. This total is then divided by 907,185 grams per ton to convert the emissions reduced to tons per day. Using these emissions factors, the total VOC and NOx reduced for our example in Figure 1:

VOC = 448 trips x 1.6358 gm/trip = 733 gm
= 24,640 VMT x 0.2901 gm/VMT = 7,148 gm
= (733 gm + 7,148 gm) / 907,185 gm/ton

= 0.0087 tons VOC reduced

NOx = 448 trips x 0.9905 gm/trip = 444 gm
= 24,640 VMT x 0.6881 gm/VMT = 16,955 gm
= (444 gm + 16,955 gm) / 907,185 gm/ton

= 0.019 tons NOx reduced

Step 9 – Estimate Energy and Commuter Cost Savings

While air quality is the primary impact driving the TERM analysis, energy and consumer benefits also are real and tangible benefits from commute alternative programs. For this analysis, energy and commuter cost savings factors are applied to the VMT reduced. These factors are as follows:

- Energy savings are based on a national average fuel consumption factor of 23.8 miles per gallon (2003 data)
- Consumer savings are based on an average marginal operating cost per mile (oil, gasoline, maintenance) for a mix of vehicle types and average distance driven per year. The American Automobile Association estimated a composite national average cost to be 14.4 cents per mile in 2001, the most recent period for which AAA prepared cost estimates.

For this analysis, energy and commuter cost savings are calculated by multiplying the energy and consumer cost factors to the total (not adjusted) VMT reduced. As shown in Figure 1, the daily and annual energy and cost savings for the example TERM are as follows:

Energy saving (gallons of fuel)	= 28,000 daily VMT / 23.8 mpg
Daily saving	= 1,176 gallons per day
Annual saving (250 work days)	= 294,100 gallons saved per year
Commuter cost saving ($)	= 28,000 VMT x $0.144/mile
Daily saving	= $4,032 per day
Annual saving (250 work days)	= $1,008,000 saved per year
Annual saving per commuter (based on 1,600 placements)	= $630 saved per placement per year

Step 10 – Estimate Cost-Effectiveness

The final step in the impact calculation is that of estimating TERM cost-effectiveness. The simplest means to calculate cost effectiveness is to divide the annual program results (number of vehicle trips reduced, VMT reduced, and tons of NOx and VOC reduced attributed to each TERM area by the cost of funding that TERM. This will create the following measures:

- Cost per vehicle trip reduced
- Cost per VMT reduced
- Cost per ton of NOx and VOC reduced

A complicating issue is that of the longevity of impacts. Even though a new ridesharer placed in 2003 should be credited against the cost of the program in 2003, that new ridesharer may be in a carpool for two or three years. Likewise, a carpooler placed in 2001 that remains in that arrangement for three years will yield benefits through 2003. Therefore, the “benefits” stream may be greater than one year.

SAMPLE CALCULATIONS OF IMPACTS FOR EACH TERM

The impact calculation methodology described above described the basic steps applied to all TERMs and provided one hypothetical numerical example. However, each TERM has unique placement rates and VTR factors and some of the steps differ slightly. Specific examples are presented for each TERM (and subcomponents such as kiosks and Metrochek/SmartBenefits) in Appendices C through J. A sample calculation method is not provided for the Mass Marketing TERM as this method will be refined as State of the Commute survey results and COC activity records are analyzed and a final recommended method developed.

It should be noted that the numbers shown in the example are from the 2002 TERM Analysis Report which forms the basis of this evaluation framework. The actual 2002-2005 values for placement rates, VTR factors, trip distances, SOV access percentages, and other calculation variables will be computed after the appropriate surveys have been completed and are likely to be somewhat different that the values shown in the appendices examples. The appendices are provided for illustrative purposes only.

SECTION 7 RECOMMENDED EVALUATION SCHEDULES AND RESPONSIBILITIES

The key to any successful evaluation effort is for evaluation information to be generated and reported in a timely manner to decision makers. Commuter Connections prepares monthly summaries for use by internal staff and local jurisdiction program partners to assess on-going progress. Annual or triennial evaluation results are reported to Commuter Connections staff, local jurisdiction program partners, and regional policy-makers in a useful, easily-digestible manner for policy purposes. Formal review of the results is an integral part of the work program development for both COG and program partners.

Evaluation activities fall into four categories, with various recommended schedules as described in Table 2. The first column shows the evaluation activity, including surveys and on-going tracking activities. The second column indicates the recommended frequency for administering surveys and on-going tracking. The specific schedule for all data collection activities has been established by Commuter Connections and is included as Appendix L. The final column of Table 2 indicates the party that would be responsible for collecting or maintaining the data.

Table 2 also shows recommended results reporting activities. It is assumed that report will be prepared following each survey (annual placement survey, GRH survey, Telework Center survey, SOC survey, kiosk survey, etc.) to document the results of the survey and calculate updated placement rates and VTR factors (if applicable) for the populations surveyed. As Table 2 indicates, in addition to these reports, activity and evaluation reports also are recommended to report the progress of the Commuter Connections program as a whole and for individual TERMs. A full TERM Evaluation Report will be developed every three years to document the TERM impacts during the previous three-year period.

RECOMMENDED EVALUATION RESPONSIBILITIES

The primary responsibility for performing monthly and annual evaluations will reside with Commuter Connections staff. Commuter Connections will assume responsibility for managing regular and special survey efforts conducted by outside contractors and will conduct some surveys, such as the GRH satisfaction survey, using in-house staff. Commuter Connections staff also will assemble ongoing monitoring data, oversee all activities, and seek input from Transportation Planning Board (TPB) staff to ensure consistency with accepted TERM analysis methods.

