

TRANSPORTATION DEMAND MANAGEMENT (TDM) PROGRAM EVALUATION FRAMEWORK - DRAFT

FY 2024–FY 2026

February 7, 2025

TRANSPORTATION DEMAND MANAGEMENT (TDM) PROGRAM ELEMENTS REVISED EVALUATION FRAMEWORK FY 2024–FY 2026

Adopted on Month Date, Year (if not officially adopted, just include a publish date)

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Acknowledgements

The preparation of this report was financially aided through grants from the District of Columbia Department of Transportation; Maryland Department of Transportation; Virginia Department of Transportation; the Virginia Department of Rail and Public Transportation; U.S. Department of Transportation, Federal Highway Administration; and the U.S. Department of Transportation, Federal Transit Administration.

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SECTION 1 EXECUTIVE SUMMARY

Overview of the Evaluation Framework

The Commuter Connections Program of the Metropolitan Washington Council of Governments (COG), in concert with program partners, is responsible for implementing a package of Transportation Demand Management (TDM) program elements in the metropolitan Washington region. This report provides a framework and methodology for evaluating transportation and air quality impacts of five Commuter Connections TDM program elements. The objective of these elements is to improve the travel experience of regional commuters and support regional efforts to meet air quality goals and mitigate growth in vehicle miles traveled (VMT). The five TDM program elements covered by this evaluation framework include:

- **Maryland Telework Assistance:** The Maryland Telework Assistance program element provides information and assistance to Maryland commuters and employers to further in-home and co-working/telecenter-based telework programs.
- **Guaranteed Ride Home (GRH):** Eliminates a barrier to use of non-drive alone modes by providing free rides home in the event of an unexpected personal emergency or unscheduled overtime for commuters who use non-drive alone modes.
- **Employer Outreach:** Provides regional outreach services to encourage large, private-sector and non-profit employers voluntarily to implement commuter assistance strategies that will contribute to reducing vehicle trips to worksites. This program element includes the efforts of jurisdiction sales representatives to foster new and expanded trip reduction programs.
- **Mass Marketing:** Involves a large-scale, comprehensive media campaign to inform the region's commuters of services available from Commuter Connections as one way to address commuters' concerns, while also informing and encouraging engagement in the program's services. Various incentive programs and special promotional events also are part of this program element.
- **Commuter Program Operations:** Commuter Connections provides commute information and assistance directly to commuters, in part through the Commuter Operations Center (COC), providing services such as carpool and vanpool matching, transit information, and other information on travel services through telephone and internet assistance to commuters. In so doing, the COC supports the other four programs listed above. Commuter Connections also encourages and assists commuters to form ridesharing arrangements.

This report provides a framework and methodology for evaluating the transportation and air quality impacts of these TDM program elements. The methodology and data collection tools described in this report are used to estimate impacts of these elements for the period from July 2024 through June 2026 (FY 2024–FY 2026). These impacts will then be compared against the goals established for each element by COG's National Capital Region Transportation Planning Board (TPB), the region's designated Metropolitan Planning Organization (MPO). The evaluation will also help COG assess the use and effectiveness of each program element for future program planning purposes. The TDM evaluation framework and analysis reports are reviewed by the Commuter Connections Subcommittee and the TDM Evaluation Work Group.

Since the inception of the TDM program elements, occurring largely in the 1990s,¹ Commuter Connections has elected to undertake significant evaluation for each element. The **objective of the evaluation process** is to provide timely and meaningful information on the performance of each element to decision-makers and other groups, including the TPB and other regional policy makers; COG program funders; Commuter Connections staff; TDM program partners; and employers and commuters who comprise Commuter Connections' clients.

Nine previous evaluation frameworks have been prepared, for the following time periods:

- January 1997–June 1999 (FY 1997–FY 1999)
- July 1999–June 2002 (FY 2000–FY 2002)
- July 2002–June 2005 (FY 2003–FY 2005)
- July 2005–June 2008 (FY 2006–FY 2008)
- July 2008–June 2011 (FY 2009–FY 2011)
- July 2011–June 2014 (FY 2012–FY 2014)
- July 2014–June 2017 (FY 2015–FY 2017)
- July 2018–June 2020 (FY 2018–FY 2020)
- July 2020–June 2023 (FY 2021–FY 2023)

Key Updates to the Evaluation Framework

The evaluation framework builds on the framework used in the FY 2021–FY 2023 analysis and the eventual report for that period (which had some methodology changes since the framework was established). Key changes to the framework for this review period include:

- Addition of the “Context of Evaluation” section
- Addition of mode shift placement from drive alone as a key outcome result of program impacts
- Addition of program-specific performance measures related to equitable access to services, program efficacy in facilitating mode shift
- Consolidation of individual TDM programs for analysis.
- Removal of Car Free Day from the evaluation framework as the event has been discontinued, and no survey was completed in 2024.

Impact Performance Measures and Calculation of Impacts

The evaluation process outlined in this framework applies several types of performance measures to allow for both ongoing estimation of program effectiveness and for annual and triennial evaluations. Measures reflecting commuters' and users' awareness, participation, and satisfaction with the program, and their attitudes related to transportation options are examined to track program recognition, output, and program service quality. Measures documenting shifts to non-drive alone modes following use of TDM program elements are reported to assess the effectiveness of the elements in motivating travel behavior change. Performance data is collected through surveys of users of each program and documented in the survey reports.

¹ https://www.mwcog.org/assets/1/6/50th_Brochure_Final.pdf

Program impact measures are used to quantify six key outcome results:

- Vehicle trips (VT) reduced
- Vehicle miles of travel (VMT) reduced
- Emissions reduced: Volatile Organic Compounds (VOC), Oxides of Nitrogen (NO_x), and Carbon Dioxide (CO₂) and other associated greenhouse gases
- Energy reduction (fuel saving)
- Consumer saving (commuting cost saving)
- Mode shift placement from drive alone

To compute these impacts, the evaluation process uses several multiplier factors derived from surveys of Commuter Connections' program applicants and/or the public-at-large. These factors include:

- Placement rate (percentage of commuters who shift to non-drive alone modes)
- Vehicle trip reduction (VTR) factor (average daily trips reduced for each commuter placed in a non-drive alone mode)
- Average commute trip distance
- Drive alone access percentage (proportion of rideshare and transit users who drive alone to meet their carpool, vanpool, bus, or train)

These performance measures and factors are applied within these basic methodology steps to calculate program impacts for each TDM program element:

1. Estimate commuter population "base" for the TDM program element (e.g., all commuters, GRH applicants, rideshare matching applicants, Employer Outreach employees, etc.)
2. Derive "placement rate": Percentage of commuters in the population base who made a travel change after using the TDM program element
3. Estimate the number of new non-drive alone mode placements (e.g., commuters who start/increase use of non-drive alone modes): Multiply placement rate by the population base for the evaluation period
4. Derive vehicle trip reduction (VTR) factor for new placements: Average daily vehicle trips reduced per placement
5. Estimate vehicle trips reduced: Multiply number of placements by the VTR factor
6. Estimate vehicle miles traveled (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 NO_x, VOC, and CO₂ emissions reduced: Multiply adjusted vehicle trips and VMT reduced by emissions factors consistent with the regional planning process
9. Estimate the energy and commuter and societal cost savings: Multiply VMT reduced by fuel efficiency and vehicle operating cost factors and by societal benefit cost factors

The calculations outlined above, excluding mode shift, have been embedded into a spreadsheet used by Commuter Connections and its partners to track results on a quarterly basis. The spreadsheet will be updated to include calculations for mode shift to quantify the number of commuters who switch from single occupancy vehicle trips to non-drive alone modes. A summary of these results will be included in Commuter Connections' Annual Report. The factors used in the spreadsheet are updated as new surveys relevant to each element are completed. At the end of the

three-year evaluation period, a TDM Analysis Report is prepared to summarize placements; reductions in vehicle trips, VMT, and emissions; and progress toward goals in each of these performance measures for the three-year period.