Commuter Connections local jurisdiction program partners will play a role in tracking some ongoing activities, especially in Employer Outreach, and will review and provide input on TERM evaluation activities.

Contractors may be used for some data collection and evaluation activities as directed by Commuter Connections staff. GRH service providers will provide data on usage as required in their contracts. Finally, employers and Telework Center managers will work with Commuter Connections staff and its partners to provide information on program service utilization.

Table 2
Data Collection and Reporting Activities
Proposed Frequency and Responsibility

Evaluation Activity/Tool	Frequency	Responsibility
Ongoing Monitoring		
• ACT! employer contact database	Monthly	Sales representatives
• Metrochek/SmartBenefits Employer database	Quarterly	WMATA
• Telework (TRC) Employer Records	Ongoing	CC/TRC
• Bike-to-Work Day participant records	Annual	CC
• Commuter Connections Applicant Database	Ongoing	CC
• GRH Applicant Database	Ongoing	CC
• Telework center occupancy count	Annual	CC and MWTC
• Commuter Operations Center activity tracking	Ongoing	CC
Existing/Ongoing Surveys		
• CC Applicant Placement Survey	Annual	Contractor to CC
• State of the Commute Survey	Triennial	Contractor to CC
• GRH Survey	Triennial	CC
• Bike-to-Work Participant Survey	Annual	CC
• Employee Commute Surveys	Ongoing	Contractor to CC
• Telecenter users travel patterns surveys	Triennial	CC and MWTC
• TRC assisted Employer follow-up Survey	Annual	CC and MWTC
New Periodic Surveys		
• Mini-household Survey	Triennial	Contractor to CC
Evaluation Results Reporting		
• Commuter Connections "Report Card"	Monthly	CC
• CC Program Annual Report	Annual	CC
• TERM Evaluation Report	Triennial	Contractor to CC

CC – Commuter Connections
MWTC – Metropolitan Washington Telework Center managers
TRC – Telework Resource Center
WMATA – Washington Metropolitan Area Transit Authority

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APPENDIX A
CALCULATION OF VTR FACTOR

The vehicle trip reduction (VTR) factor represents the average number of vehicle trips that a commuter "placed" in an alternative mode would reduce per day. The VTR factor combines the trip reduction results of three possible types of travel changes that new commuter placements might make:

1. Drive alone commuters shifting to a commute alternative
2. Commuters who currently use a commute alternative shifting to another alternative mode (e.g., from carpool to transit)
3. Commuters who currently use a commute alternative increasing their weekly frequency of commute alternative use (e.g., from carpool one time per week to carpool three times per week).

Shown below is a brief example of how the VTR factor would be calculated for seven commuter placements who made the following travel changes:

- Placement 1 – shifts from driving alone, 5 days per week, to a two-person carpool, 5 days per week
- Placement 2 – shifts from driving alone, 5 days per week, to transit, 5 days per week
- Placement 3 – shifts from driving alone, 5 days per week, to telecommuting, 2 days per week and driving alone 3 days per week
- Placement 4 – shifts from driving alone, 5 days per week, to two-person carpool, 2 days per week and driving alone 3 days per week
- Placement 5 – shifts from a two-person carpool, 5 days per week, to transit, 5 days per week
- Placement 6 – shifts from transit, 5 days per week, to a two-person carpool, 5 days per week
- Placement 7 – increases the frequency of carpool from 1 day per week to 3 days per week, driving alone the other 2 days

The VTR factor is calculated by determining the number of vehicle trips all placements would reduce together and dividing that total by the number of placements. We assume that a commuter makes both a trip from home to work and a second trip from work to home, thus a commuter who drives alone would make 2 vehicle trips each day. If the commuter carpools, he would make ½ vehicle trip to work and ½ trip back home, for a total of 1 vehicle trip per day. A commuter who uses transit, bikes, or walks is assumed to make 0 vehicle trips. A commuter who telecommutes also makes 0 vehicle trips for telecommute days.

Shown below are the travel modes and the numbers of vehicle trips each of the seven commuters described above would make for each day of the week before the shift to a commute alternative and after the shift. The third column shows the net vehicle trips (number of trips after the shift minus number of trips before the shift). The final column shows the total weekly trips reduced. Note that commuter placement #6 actually increases his weekly commute trips, because he shifts from a higher occupancy mode (transit) to a lower occupancy mode (carpool).

APPENDIX A (CONT.)