Throughout the evaluation period, additional reports are prepared to present results of major data collection efforts, such as the Applicant Placement Rate survey, the “State of the Commute” survey of regional commuting trends and attitudes, the GRH applicant survey, and others. These reports are distributed to program partners, policy makers, and others with an interest in regional transportation to help inform regional transportation plans and initiatives.

Note that the TDM program elements included in the Commuter Connections evaluation framework do not encompass all the TDM activities currently ongoing in the Washington metropolitan region. Many other organizations, such as states and local jurisdictions, transportation management associations, transit agencies, vanpool vendors, other transportation service providers, employers, commercial and residential building operators, and other organizations also offer services that perform similar functions to the TDM program elements implemented by Commuter Connections. The impacts of these other TDM services are not addressed in this framework, but certainly are expected to provide travel and air quality benefits to the region and personal benefits to the commuters who use them.

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SECTION 1 OVERVIEW

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- July 2018–June 2020 (FY 2018–FY 2020)
- July 2020–June 2023 (FY 2021–FY 2023)

The upcoming evaluation will quantify the impacts of the five TDM program elements. The results will be used to support regional transportation and air quality planning and congestion management efforts. This evaluation framework report is organized into nine sections:

- **Section 1** presents the framework overview.
- **Section 2** considers multiple factors that impact the environment for travel.
- **Section 3** defines evaluation objectives and issues guiding the process.
- **Section 4** enumerates performance measures used to assess program effectiveness.
- **Section 5** discusses evaluation components specific to each TDM program element, and to the Commuter Operations Center (COC) and the Software Upgrade component of Integrated Rideshare, which was combined with the COC in a previous evaluation period.
- **Section 6** describes the data sources and data collection tools used to collect analysis data.
- **Section 7** outlines the method to compute travel, air quality, energy, and consumer cost impacts of the TDM program elements.
- **Section 8** describes tools currently used to report Commuter Connections' evaluation results to various stakeholder audiences.
- **Section 9** outlines the evaluation schedule and responsibilities.

Note that the TDM program elements included in the Commuter Connections evaluation framework do not encompass all the TDM activities currently ongoing in the Washington metropolitan region. Many other organizations, such as states and local jurisdictions, transportation management associations, transit agencies, vanpool vendors, other transportation service providers, employers, commercial and residential building operators, and other organizations also offer services that perform similar functions to the TDM program elements implemented by Commuter Connections. The impacts of these other TDM services are not addressed in this framework, but certainly are

² https://www.mwcog.org/assets/1/6/50th_Brochure_Final.pdf

expected to provide travel and air quality benefits to the region and personal benefits to the commuters who use them.

SECTION 2 CONTEXT OF EVALUATION

Commuting patterns in the region have significantly evolved over the last two evaluation periods, with many factors contributing to changes in commuter behavior. The context for the evaluation includes:

- Factors currently influencing commuter behavior and the anticipated potential workplace changes that could further change commuter travel choices.
- Considerations for determining baseline year comparisons for the evaluation. Specifically, the value of using both the pre-COVID-19 pandemic (FY 2018–FY 2020) evaluation and the “during COVID-19 pandemic” (FY 2021–FY 2023) evaluation as baselines to compare current conditions.
- Considerations of evaluation components beyond the conventional “TDM impact” measures.
- Discussion about how conducting a process evaluation to help Commuter Connections better understand how travel behavior is influenced by extraneous societal factors, such as those mentioned in the rest of this section.

Factors Influencing Commuter Behavior

WORKPLACE POLICIES

Employers throughout the region are offering a variety of work location policies. Some organizations have rescinded the temporary measures in place during the COVID-19 pandemic and are now transitioning toward a pre-pandemic state of office operations, including some which have mandated return-to-office (RTO) policies, requiring employees to work on site every day with no option of teleworking. Others have settled into hybrid policies, requiring employees to be in the office two or three days a week, often with more flexible schedules which allow employees to commute outside of peak periods. Still others have maintained a fully or mostly remote work policy, with minimal or no in-office requirements.

This array of policies has numerous effects on commuter behavior and, consequently, the usage of TDM programs. RTO policies are likely to increase demand for employer outreach support with commuter benefit programs and TDM strategies to create commute-friendly workplaces. If employees are required to commute regularly, especially in congested areas during peak travel periods, they are likelier to use of transit, carpooling, and vanpooling, thus increasing their desire to receive incentives and subsidies to sustain use of these modes. This has particular relevance in light of ongoing and anticipated RTO policies among Federal agencies, requiring employees to work on-site full time. The influx of employees returning to the office can significantly increase traffic congestion and lead to a higher number of solo drivers on the road, exacerbating long commute times and environmental impacts.

On the other hand, hybrid policies may actually result in less TDM program usage. Hybrid employees may not be as deterred by the stress and expense of driving and parking if they only commute a few times per week. In particular, the Guaranteed Ride Home (GRH) program has already seen declining registration rates in the wake of hybrid work policies. Finally, employees with fully or mostly remote work policies will continue to have low TDM program participation, as they are minimally or not commuting. Factors such as cost, time, and convenience are crucial in determining commuting choices. With reduced commuting days, these factors are perceived differently.

For example, the 2023 Employer Outreach analysis demonstrated an increase in telework as a worksite program change. Much of that change was assumed to be prompted by COVID-19 pandemic workplace shutdowns and not directly related to employer outreach actions. During the present evaluation, the Maryland Telework! Assistance program placement rate will be affected by current workplace changes, possibly declining in impact. The relevance of telework assistance has diminished and has been made less of a priority with the shift back to more traditional office operations.

OTHER EMPLOYER DECISIONS

The COVID-19 pandemic prompted many organizations to reevaluate not only their work location policies, but larger operational strategies as well. Many employers chose to forgo their office leases as their employees successfully transitioned to teleworking, demonstrating the feasibility and effectiveness of remote work arrangements, which also enabled employees to relocate to more affordable areas, further away from their original office locations. Other decisions included employers relocating their offices out of urban centers to reduce costs, incentivizing employees to relocate to other offices, and forgoing traditional leased office space in favor of co-working spaces which may be closer to employees' residences or spread more throughout the region.

These trends have generally resulted in increased office vacancies and less commute-related congestion in traditional business districts, with increased activity in suburban and rural areas. In many cases, this has resulted in transit providers reducing service, especially on commuter bus and rail that were designed with peak-period, peak-direction travelers in mind. While many commuters still need these services (and the TDM programs that promote and subsidize them), many others have work arrangements and locations that are no longer well-matched with traditional commuter programs. Employer decisions, such as office closures or relocations, can significantly impact commuting patterns and program engagement.

Baseline Year Considerations

Conventionally, this triennial evaluation would compare current conditions to those of the previous evaluation period—in this evaluation, that would mean comparing to the FY 2021–FY 2023 (July 2020 through June 2023). However, in light of how dramatically commuting behavior has changed (and continues to change) in the wake of the COVID-19 pandemic, there is value in comparing current conditions with both the FY 2021–FY 2023 evaluation and the FY 2018–FY 2020 evaluation (July 2018 through June 2020). Looking back at both “during the pandemic” and pre-pandemic conditions can provide a more nuanced understanding of how TDM program usage has changed over time and the contributing factors. Providing these two vastly different points of comparison can also contextualize usage trends for individual programs, i.e., identifying which programs are experiencing a post-pandemic recovery and which are not. It can also set the stage for considering how certain travel characteristics may revert to pre-pandemic conditions and others may not.