Sample VTR Calculation
Travel Modes Before and After Shifts to Commute Alternatives
By Commuter Placement and by Day of the Week

	Vehicle Trips Before Shift					Vehicle Trips After Shift					Vehicle Trips Net Trips					Weekly
	M	**T**	**W**	**T**	**F**	**M**	**T**	**W**	**T**	**F**	**M**	**T**	**W**	**T**	**F**	**Change**
Placement 1	D	D	D	D	D	C	C	C	C	C						
DA to 2p CP	2	2	2	2	2	1	1	1	1	1	-1	-1	-1	-1	-1	-5 trips
Placement 2	D	D	D	D	D	T	T	T	T	T						
DA to TR	2	2	2	2	2	0	0	0	0	0	-2	-2	-2	-2	-2	-10 trips
Placement 3	D	D	D	D	D	D	D	C	C	C						
DA to TC/DA (part-time)	2	2	2	2	2	2	2	2	0	0	0	0	0	-2	-2	-4 trips
Placement 4	D	D	D	D	D	D	D	C	C	C						
DA to CP/DA (part-time)	2	2	2	2	2	2	2	2	1	1	0	0	0	-1	-1	-2 trips
Placement 5	C	C	C	C	C	T	T	T	T	T						
2p CP to TR	1	1	1	1	1	0	0	0	0	0	-1	-1	-1	-1	-1	-5 trips
Placement 6	T	T	T	T	T	C	C	C	C	C						
TR to 2p CP	0	0	0	0	0	1	1	1	1	1	+1	+1	+1	+1	+1	+5 trips
Placement 7	D	D	D	D	C	D	D	C	C	C						
DA/CP to CP (part-time)	2	2	2	2	1	2	2	1	1	1	0	0	-1	-1	0	-2 trips
Total weekly trips	11	11	11	11	10	8	8	7	4	4	-3	-3	-4	-7	-6	-23 trips

Total placements	= 7 placements (travel for each shown above)
Total trips reduced per week	= 23 trips per week (all placements together)
Total trips per day (all placements together)	= 23 trips per week / 5 days per week =4.6 trips per day
Average trips reduced per placement	**= 4.6 trips per day / 7 placements** **= 0.66 trips per placement**

The seven commuter placements would reduce a total of 4.6 trips during a single day, thus the average number of trips reduced per day by each of the seven placements would be 0.66. This is the VTR factor.

APPENDIX B
SAMPLE CALCULATION OF VEHICLE TRIP REDUCTION (VTR) FACTOR

Summary of Current and Previous Mode for Survey Respondents Who Made a Shift to an HOV Mode

	Current One-Way Weekly Person Trips				Previous One-Way Weekly Person Trips				New One-Way Weekly Person Trips (current – prev)		
	DA	**RS**	**TR**	**RSOcc.**	**DA**	**RS**	**TR**	**RSOcc.**	**DA**	**RS**	**TR**
Drive alone shift to Transit											
	0	0	8	0	8	0	0	0	-8	0	8
	0	0	10	0	2	0	8	0	-2	0	2
	0	0	10	0	10	0	0	0	-10	0	10
Total	**0**	**0**	**28**		**20**	**0**	**8**		**-20**	**0**	**20**
Drive alone shift to Rideshare											
	2	6	0	2	8	0	0	0	-6	6	0
	0	2	8	8	2	0	8	0	-2	2	0
	0	10	0	3	2	8	0	2	-2	2	0
	0	10	0	2	10	0	0	0	-10	10	0
	0	10	0	3	10	0	0	0	-10	10	0
	0	8	0	13	8	0	0	0	-8	8	0
Total	**2**	**46**	**8**		**40**	**8**	**8**		**-38**	**38**	**0**
Rideshare shift to Transit *											
	0	0	10	0	0	2	8	3	0	-2	2
	0	0	10	0	0	10	0	3	0	-10	10
	0	0	10	0	0	10	0	4	0	-10	10
	0	0	10	0	0	8	2	2	0	-8	8
Total	**0**	**0**	**40**		**0**	**30**	**10**		**0**	**-30**	**30**
Rideshare shift to Rideshare (ex. carpool to vanpool)											
	0	5	0	3	0	5	0	2	0	0	0
	0	5	0	3	0	5	0	13	0	0	0
	0	10	0	3	0	10	0	3	0	0	0
Total	**0**	**20**	**0**		**0**	**20**	**0**		**0**	**0**	**0**
Transit shift to Other Transit (ex. bus to train) *											
	0	0	10	0	0	0	10	0	0	0	0
	0	0	10	0	0	0	10	0	0	0	0
Total	**0**	**0**	**20**	**0**	**0**	**0**	**20**		**0**	**0**	**0**
Transit shift to Rideshare*											
	0	10	0	2	0	0	10	0	0	10	-10
	0	10	0	2	0	0	10	0	0	10	-10
	0	10	0	12	0	0	10	0	0	10	-10
	0	10	0	4	0	0	10	0	0	10	-10
	0	10	0	3	0	0	10	0	0	10	-10
Total	**0**	**50**	**0**		**0**	**0**	**50**		**0**	**50**	**-50**
Average RS Occupancy				**4.5**				**4.0**			

APPENDIX B – SAMPLE CALCULATION OF VTR FACTOR (CONT.)

Summary of Travel Changes for all Respondents

Current One-way Weekly Trips (all respondents)

	DA	RS	TR/BW
Weekly person trips	2	116	96
Average RS occupancy	1	4.5	N/A
Weekly Vehicle trips (Person trips/RS occupancy)	2	25.8	0

Previous One-way Weekly Trips (all respondents)

	DA	RS	TR/BW
Person trips	60	58	96
Average RS occupancy	1	4.0	N/A
Vehicle trips	60	14.5	0

Net One-way Weekly Trips (all respondents) = current trips – previous trips

	DA	RS	TR/BW
Person trips	-58	58	0
Vehicle trips	-58	11.3	0

Weekly person trips reduced *(DA + RS+ TR/BW)*	0
Weekly vehicle trips reduced *(DA + RS + TR/BW)*	-46.7
Respondents with change	23
Average weekly vehicle trips reduced *(Weekly vehicle trips reduced / # of respondents)*	-2.03
Average daily vehicle trips reduced *(Average wkly vehicle trips reduced / 5 days per week)*	**-0.41**

* For purpose of VTR calculation, Transit category also includes bike/walk

NOTE: Numbers shown in this sample calculation are not based on actual survey data. Data were created as a hypothetical example for illustration only.