Evaluation Components

While the evaluation will estimate the measurable impact of TDM programs by reporting vehicle trips (VT) reduced, vehicle miles of travel (VMT) reduced, emissions reduced, energy reduced, consumer savings, and mode shift, it is important to note that there are other outcomes worth noting. The FY 2024–FY 2026 evaluation will consider additional metrics such as consumer awareness, consumer

satisfaction, attitudinal changes about non-drive alone travel modes, and availability of transit and other non-drive alone options. These metrics provide key insights into what motivates travelers to use non-drive alone options and enables Commuter Connections' programs to be evaluated for their customer reach and customer satisfaction.

Process Evaluation

Program evaluations have many components, with this specific evaluation focusing on measuring the impacts of Commuter Connections' five TDM program elements. A process evaluation can help to identify possible program improvements by examining specific factors that influence commuter behavior. For example, determining the number and type of interactions a traveler has with a Commuter Connections program, service, or marketing material before they decide to make a travel change is key to understanding effective methods that incite positive change. In anticipation of new challenges and evolving commuting patterns in the region (including the other factors described in this Context of Evaluation section, plus other unanticipated changes), a process evaluation can shed light on the causal link between outreach and impacts, thereby helping to adapt TDM programs to these changing conditions. A process evaluation could be conducted later within the triennial evaluation or in a future evaluation cycle.

SECTION 3 EVALUATION OBJECTIVES AND ISSUES

Objectives

The objective of the evaluation process is to provide timely and meaningful information on performance of TDM program elements to document transportation and emission impacts, help identify program enhancements that support effective program outreach and service delivery, and guide decisions on future funding priorities. This information includes travel and air quality impacts, such as reductions in vehicle trips, vehicle miles of travel, and emissions generated by use of Commuter Connections TDM program elements, as well as data on commuters' travel patterns, opportunities, constraints, and attitudes.

Emphasis Areas for the Triennial Analysis

REGIONAL GOALS AND NEW TECHNOLOGIES/NEW MODES

Two topics added to the evaluation in the FY 2021–FY 2023 framework remain of interest for the FY 2024–FY 2026 evaluation; these are the contribution of Commuter Connections' TDM program elements to regional transportation-related societal goals and how the availability and use of new technologies and new mode options can influence commute decisions.

IMPACT OF RETURN TO OFFICE (RTO) POLICIES/HYBRID WORK ARRANGEMENTS ON TRAVEL

One regionally-significant topic that will be important to the FY 2024–FY 2026 TDM evaluation is the effect of RTO policies and hybrid work arrangements on regional commuter travel. Commuter travel behavior is expected to continue evolving as workplaces continue to refine their post-COVID-19 pandemic policies, with some organizations embracing remote work and others (notably the Federal government) implementing stricter in-office requirements.

A key change since the FY 2021–FY 2023 evaluation is the growing prevalence of hybrid workplace policies. While the FY 2021–FY 2023 evaluation captured a period where most employees either had jobs that could not be performed remotely (e.g., hospitality or service jobs) or had office jobs with COVID-19 pandemic related telework policies, the FY 2024–FY 2026 evaluation will capture a more nuanced picture of hybrid arrangements where commuting patterns are more flexible and irregular. These trends may affect the way hybrid employees perceive TDM programs and their necessity, particularly those employees who no longer need to travel during peak periods, or only need to do so occasionally.

Throughout this evaluation period, the project team will review and revise data collection and analysis methodologies, including survey questions, in order to better understand the ever-evolving commuting environment and TDM's role in it. Since the COVID-19 pandemic began in early 2020, Commuter Connections has included pandemic-related questions in several surveys, offering a real-time view of how commuters and employers were adjusting work locations and mode use choices as the pandemic progressed. Commuter Connections surveys such as the State of the Commute survey and Guaranteed Ride Home survey will provide additional insights into changing commuting patterns. Updates to the 2025 State of the Commute survey include questions about whether respondents split workdays between their workplace and home or another location and how their

travel behavior has changed since early 2022 when the last State of the Commute survey was administered.

EQUITY IN ACCESS TO AND DELIVERY OF SERVICES

An additional MWCOC initiative that is relevant for the evaluation framework is the focus on equity in access to and delivery of transportation services. This topic was emphasized in the FY 2021–FY 2023 evaluation and continues to be a focus for the FY 2024–FY 2026 evaluation. The MWCOC Board of Directions affirmed that equity would be “woven into COG’s Region Forward Vision to ensure a more prosperous, accessible, livable, sustainable, and equitable future for all area residents and throughout COG’s analyses, procurement, programs, and priorities.”³ Further, the National Capital Region Transportation Planning Board (TPB) identified Equity Emphasis Areas (EEAs) across the region to help assess equity of impacts of transportation planning projects.

Commuter Connections undertakes a variety of outreach and assistance activities to ensure equity in service delivery and service access. For example, Commuter Connections offers multiple methods by which commuters can receive information and assistance, including a regional call center that accommodates Spanish-speaking callers; the program website; multiple mobile applications; and information-sharing through jurisdiction-based partners. Additionally, Commuter Connections translates its web content into numerous languages and targets program marketing to residents of EEAs and essential workers.

To expand on equity access and delivery of services, this triennial review may include the following:

- An accessibility review of the Commuter Connections website, mobile applications, resources, and accommodations within various programs.
- Analyzing program and survey data to better examine whether Commuter Connections programs reach and meet the needs of historically disadvantaged groups and non-traditional commuters (those who work outside the typical 9-to-5 Monday-Friday schedule). In particular, analyzing access to commuter services for people living or working in EEAs.

One specific way that the 2025 State of the Commute survey reporting will enable further analysis of equity in the context of commuting and TDM programs is by appending census block group information to respondents’ survey data. Block groups are a small enough geography to allow examination of service access and use in EEAs and large enough to protect respondents’ privacy. All

Evaluation Framework Emphasis Areas for FY 2024–FY 2026

- Collect and share TDM program data to document TDM contribution to the region and support regional and local planning.
- Collect data to examine commuters’ attitudes toward and use of new technologies and new mode options and influence on commute decisions.
- Collect data for regional analysis of travel changes related to return-to-office (RTO) and hybrid work policies.
- Collect and report data on equity of service access, delivery, and use of programs.

³ <https://www.mwcog.org/about-us/cog-board-and-priorities/equity/>

surveys conducted for the evaluation collect demographic data and some geographic data. Past evaluations have reported on access, awareness, and use of Commuter Connections services by geographic and demographic sub-populations.

Key Audiences

Key audiences for the evaluation include decision-makers such as the TPB and other regional policy makers; COG program funders; COG/TPB staff; Commuter Connections program partners, such as local jurisdictions and transportation management associations (TMAs); and employers and commuters who comprise Commuter Connections' clients. Specific information of interest or relevant to each group includes:

- Regional policy makers: Impacts and cost-effectiveness of TDM program elements in contributing to regional goals for reducing congestion, enhancing transportation system performance, improving air quality, reducing energy consumption, and improving mobility and accessibility.
- Program funders: Impacts and cost-effectiveness of the TDM program elements implemented via the Commuter Connections program.
- Regional and local transportation planners and TDM program staff: Regional commute trends and attitudes and the collective impact of Commuter Connections' programs on regional traffic and air quality. The FY 2024–FY 2026 evaluation will continue to collect travel pattern data that Commuter Connections can provide for regional and local jurisdiction analyses on transportation system performance measurement. The evaluation also will compile evaluation data to assist program managers to report TDM program benefits in ways meaningful to policy makers and funders.
- COG TPB staff and Commuter Connections program partners: Program enhancements that will increase service effectiveness and efficiency of service delivery, attract additional commuters to non-drive alone modes, and contribute to improved performance of the transportation network.
- Employers and commuters: Collective, regional impacts of individual participation, benefits for employers that support commute programs, and personal benefits received by commuters who use non-drive alone modes. Evaluation information also can be useful to educate employers about feasible and effective trip reduction strategies for their specific worksite conditions.