APPENDIX C
SAMPLE CALCULATIONS OF METROPOLITAN WASHINGTON TELEWORK RESOURCE CENTER IMPACTS

Populations of Interest

• All regional teleworkers (TW)	381,100	*(from SOC survey)*
• Employees at worksites assisted by TRC	119,002	*(from TRC TW assistance survey)*
• TC Pilot program teleworkers	1,265	*(from contact with pilot employers)*
• MWTC teleworkers	356	*(from MWTC survey)*

Telecommute Placement Rates

• Directly assisted TW	6.7%	*(% of TW assisted by TRC, from SOC survey)*
• Assisted worksites	1.8%	*(% of new TW at sites, from TRC assistance survey)*

Placements

Mixed home and TC based

• Directly assisted TW	25,527	*(regional TW x directly assisted placement rate)*
• TW at TRC asst. sites	2,142	*(employees at assisted sites x asst site placement rate)*
• TC Pilot program TW	1,265	(c*ount from pilot program employers)*
Total assisted TW	**28,934**	

Telecenter only

• MWTC teleworkers	356	*(from MWTC survey)*

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

• % Home-based TW	88%	*(from SOC survey)*
• % telecenter-based TW	12%	*(from SOC survey)*
• HB TW	25,462	*(total assisted TW x % HB TW)*
• TC-based TW	3,472	*(total assisted TW x % TC-based TW)*
• MWTC teleworkers	356	*(from MWTC survey)*

Daily Vehicle Trips Reduced

VTR Factors

• Home-based factor	0.49	*(from SOC survey)*
• TC-based factor	0.04	(*from SOC survey)*
• MWTC TW factor	-0.07	*(from MWTC survey)*
• Home-based VT reduced	12,476	*(HB TW x HB VTR factor)*
• TC-based VT reduced	139	(*TC-based TW x TC VTR factor)*
• MWTC TW VT reduced	(25)	*(MWTC TW x MWTC VTR factor)*

Total Daily Vehicle Trips Reduced 12,590

Appendix C, continued

Daily VMT Reduced

Ave one-way trip distance (mi)

• Home-based TW	20.8	*(from SOC survey)*
• Non-MWTC net VMT red/day (mi)	12.1	*(from SOC survey)*
• MWTC net VMT red/day (mi)	33.9	(from MWTC survey)

Days teleworking (telecenters)

• Ave. days/wk TW	2.0	*(from SOC survey)*
• Ave days/wk TW	1.4	*(from MWTC survey)*

VMT reductions on TC days

• Home-based VMT reduced	259,508	*(HB VT reduced x avg trip distance)*
• Non MWTC VMT reduced	16,805	*(TC TW x wkly TC freq / net daily miles reduced)*
• MWTC VMT reduced	3,379	*(MWTC TW x wkly TC freq / net daily miles reduced)*
Total Daily VMT Reduced	**279,692**	

Daily Emissions Reduced

NOx reduced		**Trips**	**02 Emis. Factor**	**VMT**	**02 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	12,590	1.1835			14,901	0.0164	
• Running (35mph)				279,692	1.2075	337,728	0.3723
Total NOx reduced (tons)							**0.3890**

VOC reduced		**Trips**	**02 Emis. Factor**	**VMT**	**02 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	12,590	3.202			40,314	0.0444	
• Running (35mph)				279,692	0.4885	136,630	0.1506
Total VOC reduced (tons)							**0.1950**

APPENDIX D
SAMPLE CALCULATIONS OF GUARANTEED RIDE HOME IMPACTS

Populations of Interest		
• GRH applicants	21,224	*(from GRH database, as of 6-3-02)*
• One-time exceptions	1,530	*(from GRH database, FY 00, 01, and 02)*
Total GRH base	**22,754**	
Within MSA	18,453	
Outside MSA	4,301	
GRH Placement Rates (continued rates only)		
• Within MSA placement rate	30.4%	*(from GRH survey)*
• Outside MSA placement rate	27.9%	*(from GRH survey)*
Placements (continued only)		
• **Within MSA**	**5,604**	*(Within MSA base x within MSA placement rate)*
• **Outside MSA**	**1,199**	*(Outside MSA base x outside MSA placement rate)*
Daily Vehicle Trips Reduced		
VTR Factors (continued only)		
• Within MSA	1.00	*(from GRH survey)*
• Outside MSA	1.00	*(from GRH survey)*
VT Reduced (continued only)		
• **Within MSA**	**5,604**	***(Within MSA placements x within MSA VTR factor)***
• **Outside MSA**	**1,199**	***(Outside MSA placements x outside MSA VTR factor)***
Daily VMT Reduced		
• Ave one-way trip distance (mi)		
• Within MSA	29.7	*(from GRH survey)*
• Outside MSA	29.7	*(discounted from actual 54.8 miles from GRH survey)*
VMT reduced		
• Within MSA	166,448	*(Within MSA VT reduced x trip distance)*
• Outside MSA	35,610	*(Outside MSA VT reduced x trip distance)*
Total Daily VMT Reduced	**202,058**	
Trip and VMT Adjustment for SOV Access to HOV Modes (reduce VT and VMT for AQ analysis)		
• Non-SOV access percentage	37%	*(from GRH survey)*
• SOV access distance (mi)	5.7	*(from GRH survey)*
VT Reduction		
• No SOV access	2,517	*(VT x non-SOV access %)*
Total VT for AQ analysis	**2,517**	

Appendix D, continued

VMT Reduction

• No SOV access	74,762	*(VT x SOV % x trip distance)*
• With SOV access	120,866	*(VT x SOV % x (trip distance – access distance)*
Total VMT for AQ analysis	**177,628**	

Daily Emissions Reduced

NOx reduced		**Trips**	**02 Emis. Factor**	**VMT**	**02 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	2,517	1.1835			2,979	0.0033	
• Running (35mph)				177,628	1.2075	214,485	0.2364
Total NOx reduced (tons)							**0.2400**

VOC reduced		**Trips**	**02 Emis. Factor**	**VMT**	**02 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	2,517	3.202			8,060	0.0089	
• Running (35mph)				177,628	0.4885	86,771	0.0956
Total VOC reduced (tons)							**0.1050**

APPENDIX E
SAMPLE CALCULATION OF INTEGRATED RIDESHARE SOFTWARE UPGRADE IMPACTS

Populations of Interest – Commuter Connections Rideshare Applicants

• FY 2000	18,942	*(from CC database)*
• FY 2001	20,814	*(from CC database)*
• FY 2002	21,025	*(from CC database)*
Total applicants	**60,781**	

Software Upgrades Placement Rates

• Continued placement rate	0.8%	*(from CC placement surveys)*
• Temporary placement rate	1.0%	*(from CC placement surveys)*
• One-time placement rate	5.7%	*(from CC placement surveys)*

Placements

• Continued placements	486	*(CC applicants x continued placement rate)*
• Temporary placements	608	*(CC applicants x temporary placement rate)*
• One-time placements	3,465	*(CC applicants x one-time placement rate)*
Total placements	**4,559**	

Daily Vehicle Trips Reduced
VTR Factors

• Continued VTR factor	0.60	*(from CC placement surveys)*
• Temporary VTR factor	0.60	*(from CC placement surveys)*
• One-time VTR factor	0.80	*(from CC placement surveys)*
• Continued VT reduced	292	*(Continued placements x continued VTR factor)*
Temporary VT reduced *discount for temporary use)*	58	*(Temporary placements x temporary VTR factor x .16*
• One-time VT reduced	22	*(One-time placements x one-time VTR facto x .0.008 discount for one-time use)*
Total Daily Vehicle Trips Reduced	**372**	

Daily VMT Reduced

• Continued one-way trip dist (mi)	32.5	*(from CC placement survey)*
• Temp/one-time trip dist (mi)	32.0	*(from CC placement survey)*
• Continued VMT reduced	9,482	*(Continued VT reduced x continued trip distance)*
• Temp/one-time VMT reduced	2,577	*(Temp/one-time VT reduced x Temp/OT trip distance)*
Total Daily VMT Reduced	**11,349**	

Appendix E, continued

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

• Non-SOV access percentage	33%	*(from CC placement survey)*
• SOV access distance (mi)	3.0	*(from CC placement survey)*

VT Reduction

• No SOV access (cont)	96	*(continued VT x non-SOV access %)*
• No SOV access (temp)	7	*(temporary VT x non-SOV access %)*
Total VT for AQ analysis	**104**	

VMT Reduction

• No SOV access(cont)	3,129	*(continued VT x SOV % x trip distance)*
• No SOV access (temp)	234	*(temporary VT x SOV % x trip distance)*
• With SOV access (cont)	5,766	*(continued VT x SOV % x (trip dist – access dist)*
• With SOV access (temp)	431	*(temporary VT x SOV % x (trip dist – access dist)*
Total VMT for AQ analysis	**9,560**	

Daily Emissions Reduced

NOx reduced		**Trips**	**02 Emis. Factor**	**VMT**	**02 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	104	1.1835			123	0.0001	
• Running (35mph)				9,560	1.2075	11,544	0.0127
Total NOx reduced (tons)							**0.0130**

VOC reduced		**Trips**	**02 Emis. Factor**	**VMT**	**02 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	104	3.202			332	0.0004	
• Running (35mph)				9,560	0.4885	4,670	0.0051
Total VOC reduced (tons)							**0.0060**

APPENDIX F
SAMPLE CALCULATION OF INTEGRATED RIDESHARE - KIOSK IMPACTS

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

• Regional kiosk users	50,800	*(from SOC survey)*

Kiosk Placement Rates

• Continued placement rate	0.0%	*(from SOC survey)*
• Temporary placement rate	21.8%	*(from SOC survey)*

Placements

• Continued placements	0	*(Kiosk users x continued placement rate)*
• Temporary placements	11,074	*(Kiosk users x temporary placement rate)*
Total placements	**11,074**	

Daily Vehicle Trips Reduced

VTR Factors

• Continued VTR factor	0.0	
• Temporary VTR factor	1.1	*(from SOC survey)*
• Continued VT reduced	0	
• Temporary VT reduced	3,045	*(Temporary placements x temporary VTR factor x .25 discount for temporary use)*
Total Daily Vehicle Trips Reduced	**3,045**	

Daily VMT Reduced

• Continued one-way trip dist (mi)	0	
• Temp trip dist (mi)	35.0	*(from SOC survey)*
• Continued VMT reduced	0	
• Temp VMT reduced	106,591	*(Temp VT reduced x Temp trip distance)*
Total Daily VMT Reduced	**106,591**	