Evaluation Principles and Issues

Several overarching principles and issues apply to the evaluation, presented here to emphasize the underlying foundation of the evaluation process. **Section 5** elaborates on the evaluation activities and issues for individual TDM program elements.

DOCUMENT PROGRESS TOWARD TDM GOALS AND SUPPORT PROGRAM MANAGEMENT

The evaluation uses common, quantitative performance measures for all TDM program elements to allow for comparisons among program elements and between program elements and other strategies that could be implemented to address congestion and air quality concerns. These common performance measures are listed in **Section 4**.

The evaluation framework allows for quarterly projection of benefits as a program management information tool. While assessment of travel and air quality benefits is the key purpose of the evaluation, the process also provides information to support administration of Commuter

Connections TDM program elements. Additionally, the evaluation process follows industry-accepted evaluation techniques, is rigorous, ongoing, resource efficient, unobtrusive for Commuter Connections partners, and is compatible with regional, state, national, and international practices. Finally, the evaluation framework addresses collection of data to assist MWCOG to integrate Commuter Connections' TDM program elements into its response to the FAST Act federal performance-based planning requirements and the regional congestion management process.⁴

SEPARATING IMPACTS OF PROGRAM ELEMENTS

The evaluation separates individual Commuter Connections TDM program element impacts and applies discount factors to avoid overestimating benefits (e.g., double-counting benefits) when a commuter uses more than one Commuter Connections service. For example, carpools might be formed as a joint result of ridematching and GRH. These impacts must either be credited to one of the two program elements or divided between them in proportion to their respective influences in encouraging the change. A commuter using multiple program benefits instead of just one does not necessarily equate to additional impacts.

Similarly, the evaluation separates the impacts of Commuter Operations Center “basic” services from the impacts of other TDM program elements. **Section 7** presents the method for attributing impacts to specific elements. This is especially relevant for the Mass Marketing program element, because impacts can be “direct,” meaning the marketing alone motivated a shift to a non-drive alone mode, or “referred,” where the marketing influenced commuters to use another Commuter Connections program, such as GRH. In such cases, the travel and air quality impacts will be assigned to the element or to Commuter Program Operations, based on their respective influences.

When possible, the evaluation recognizes and attempts to address the possible influence of other factors, such as the extent of congestion, work and home locations, economic factors, fuel prices, and other factors on travel behavior and mode choice. The regional State of the Commute survey and other service user surveys that explore commuters' reasons for choosing their travel modes can help gauge the relative importance of TDM program elements, among the many factors that can influence travel behavior, in commuters' use of a new travel mode.

ACCOUNTING FOR PRIOR MODE AND ACCESS MODE

Prior mode is an important variable in the evaluation, because a shift to a non-drive alone mode does not always mean a vehicle trip was eliminated. Vehicle trips are reduced only in three cases: 1) the commuter shifts from driving alone to a non-drive alone mode, 2) a non-drive alone mode commuter increases the frequency of use of alternative modes, or 3) the commuter shifts to a higher-occupancy mode (e.g., from carpool to vanpool or vanpool to transit). **Section 7** describes the

⁴ MWCOG has been required since passage of the 2005 SAFETEA-LU federal legislation to undertake a Congestion Management Process (CMP). The current FAST Act fully maintains the CMP requirements with additional options. The National Capital Region's CMP Technical Report describes the region's activities to monitor and evaluate transportation system performance and defines congestion management strategies the region will implement. The Commuter Connections' TDM Program elements are included among the strategies described. The current CMP for the National Capital Region was documented in the 2024 Congestion Management Process (CMP) Technical Report, National Capital Region Transportation Planning Board, MWCOG, November 2024. This document notes that the 2021 Infrastructure Investment and Jobs Act, also known as the Bipartisan Infrastructure Law (IIJA/BIL), as well as subsequent rulemaking, were silent on the topic of the CMP and that the previous federal requirements as updated under the FAST Act are understood as remaining in place. The current and previous CMP Technical Reports are available at <https://www.mwcog.org/documents/2024/11/19/congestion-management-process-cmp-technical-report-congestion-congestion-management-process/>.

development of the vehicle trip reduction (VTR) factor used to convert the number of non-drive alone mode placements into the number of vehicle trips reduced, considering various types of before-after non-drive alone mode combinations.

For emission reduction evaluation purposes, the evaluation also accounts for the access mode of carpoolers, vanpoolers, and transit riders—that is, how commuters who use these modes travel from home to park & ride facilities, bus stops, train stations, or other places where they meet rideshare partners or board a bus or train. Access mode is a minor issue in the evaluation of VMT reduction, because access trips generally account for a small portion of the total miles between home and work and the non-drive alone mode generally is used for the most congested and longest portion of the trip. However, commuters who drive alone to the meeting point still make a vehicle trip and accumulate some drive-alone miles, which must be subtracted from the vehicle trips reduced and VMT reduced in the emissions analysis.

UPDATING CALCULATION FACTORS AND ASSUMPTIONS USED IN THE EVALUATION

The TDM evaluation methodology applies calculation factors developed from surveys and other research conducted during the evaluation period. Revisions will be incorporated in the FY 2024–FY 2026 evaluation as noted later in this report for each element. Additionally, regional emissions factors will be updated to reflect factors that will apply in 2026.

APPLY LIFE-CYCLE ASSESSMENT TO MODE SHIFTS TO CAPTURE THE FULL DURATION OF BENEFITS FOR TDM IMPACTS

In Commuter Connections evaluations prior to 2017, mode shifts motivated by TDM program elements during an evaluation period were not carried over to the next evaluation cycle. But numerous surveys conducted for past TDM program analyses suggested that commuters who made mode shifts continued using the new modes for more than three years, so some additional impacts could be retained from one three-year evaluation cycle to the next. To address this opportunity, in 2016, Commuter Connections conducted a new “Retention Rate” survey to estimate the share of past service users who continued to use non-drive alone modes during the current cycle.

The survey interviewed Commuter Connections online system users and GRH users who last participated in these programs prior to the start of the FY 2015–FY 2017 evaluation period. Users were asked about their current modes, how long they had used the modes, and what Commuter Connections services they received. Commuters who were still using non-drive alone modes were asked if and how Commuter Connections services influenced them to continue to use non-drive alone modes. These survey data were used to develop “retained” placement rates and other factors for the GRH transportation emission reduction measure (TERM) and for the Commuter Operations Center and the 2017 TDM analysis calculated “retained” impact credits, in addition to new impacts, for each of these program elements.

Commuter Connections conducted a second Retention Rate survey in February 2021, following the same method from the 2016 survey. Results from this survey were used to update the multiplier factors for GRH and for the Commuter Operations Center for the 2023 triennial analysis and will be carried over for the present analysis. **Section 6** provides additional details on the Retention Rate survey.

SPECIFIC EVALUATION ISSUES FOR INDIVIDUAL TDM PROGRAM ELEMENTS

In general, the analysis approaches documented in the 2023 TDM Analysis Report are used as the basis for the evaluation methods described in this framework. A sample of the calculations are included in Appendices D through I, as excerpted from the 2023 TDM Analysis Report.

Maryland Telework Assistance

The telework program element is comprised of resources to help employers, commuters, and program partners initiate and expand telework programs. In evaluating teleworking, several travel changes need to be assessed, including trip reduction due to telework, the mode(s) used for commuting on non-telework days, and mode and travel distance to telework locations other than home. Impacts are estimated from the State of the Commute survey and from surveys conducted with Maryland employers that received telework information or assistance from Commuter Connections.

Note that the calculated telework impacts do not include all telework in the region—only impacts that can be tied to a service provided by Commuter Connections or a partner organization and services that are provided under this TDM program element. Additionally, Commuter Connections and its program partners also offer some telework assistance under the Employer Outreach program element and Commuter Program Operations. These impacts are calculated separately from those for Maryland Telework Assistance for the commuter and employer target telework populations and assigned to either Employer Outreach or Commuter Program Operations.

As noted in **Section 2**, workplace policies—whether trending towards more telework or more in-person work—will impact demand for this program.

Guaranteed Ride Home (GRH)

The primary goal of GRH is to provide a safety net to help encourage commuters who drive alone to shift to non-drive alone modes and to encourage commuters who were carpooling or using other shared modes before they registered for GRH to continue or expand their use of these modes without fear of being stuck in the case of an emergency. The evaluation for GRH will gauge the influence of GRH availability on both mode shifts and frequency of non-drive alone mode use. The FY 2024–FY 2026 methodology includes the “retained” component, described above, for registrants who ended their participation in GRH prior to the start of the current evaluation period but who are continuing to use non-drive alone modes to commute.

Employer Outreach (EO)

The EO evaluation applies a two-step approach employing empirical data on employer programs and modeled impacts. Empirical data come from the regional ACT! data employer contacts, which includes information on TDM strategies implemented by employers at their worksite. The EPA COMMUTER model (v 2.0) applies these empirical data to project the likely change in employee commuting behavior for given changes in the employer’s program (more information about the model is available in the **Analysis Tools** section).

The EO evaluation will calculate impacts for three employer groups:

- **Maintained impacts:** Employers that joined EO before the start of the evaluation period (e.g., July 1, 2023), continued in the program, but made no changes since that date.
- **New impacts:** Employers that joined the EO program during the current evaluation period.
- **Expanded impacts:** Employers that were involved in EO before July 1, 2023, but that expanded their commute assistance services after that date.

The evaluation also includes impacts for employers that participated in the program during the most recent past evaluation period but dropped out of EO before the start of the new period. Impacts that would have been credited for these employers would have to be replaced or “backfilled” by new/expanded impacts.

Finally, employer bicycle programs, which were evaluated separately from other EO services prior to 2008 under the Employer Outreach for Bicycling component, are now addressed within the broad EO program element.

Mass Marketing

The critical issue for this program element is attributing changes in attitudes and behavior to the mass marketing campaign versus another TDM program element. The following types of impacts are evaluated for Mass Marketing:

- **“Direct marketing” impacts** generated by commuters who cite regional Commuter Connections advertising messages as an influence on their commuting change.
- **“Referred marketing” impacts** that are generated when advertising encourages commuters to submit rideshare and GRH applications.
- **Event impacts** generated from mode shifts related to special event programs, such as Bike-to-Work Day.
- **Incentive impacts** generated by shifts to non-drive alone modes by commuters who receive ‘Pool Rewards carpool start-up and vanpool start-up/continuation incentives, Flextime Rewards incentives for shifting travel out of the peak period, and CommuterCash (formerly incenTrip) rewards for non-drive alone mode trips logged using the mobile application.
- **Dynamic ridematch impacts** generated by shifts to carpool by commuters who use the CarpoolNow dynamic ridematch mobile application.

New calculations were added to Mass Marketing for the FY 2021–FY 2023 evaluation for two incentive programs, Flextime Rewards and CommuterCash (formerly incenTrip), and the CarpoolNow “dynamic ridematch” component. The November 2020 Applicant Placement Rate survey interviewed users of these programs, allowing the derivation of impact multiplier factors for the TDM analysis.

Section 6 presents additional information on the data sources for this analysis.

Commuter Program Operations

Impacts for the Commuter Operations Center (COC) and integrated rideshare will again be evaluated as in past analyses—and this time they are being combined into this overarching category, Commuter Program Operations. The methodology includes two components that were added to the methodology in the 2017 TDM analysis: the “retained” component for online system applicants who received services before the start of the current evaluation period and who are continuing to use non-drive alone modes to commute and incorporating impacts from Commuter Connections-assisted telework that occurs outside of the telework components of the Maryland Telework Assistance program element. **Appendix C** describes the assignment of these telework impacts.

SECTION 4 PERFORMANCE MEASURES

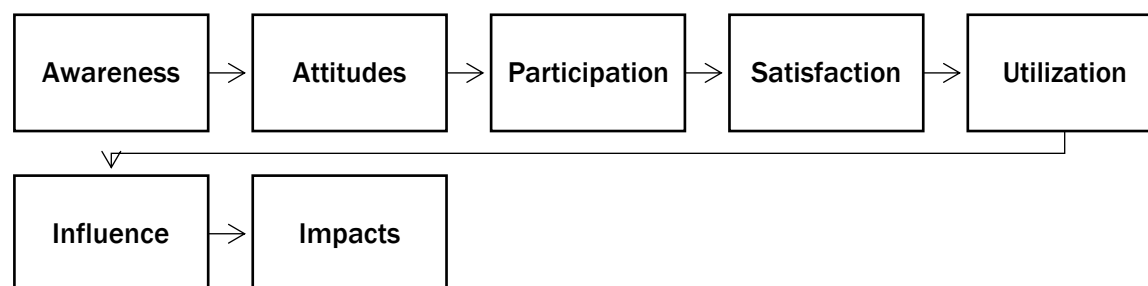
Performance Measures by Category

Performance measures assess the extent to which Commuter Connections is meeting its objectives, in particular the travel and emission targets set by the TPB, as well as evaluating customer-focused outcomes related to service awareness, service use, and user satisfaction. Car culture is ever-present in our society and many people are conditioned to assume car travel as the default. Changing this mindset often requires that commuters go through an educational process supported by positive experiences before they permanently adopt the desired behavior. The **classic social marketing model** outlines this multi-step transformation:

- Awareness: Build initial awareness of the concept
- Familiarity: Increase appreciation and understanding of options
- Consideration/Trial: Try an option and have a favorable experience
- Desired behavior: Adopt the behavior in everyday living

The Commuter Connections evaluation framework adapts this model for a seven-step approach to TDM program evaluation, with each step representing one component on a “continuum” of results (**Figure 1**). The first five categories (top row in the image) represent steps necessary for social behavioral change. The sixth category (Influence) refers to assessment of the factors influencing or motivating behavioral changes. The final category includes indicators related to the external impacts resulting from behavior changes. For a TDM program, the impacts are typically travel and environmental changes, but can include other personal or social impacts also, such as enhanced quality of life, personal travel savings, and other indicators. The remainder of this section provides details about each of the seven steps in the approach, with some steps grouped together for thematic purposes.

Figure 1: TDM Performance Continuum



AWARENESS AND ATTITUDES

Awareness measures assess the degree to which commuters know about the Commuter Connections program and its services. While not a direct measure of program impacts, awareness is a required precursor to use of the services. Awareness has assumed a larger role in recent evaluation periods because it is a primary objective of the Mass Marketing program element. A related type of measure is commuters’ **attitudes**—their personal feelings about their commute experience, commute travel mode options available in the region, and their willingness to consider and try new modes of travel.

Methods and Data Sources

Program **awareness** will be assessed by the proportion of residents and commuters who recognize the Commuter Connections “branding” and who are aware of transportation infrastructure, non-drive alone modes, and commuter assistance services available to them. Awareness will be assessed by questions in the State of the Commute (SOC) survey and/or other surveys of the public at large.