Daily Emissions Reduced

NOx reduced		**Trips**	**02 Emis. Factor**	**VMT**	**02 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	3,045	1.1835			3,604	0.0040	
• Running (35mph)				106,591	1.2075	128,709	0.1419
Total NOx reduced (tons)							**0.1460**

VOC reduced		**Trips**	**02 Emis. Factor**	**VMT**	**02 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	3,045	3.202			9,752	0.0107	
• Running (35mph)				106,591	0.4885	52,070	0.0574
Total VOC reduced (tons)							**0.0680**

APPENDIX G
SAMPLE CALCULATION OF EMPLOYER OUTREACH – JURISDICTION SALES REPRESENTATIVES IMPACTS

Populations of Interest		
• Sites with Level 3-4 program	433	*(from ACT! database)*
• Employees at L3-4 sites	135,883	*(from ACT! database)*
Total TERM base employees	**135,883**	
Average Vehicle Occupancy (AVO)		
• Starting (pre-program)	1.33	*(from employee survey data)*
• Ending (with program)	1.71	*(from COMMUTER model runs)*
Daily person trips		
• Starting (pre-program)	271,766	*(total employees x 2 one-way trips per day)*
• Ending (with program)	271,766	*(total employees x 2 one-way trips per day)*
Daily vehicle trips		
• Starting (pre-program)	204,804	*(total employees / starting AVO)*
• Ending (with program)	158,830	*(total employees / ending AVO)*
Total Daily Vehicle Trips Red.	**45,974**	*(starting vehicle trips – ending vehicle trips)*
Daily VMT Reduced		
• One-way trip dist (mi)	15.5	*(from SOC survey, regional average)*
Total Daily VMT Reduced	**712,597**	**(***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	75%	*(from SOC survey)*
• SOV access distance (mi)	2.9	*(from SOC survey)*
VT Reduction		
• No SOV access (cont)	34,481	*(VT reduced x non-SOV access %)*
Total VT for AQ analysis	**34,481**	
VMT Reduction		
• No SOV access	534,448	*(VT reduced x SOV % x trip distance)*
• With SOV access	144,818	*(VT reduced x SOV % x (trip dist – access dist)*
Total VMT for AQ analysis	**679,266**	

Appendix G, continued

Daily Emissions Reduced

NOx reduced		Trips	02 Emis. Factor	VMT	02 Emis. Factor	Tot gm	Tot ton
• Cold start	34,481	1.1835			40,808	0.0450	
• Running (35mph)				679,266	1.2075	820,214	0.9041
Total NOx reduced (tons)							**0.9491**

VOC reduced		Trips	02 Emis. Factor	VMT	02 Emis. Factor	Tot gm	Tot ton
• Cold start	34,481	3.202			110,407	0.1217	
• Running (35mph)				679,266	0.4885	331,821	0.3658
Total VOC reduced (tons)							**0.4875**

Correction for Overlap with EO-Bike and TRC TERMs

	EO base	EO-bike	TRC	Net EO
Vehicle Trips Reduced	45,974	266	1,662	44,046
VMT Reduced (miles)	712,597	1,064	25,761	685,772
NOx Reduced (tons)	0.9491	0.002	0.036	0.911
VOC Reduced (tons)	0.4875	0.002	0.020	0.466

TRC Impacts counted in EO

NOx reduced		Trips	02 Emis. Factor	VMT	02 Emis. Factor	Tot gm	Tot ton
• Cold start	1,662	1.1835			1,967	0.0022	
• Running (35mph)				25,761	1.2075	31,106	0.0343
Total NOx reduced (tons)							**0.0365**

VOC reduced		Trips	02 Emis. Factor	VMT	02 Emis. Factor	Tot gm	Tot ton
• Cold start	1,662	3.202			5,322	0.0059	
• Running (35mph)				25,761	0.4885	12,584	0.0139
Total VOC reduced (tons)							**0.0198**

APPENDIX H
SAMPLE CALCULATION OF EMPLOYER OUTREACH – METRO-CHEK/SMARTBENEFITS IMPACTS

Populations of Interest

- Worksites with Metrochek/SmartBenefits 138 *(from WMATA file, not including private employers 100+ employees listed in ACT! database)*
- Employees at Metrochek/SmartBenefits sites 70,126 *(from WMATA files)*

Total TERM base employees 70,126

Average Vehicle Occupancy (AVO)

- Starting (pre-program) 1.40 *(from employee survey data)*
- Ending (with program) 1.92 *(from COMMUTER model runs)*

Daily person trips

- Starting (pre-program) 140,252 *(TERM base employees x 2 one-way trips per day)*
- Ending (with program) 140,252 *(TERM base employees x 2 one-way trips per day)*

Daily vehicle trips

- Starting (pre-program) 100,180 *(total employees / starting AVO)*
- Ending (with program) 72,959 *(total employees / ending AVO)*

Total Daily Vehicle Trips Red. 40,973 *(starting vehicle trips – ending vehicle trips)*

Daily VMT Reduced

- One-way trip dist (mi) 15.5 *(from SOC survey, regional average)*

Total Daily VMT Reduced 421,926 (*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 75% *(from SOC survey)*
- SOV access distance (mi) 2.9 *(from SOC survey)*