One goal of the Mass Marketing program element is to address commuters’ frustration with congestion. The evaluation will document travel **attitudes** over time, including commute ease and commute satisfaction, the extent of recent shifts to non-drive alone modes, and the reasons and influences for those shifts. This information is currently captured in the SOC survey and will continue to be tracked as more general population surveys are conducted.

PROGRAM PARTICIPATION AND SATISFACTION

Participation refers to indicators related to use of TDM services by targeted populations, for example, the numbers of ride matchlist requests, GRH applicants, and bicyclists who register for Bike-to-Work Day, and the number of employers that participate in Employer Outreach. Participation data measure program outputs and are needed to compute program impacts. An expanded definition of participation can include the share of commuters who take actions based on commute information they receive, for example, contacting other commuters on a matchlist or asking an employer for permission to telework.

Satisfaction measures commuters’ satisfaction with various features of TDM services and the efficiency of service delivery, for example, the speed with which requests are fulfilled and users’ impression of the usefulness of the services. These measures are not necessarily correlated to participation or travel change but are important to determine future staffing and funding needs, increase in commuter referrals, and program improvements.

Methods and Data Sources

Program participation will be assessed by the number of clients or customers who request individual Commuter Connections TDM program services and the number who are assisted. Participation could include the numbers of new employers who participate in Employer Outreach services, new and re-registering GRH applicants, online TDM information system users, telework employer sites, etc. A primary participation measure is generally the *number of applicants or users*—other measures, specific to individual program elements, also are described in **Section 4**. These measures are typically tracked through internal databases by Commuter Connections staff who administer each TDM program element.

A primarily qualitative set of performance measures will be used to assess **program and service satisfaction** to determine how well services are meeting customers’ needs and expectations. Satisfaction of various customer groups will be examined through questions in user surveys (e.g., GRH survey, Applicant Placement Rate survey, employer satisfaction survey).

MODE UTILIZATION AND INFLUENCE

Utilization refers to new and expanded use of non-drive alone modes motivated by use of TDM program element services, for example, the percentage of GRH registrants who shift from driving alone to a non-drive alone mode to be eligible for GRH. Data on mode shifts is assessed through user surveys that document current mode use and modes used before receiving TDM services.

Influence measures examine the role that TDM program elements play in motivating behavior changes relative to other factors that influence the changes.

Methods and Data Sources

Utilization is measured through estimating the number of non-drive alone mode placements. The measure of “placements” is defined as the number of commuters who shift to (i.e., are “placed” in) non-drive alone mode arrangements following use of the Commuter Connections services. These commuters could be new carpoolers, vanpoolers, transit riders, bicyclists/walkers, or teleworkers, as well as commuters who increase use of these modes.

Influence is typically assessed through user surveys, which ask service users who made a travel change what motivated the change; how or how much the service assisted or influenced the change; and how likely they would have been to make the same change if the service was not available.

PROGRAM IMPACTS

Program impacts reflect the travel, air quality, energy, and commuter cost saving benefits of the TDM program elements. The impact measures and targets set for 2026 were established by Commuter Connections following the 2023 TDM analysis. They reflect both past trends and proposed future resources and efforts by Commuter Connections and program partner staff. This section describes several performance measures to be assessed for each element and for the program overall. Other performance measures specific to each element are listed in **Section 5**. Impact measure goals also are detailed for each element in **Section 5**.

- **Vehicle Trips (VT) Reduced:** The number of vehicle trips reduced is a travel impact measure. It defines the number of daily vehicle trips that non-drive alone mode placements remove from the road during their commutes. This is a primary indicator of congestion relief through reduction in travel delays, increase in travel speed, reduction in travel time, and improvement of roadway service levels. In essence, trip reduction equates to a roadway capacity increase by freeing up roadway space for additional vehicles. It also is a primary input (trip end emissions) to the air quality analysis.
 - Vehicle trip reduction is computed using a vehicle trip reduction (VTR) factor, defined as the average number of vehicle trips reduced per day by a non-drive alone mode placement. The VTR factor accounts for shifts from drive alone to non-drive alone modes, shifts among non-drive alone modes (e.g., from carpool to vanpool and from transit to carpool), increases in the days per week that a commuter uses a non-drive alone mode, and changes in carpool and vanpool occupancy. Shifts from non-drive alone modes to drive alone are not included, because these changes are not motivated by commuters’ contact with Commuter Connections. **Appendix A** presents an example of the calculation of VTR factor.
- **Vehicle Miles of Travel (VMT) Reduced:** VMT reduced, a second travel impact measure, assesses the total daily miles of vehicle travel removed by mode shifts. VMT reduction is important to the air quality and energy evaluation and is relevant to any assessments of the roadway system performance impacts.
- **Emissions Reduced:** Emissions reduced refers to decreases in mobile source emissions resulting from reductions in vehicle trips or VMT. From the start of the TDM evaluations, the primary pollutants of concern were Nitrogen Oxides (NOx) and Volatile Organic Compounds (VOC), both of which are ozone precursors; the 2026 evaluation will estimate reductions in these emissions.

The 2008 TDM Analysis added calculation of impacts for particulate matter (PM2.5) and for Carbon Dioxide (CO2), the primary greenhouse gas; CO2 emissions also will be assessed in the 2026 evaluation, but PM2.5 emissions will not because the region is in attainment for this pollutant. Thus, reductions in PM2.5 are no longer required for the regional conformity analysis and COG/TPB staff will no longer calculate PM2.5 emissions factors.

- **Energy Saving:** Energy savings resulting from reduced VMT is measured by the reduction in the number of gallons of gasoline consumed.
- **Consumer Cost Saving:** Another measure of program impact is the aggregate cost savings realized by commuters who reduce daily vehicle trips and VMT, including measures of fuel cost, car ownership and maintenance, and more.
- **Mode Shift:** This is a new program measure for the 2026 TDM Analysis. Mode shift will be assessed by the percent of customers who request or receive individual Commuter Connections TDM program services and made a mode change from driving alone to a non-drive alone mode.

SOCIETAL BENEFIT COST SAVINGS

Societal benefits include cost savings for reductions in air pollution, greenhouse gases, noise pollution, hours of travel delay, gallons of fuel used, and vehicle crashes. The 2023 analysis, which is summarized in **Appendix J**, applies benefit “unit conversion” and unit cost multipliers to translate VMT reduction impacts into units of benefits and daily cost savings for each benefit and for all societal benefits combined. For most benefits, the method used to derive the units of benefit, and the unit cost factors were obtained from the Trip Reduction Impacts of Mobility Management Strategies (TRIMMS™) model developed by the Center for Urban Transportation Research (CUTR). The societal benefits cost savings calculation also will be prepared for the 2026 TDM Analysis.

Performance Measures in the Greater MWCOC Context

The impact measures described above were developed primarily to report the performance of TDM program elements as compared with regional goals set for them by the National Capital Region Transportation Planning Board (TPB) for air quality conformity determinations, and the benefit of these measures has been reported as part of the conformity analysis. The June 2022 TPB conformity analysis report outlines the Commuter Connections strategies and shows historical and forecasted reductions in VMT and the resulting emissions reductions that can be attributed to the Commuter Connections program.⁵

TPB’s *Visualize 2045* long-range transportation plan approved in October 2018 and updated in June 2022 reiterated the important regional role of the Commuter Connections program and of the transportation options that Commuter Connections promotes and encourages. The report stated that “Commuter Connections is the major demand management component of the TPB’s congestion management process and it helps support regional air quality goals” and noted that one goal in the *2014 Regional Transportation Priorities Plan (RTPP)* was to “provide a comprehensive range of transportation options,” which would be expected to help “protect and enhance the environment,

⁵ Metropolitan Washington Council of Governments. Air Quality Conformity Analysis of the 2020 Amendment to Visualize 2045, March 2020.
<https://www.mwcog.org/file.aspx?D=qh0WXMPVdSVBovFZHh4654ZWvhpLhB9dCUxgJ%2bFK7eM%3d&A=VZhLrRWBEIzEB4ZVOvrrroE6PoWw%2bMMqShdBckWgYs0%3d>

promote energy conservation, and improve quality of life.”⁶ Further, the *Visualize 2045* plan, which includes aspirational initiatives that go beyond fiscal constraints, spelled out a “call to action” for policies, programs, and projects that “better manage peak period travel demand, reduce single occupant travel, make transit more viable and affordable, and enhance existing infrastructure.”⁷

COG will continue to document and communicate the benefits to the community of the Commuter

Visualize 2045 Aspirational Initiatives

1. Bring jobs and housing closer together
2. Increase telecommuting and other options for commuting
3. Improve walk and bike access to transit
4. Expand bus rapid transit and transitways
5. Complete the National Capital Trail Network
6. Move more people on Metrorail
7. Expand the express highway network

Connections programs to reinforce the value of program investments. Documenting these contributions also will support the regional response to the federally mandated performance-based planning and programming (PBPP) process required of states and MPOs.⁸ Under this requirement, MWCOC must track a variety of performance indicators related to transportation system performance.

The SOC and user surveys conducted throughout the evaluation period offer immediate

opportunities for Commuter Connections to collect data of interest to the broader TPB and MWCOC program such as transportation system performance, regional and societal benefits of TDM programs, and data on emerging transportation issues. For example, the SOC survey analysis will elucidate how commute satisfaction and transit usage (both current and past) are related to the availability and quality of transportation services.

⁶ National Capital Region Transportation Planning Board. *Visualize 2045: A Long-Range Transportation Plan for the National Capital Region*, Update Plan Document, June 15, 2022, page 102-104.

⁷ National Capital Region Transportation Planning Board. *Visualize 2045: A Long-Range Transportation Plan for the National Capital Region*, Plan Document, October 17, 2018, page 34.

⁸ Federal Register, Vol. 81, No. 103, Friday, May 27, 2016, page 34051, Section B.1.

SECTION 5 EVALUATION OF INDIVIDUAL TDM PROGRAM ELEMENTS

Section 3 and **Section 4** stated the objectives and issues guiding the evaluation process and presented several common performance measures that will be used for all TDM program elements. This section details the specific evaluation approach for each of the TDM program elements.

The TDM program elements included are:

- **Maryland Telework Assistance**
- **Guaranteed Ride Home**
- **Employer Outreach**
- **Mass Marketing**
- **Commuter Program Operations**

For each element, the following information is provided:

- TDM program element description
- Evaluation methodology changes since FY 2021–FY 2023
- Goals established for the element for 2026
- Nature of the evaluation
- Performance measures recommended for the element
- Data needed to estimate impacts and recommended data sources.

Section 6 of this report provides a more detailed description of the surveys and other data sources referenced in this section. **Section 9** presents a schedule for the collection of data and defines the party responsible for collecting the data. Included in the appendices are examples of how travel and emission impacts are calculated for each TDM program element. These are excerpted from the 2023 TDM Analysis Report to provide real examples of how the calculations were performed in the most recent evaluation period. These calculation methods form the basis for the refinements included in this evaluation framework.

The specific data required for each program element to compute non-drive alone mode placements, vehicle trips reduced, mode shift, and VMT reduced are described in the individual program element evaluation component sections that follow. Additionally, some common data are needed to calculate emissions, commuter cost, and energy impacts of each element, including:

- Access mode and distance to meeting locations for non-drive alone mode users (for air quality analysis)
- Regional emissions factors (to determine emission reductions)
- Regional fuel economy data in average miles per gallon consumed (to calculate energy saving)
- Vehicle operating costs (to compute commuter cost savings).

Maryland Telework Assistance

PROGRAM DESCRIPTION

The Maryland Telework Assistance program element provides resources to help employers, commuters, and program partners initiate and expand telework. In this program element, Commuter Connections, working with numerous partners in Maryland, assists employers to establish worksite

telework programs and arrangements and provides telework information to individual commuters. This component estimates the impact of telework among commuters who work or live in Maryland that is attributable to Commuter Connections' telework assistance.

The evaluation will count Commuter Connections-assisted telework not described through either the Employer Outreach TDM program element or Commuter Program Operations.⁹ **Appendix C** details the assignment of Commuter Connections assisted telework to these other program elements.

EVALUATION METHODOLOGY CHANGES SINCE FY 2021–FY 2023

There are no changes to the basic evaluation methodology since FY 2021–FY 2023. It is important to note that hybrid and return-to-office policies have shifted during the evaluation period thus far and may continue to shift in unknown ways. A portion of the evaluation period will have occurred when employers' on-site operations may still have been disrupted by the pandemic. As such, the evaluation may need to examine the role of the COVID-19 pandemic in increasing the use of telework, and it may need to separate the pandemic component of telework growth from that influenced by programs administered under this TDM program element. During this evaluation period we will also examine the impact of workplace policy changes on the use of telework services, which may warrant future updates to the Evaluation Framework..

STATED GOALS

The purpose of the Telework program element is to increase the number of full-time or part-time home-based and telework center-based teleworkers.

Commuter Connections established five goals for this element for 2026:

- Maintain 31,854 teleworkers
- Reduce 11,830 daily vehicle trips
- Reduce 241,209 daily miles of travel
- Reduce 0.0172 daily tons of NOx
- Reduce 0.0898 daily tons of VOC

NATURE OF EVALUATION

To avoid double counting benefits, the employers included in the Maryland Telework Assistance program element will be cross-referenced against employers that participate in the Employer Outreach program element. The telework impacts for any employers that participate in both programs will be subtracted from their impacts in the Employer Outreach program element, but non-telework impacts for these employers will continue to be included in Employer Outreach.

The two populations of interest for this element include:

1. Teleworkers who live and/or work in Maryland who are influenced by Telework services/assistance they receive from Commuter Connections/MWCOG to begin teleworking
2. Telework employees at Maryland worksites that are assisted by Commuter Connections

⁹ The Telework program element includes all Maryland residents, regardless of their work location, and residents of the District of Columbia and Virginia who work in Maryland.

Population 1

For the first population, the evaluation determines the number of teleworkers who live or work in Maryland who were influenced or assisted by the Telework program element services to begin teleworking and the travel impacts of their teleworking. Data for this component come from the State of the Commute survey:

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

Placement rates and average trips reduced per placement are derived for home-based teleworkers and for those working at non-home locations.

Population 2

For the second population, the evaluation defines the portion of teleworking influenced by the Telework program element through telework assistance to Maryland employers. This analysis uses data from a survey of telework-assisted Maryland employers to determine:

- Percentage of Maryland employers with telework programs before and after receiving telework assistance
- Percentage of teleworkers at assisted Maryland worksites before and after the employer received assistance

To calculate the share of Maryland-based telework attributable to the Telework program element, the evaluation will define the telework universe among Maryland commuters and examine employers' and commuters' sources of information for telework and the value of that information or assistance in their starting or expanding telework programs.

PERFORMANCE MEASURES

The following performance measures are recommended to evaluate the Maryland Telework Assistance program:

Participation, Satisfaction, and Utilization Measures

- Number of employers that receive telework assistance from Commuter Connections
- Number of employers that implement/expand telework programs after receiving assistance
- Number of commuters who receive telework information from Commuter Connections
- Number of commuters who begin teleworking after receiving assistance: home-based and non-home based
- Telework placement rate
- Average weekly frequency of teleworking

Program Impact Measures

- Daily vehicle trips reduced
- Daily VMT reduced (in miles)
- Daily emissions reduced (in tons of pollutants)
- Mode shift placement rate from drive alone

DATA NEEDS AND SOURCES

The following data are needed to assess impacts of this program element. Each data source is described in **Section 6**.