VT Reduction

- No SOV access (cont) 20,416 *(VT reduced x non-SOV access %)*

Total VT for AQ analysis 20,416

VMT Reduction

- No SOV access 316,444 *(VT reduced x SOV % x trip distance)*
- With SOV access 85,746 *(VT reduced x SOV % x (trip dist – access dist)*

Total VMT for AQ analysis 402,190

Appendix H, continued

Daily Emissions Reduced

NOx reduced		**Trips**	**02 Emis. Factor**	**VMT**	**02 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	20,416	1.1835			24,162	0.0266	
• Running (35mph)				402,190	1.2075	730,992	0.5353
Total NOx reduced (tons)							**0.5619**

VOC reduced		**Trips**	**02 Emis. Factor**	**VMT**	**02 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	20,416	3.202			65,371	0.0721	
• Running (35mph)				402,190	0.4885	196,470	0.2166
Total VOC reduced (tons)							**0.2887**

APPENDIX I
SAMPLE CALCULATION OF EMPLOYER OUTREACH FOR BICYCLING IMPACTS

Employer Bike Program

Populations of Interest		
• Sites with bicycle program	44	*(from ACT! database)*
• Employees at bicycle sites	25,400	*(from ACT! database)*
Total TERM base employees	**25,400**	
Average Vehicle Occupancy (AVO)		
With bike services in program		
• Starting (pre-program)	1.44	*(from employee survey data)*
• Ending (with program)	1.92	*(from COMMUTER model runs)*
Without bike services in program		
• Starting (pre-program)	1.44	*(from employee survey data)*
• Ending (with program)	1.90	*(from COMMUTER model runs)*
Daily person trips		
With or w/o bike services		
• Starting (pre-program)	50,800	*(total employees x 2 one-way trips per day)*
• Ending (with program)	50,800	*(total employees x 2 one-way trips per day)*
Daily vehicle trips		
With bike services in program		
• Starting (pre-program)	35,272	*(total employees / starting AVO)*
• Ending (with program)	26,523	*(total employees / ending AVO)*
Without bike services in program		
• Starting (pre-program)	35,272	*(total employees / starting AVO)*
• Ending (with program)	26,789	*(total employees / ending AVO)*
Total Daily Vehicle Trips Red.	**266**	*(ending trips w/o bike – ending trips w/ bike)*
Daily VMT Reduced		
• One-way trip dist (mi)	4.0	*(from SOC survey, regional average)*
Total Daily VMT Reduced	**1,064**	**(***vehicle trips reduced x average trip distance)*

Appendix I, continued

Bike-to-Work Day Event

Participants' riding percentage and frequency

• Number of riders	1,100	*(BTWD registration data)*
• % biking to work before event	84%	*(BTWD survey)*
• Ave days riding before event	2.9	*(BTWD survey)*
• % biking to work after event	90%	*(BTWD survey)*
• Ave days riding after event	3.0	*(BTWD survey)*
• Weekly bike days before event	2,680	*(riders x % biking before x avg days biking before)*
• Weekly bike days after event	2,970	*(riders x % biking after x avg days biking after)*

New Bike Trips and VT Reduction

• Net new bike days/week	290	*(Wkly bike days after – wkly bike days before)*
• Net new daily bike trips	116	*(New wkly bike days x 2 trips per day / 5 days per week)*
• % year round (cont) bike use	46%	*(BTWD survey)*
• % summer (temp) bike use	54%	*(BTWD survey)*
• Year-round (cont) trips	53	*(year round use % x new bike trips)*
• Summer (temp) trips	63	*(summer only use % x new bike trips)*
• % drive alone on non-bike days	24%	*(BTWD survey)*
• Continued trips reduced	13	*(year round trips x DA %)*
• Temporary trips reduced	5	*(summer trips x DA %)*
BTWD Daily Vehicle Trips Reduced	**18**	

Daily VMT Reduced

• Ave trip distance (mi)	9.1	*(BTWD survey)*
BTWD Daily VMT Reduced	**161**	*(vehicle trips reduced x average trip distance)*

Total Daily Vehicle Trips Reduced	**284**	*(Bike program VT reduced + BTWD VT reduced)*
Total Daily VMT Reduced	**1,225**	*(Bike program VMT reduced + BTWD VMT reduced)*

Daily Emissions Reduced

NOx reduced		**Trips**	**02 Emis. Factor**	**VMT**	**02 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	284	1.1835			336	0.0004	
• Running (35mph)				1,225	1.2075	1,479	0.0016
Total NOx reduced (tons)							**0.0020**

VOC reduced		**Trips**	**02 Emis. Factor**	**VMT**	**02 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	284	3.202			908	0.0010	
• Running (35mph)				1,225	0.4885	598	0.0007
Total VOC reduced (tons)							**0.0017**

APPENDIX J
SAMPLE CALCULATION OF COMMUTER OPERATIONS CENTER IMPACTS

Populations of Interest – Commuter Connections Rideshare Applicants

• FY 2000	18,942	*(from CC database)*
• FY 2001	20,814	*(from CC database)*
• FY 2002	21,025	*(from CC database)*
Total applicants	**60,781**	

CC Applicant Placement Rates

• Continued placement rate	7.5%	*(from CC placement surveys)*
• Temporary placement rate	3.9%	*(from CC placement surveys)*
• One-time placement rate	25.3%	*(from CC placement surveys)*

Placements

• Continued placements	4,543	*(CC applicants x continued placement rate)*
• Temporary placements	2,340	*(CC applicants x temporary placement rate)*
• One-time placements	15,378	*(CC applicants x one-time placement rate)*
Total placements	**22,261**	

Daily Vehicle Trips Reduced

VTR Factors

• Continued VTR factor	0.54	*(from CC placement surveys)*
• Temporary VTR factor	0.42	*(from CC placement surveys)*
• One-time VTR factor	0.87	*(from CC placement surveys)*
• Continued VT reduced	2,453	*(Continued placements x continued VTR factor)*
• Temporary VT reduced	157	*(Temporary placements x temporary VTR factor x .16 discount for temporary use)*
• One-time VT reduced	107	*(One-time placements x one-time VTR facto x .0.008 discount for one-time use)*
Total Daily Vehicle Trips Reduced	**2,718**	

Daily VMT Reduced

• Continued one-way trip dist (mi)	33.1	*(from CC placement survey)*
• Temp/one-time trip dist (mi)	32.5	*(from CC placement survey)*
• Continued VMT reduced	81,208	*(Continued VT reduced x continued trip distance)*
• Temp/one-time VMT reduced	8,589	*(Temp/one-time VT reduced x Temp/OT trip distance)*
Total Daily VMT Reduced	**89,797**	

Appendix J, continued

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

• Non-SOV access percentage	37%	*(from CC placement survey)*
• SOV access distance (mi)	6.5	*(from CC placement survey)*

VT Reduction

• No SOV access (cont)	908	*(continued VT x non-SOV access %)*
• No SOV access (temp)	98	*(temporary VT x non-SOV access %)*
Total VT for AQ analysis	**1,006**	

VMT Reduction

• No SOV access(cont)	30,047	*(continued VT x SOV % x trip distance)*
• No SOV access (temp)	3,178	*(temporary VT x SOV % x trip distance)*
• With SOV access (cont)	41.114	*(continued VT x SOV % x (trip dist – access dist)*
• With SOV access (temp)	4.329	*(temporary VT x SOV % x (trip dist – access dist)*
Total VMT for AQ analysis	**78,668**	

Daily Emissions Reduced

NOx reduced	**Trips**	**02 Emis. Factor**	**VMT**	**02 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start 1,006	1.1835			1,190	0.0013	
• Running (35mph)			78,668	1.2075	94,992	0.1047
Total NOx reduced (tons)						**0.1060**

VOC reduced	**Trips**	**02 Emis. Factor**	**VMT**	**02 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start 1,006	3.202			3,220	0.0035	
• Running (35mph)			78,668	0.4885	38,430	0.0424
Total VOC reduced (tons)						**0.0459**

Correction for Overlap with Integrated Rideshare and GRH TERMs

	COC base	**Kiosk**	**SoftUpg**	**GRH**	**Net COC**
Placements	22,261	111	4,559	2,961	14,630
Vehicle Trips Reduced	2,718	14	372	361	1,970
VMT Reduced (miles)	89,797	449	11,349	11,943	66,056
NOx Reduced (tons)	0.1060	0.0005	0.0130	0.0140	0.079
VOC Reduced (tons)	0.0459	0.0002	0.0060	0.0060	0.0340

Notes:
Kiosk – 0.5% of COC base applications obtained through kiosks
GRH – 13.3% of COC base includes applicants who ask for GRH and other information

APPENDIX K
GLOSSARY OF ACRONYMS

ACT	-	Association for Commuter Transportation
AVR	-	Average Vehicle Ridership
CC	-	Commuter Connections
CCWP	-	Commuter Connections Work Program
COC	-	Commuter Operations Center
COG	-	Council of Governments
DDOT	-	District of Columbia Department of Transportation
DTP	-	Department of Transportation Planning
ECO	-	Employee Commute Options
FHWA	-	Federal Highway Administration
GIS	-	Geographic Information System
GRH	-	Guaranteed Ride Home
HOV(s)	-	High Occupancy Vehicle(s)
ITAC	-	International Telework Association & Council
MATAC	-	Mid-Atlantic Telecommuting Advisory Council
MTA	-	Maryland Transit Administration
MDOT	-	Maryland Department of Transportation
MWAQC	-	Metropolitan Washington Air Quality Committee
MWCOG	-	Metropolitan Washington Council of Governments
MWTRC	-	Metropolitan Telework Resource Center
NO_X	-	Nitrogen Oxides
OPA	-	Office of Public Affairs
P & R	-	Park and Ride
PRTC	-	Potomac & Rappahannock Transportation Commission
SOC	-	State of the Commute
SOV	-	Single Occupant Vehicle
TAHG	-	Telecommute Ad-Hoc Group
TCM	-	Transportation Control Measure
TDM	-	Transportation Demand Management
TERM	-	Transportation Emission Reduction Measure

Appendix K (cont.)

TIP	-	Transportation Improvement Program
TMA	-	Transportation Management Association
TMO	-	Transportation Management Organization
TPB	-	Transportation Planning Board
TRC	-	Telework Resource Center
VDOT	-	Virginia Department of Transportation
VDRPT	-	Virginia Department of Rail & Public Transportation
VMT	-	Vehicle Miles Traveled
VOC	-	Volatile Organic Compounds
VRE	-	Virginia Railway Express
VT	-	Vehicle Trips
VTR	-	Vehicle Trip Reduction
WMATA	-	Washington Metropolitan Area Transit Authority
WMTC	-	Washington Metropolitan Telework Centers