Data Need	Data Source
Home-based teleworkers	State of the Commute (SOC) survey
Non-home-based teleworkers	SOC survey
Telework frequency (average days/week)	SOC survey
Percent drive-alone on non-telework days	SOC survey
Travel distance on non-telework days	SOC survey
Travel distance to telework centers	SOC survey
Commuters' source of telework information	SOC survey
Telework at assisted employers' worksites	MD-TW assistance survey

Proposed Timing of Data Collection

- SOC survey: April-June 2025
- Commuter Connections Telework assistance survey: FY 2026

Guaranteed Ride Home

PROGRAM DESCRIPTION

The Guaranteed Ride Home (GRH) Program eliminates a real or perceived barrier to use of non-drive alone modes—the fear of being stranded without a personal vehicle. GRH provides free return transportation by taxi, TNC, or rental car in the event of an unexpected personal emergency or unscheduled overtime to commuters who carpool, vanpool, 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 a non-drive alone mode on the day a GRH trip was needed. Commuters who wish to use GRH again in the future must then register.

EVALUATION METHODOLOGY CHANGES SINCE FY 2021–FY 2023

The evaluation will start tracking the number of GRH applicants who work non-traditional (non-9 to 5) hours.

STATED GOALS

Commuter Connections established the following regional goals for GRH for 2026:

- Maintain 3,500 GRH applicants
- Reduce 2,013 daily vehicle trips
- Reduce 52,201 daily vehicle miles of travel
- Reduce 0.0088 daily tons of NO_x
- Reduce 0.0054 daily tons of VOC

NATURE OF EVALUATION

GRH is intended to encourage drive-alone commuters to shift to non-drive alone modes. Additionally, GRH is expected to help maintain existing non-drive alone mode arrangements and increase

frequency of non-drive alone mode use. The evaluation estimates the number of new non-drive alone mode users whose shifts were influenced by GRH, and the number of commuters who used non-drive alone modes before registering who were influenced to increase use of the modes.

The GRH program element evaluation for FY 2024–FY 2026 will determine impacts for three commuter groups:

- Commuters who were registered for/participating in GRH at any time during the three-year evaluation period, even if they were no longer registered at the end of the period.
- Commuters who did not register for GRH but took a “one-time exception” trip during the three-year evaluation period.
- Commuters who participated in GRH prior to the evaluation period and who continue to use non-drive alone modes.

Additionally, two geographic subgroups are identified for GRH. The first sub-group includes participants who both live and work in any of the 15 jurisdictions in the Washington, DC-MD-VA ozone National Ambient Air Quality Standard (NAAQS) nonattainment area (NAA).¹⁰ The second population includes participants who work in the NAA but live outside it. Placement rates, VTR factors (average trips reduced per placement), and travel distances will be derived for each of the two sub-groups (“Within NAA” and “Outside NAA”). This distinction is made because applicants who live outside the NAA travel a portion of their VMT outside the NAA. The average VMT for “Outside NAA” applicants will be discounted to include only the portion of the VMT reduction that occurs within the NAA.

The GRH analysis also includes steps to avoid credit double-counting from overlap with two other TDM program elements. Overlap occurs between GRH and Commuter Program Operations because some GRH applicants also obtain ridematch lists, transit information, or other commute assistance information. The COC impacts are discounted to account for this overlap. GRH results also will be adjusted to assign a portion of the GRH impacts to the Mass Marketing program element to recognize that some GRH applicants will be influenced to apply for GRH by hearing a Mass Marketing advertisement.

PERFORMANCE MEASURES

The following performance measures are recommended to evaluate GRH:

Participation, Satisfaction, and Utilization Measures

- Number of GRH applicants
- Number of GRH applicants who work non-traditional (non-9 to 5) hours
- Number of one-time exception users
- Number of one-time exception users that convert to a GRH registrant
- GRH placement rate
- Percentage of GRH participants who take a GRH trip
- Satisfaction of GRH users with the service

¹⁰ The 15 jurisdictions included in the Washington, DC-MD-VA NAAQS nonattainment area (NAA) are: District of Columbia, Calvert County (MD), Charles County (MD), Frederick County (MD), Montgomery County (MD), Prince George’s County (MD), Arlington County (VA), Fairfax County (VA), Loudoun County (VA), Prince William County (VA), City of Alexandria (VA), City of Fairfax (VA), City of Falls Church (VA), City of Manassas (VA), and City of Manassas Park (VA).

Program Impact Measures

- Daily vehicle trips reduced
- Daily VMT reduced (in miles)
- Daily emissions reduced (in tons of pollutants)
- Mode shift placement rate from drive alone

DATA NEEDS AND SOURCES

The following data are needed to calculate GRH impacts. Each data source is described in **Section 6**.

Data Need	Data Source
GRH applicants	GRH database/archived GRH database
GRH applicants who work non-traditional hours	GRH Applicant survey
One-time GRH exception users	GRH database/archived GRH database
One-time GRH exception users who convert to a GRH registrant	GRH database/archived GRH database
GRH placement rate	GRH Applicant survey
GRH VTR factor	GRH Applicant survey
Average travel distance (trip length)	GRH Applicant survey
GRH retained placement rate	CC Retention Rate survey
GRH retained VTR Factor and average travel distance	CC Retention Rate survey
Percentage of GRH participants who cited GRH as a driver of mode shift	SOC survey

Proposed Timing of Data Collection

- Commuter Connections GRH database: Ongoing
- CC Retention Rate survey: FY 2026
- GRH Applicant survey: FY 2026

Employer Outreach

PROGRAM DESCRIPTION

The Employer Outreach program element is designed to encourage employers to implement new commute assistance programs and expand the services they offer in existing programs. In this element, jurisdiction-based sales representatives contact employers, inform them of benefits that commuter assistance programs offer to employers, employees, and the region, and assist them to develop, implement, and monitor worksite commuter assistance programs. Commuter Connections assists the sales force with services designed to enhance regional coordination and consistency including:

- Web-based regional employer contact database
- Marketing and information materials
- Employer outreach sales and service force training
- Annual evaluation program
- Support to Employer Outreach Committee
- Employer satisfaction survey.

EVALUATION METHODOLOGY CHANGES SINCE FY 2021–FY 2023

The evaluation will add “Employers in EEAs that participate in Employer Outreach” and “Employees at Employer Outreach worksites in EEAs” as populations of interest.

STATED GOALS

Commuter Connections has set the following regional participation and impact goals for Employer Outreach for 2026:

- Maintain 2,621 participating employees
- Reduce 70,404 daily vehicle trips
- Reduce 1,251,825 daily vehicle miles of travel
- Reduce 0.2578 daily tons of NOx
- Reduce 0.2067 daily tons of VOC

NATURE OF EVALUATION

Employer Outreach is aimed at increasing the number of employers implementing worksite commuter assistance programs, but Employer Outreach is ultimately designed to encourage employees of client employers to shift from driving alone to non-drive alone modes. Two primary evaluation questions are answered through this evaluation. First, how many employers start or expand commuter assistance programs? And second, how many employees use non-drive alone modes in response to new employer-sponsored services at the worksite? For both questions, it is also important from an equity perspective to understand how many employers and employees are located in EEAs. The populations of interest for this element are:

- Employers that participate in Employer Outreach
- Employers in EEAs that participate in Employer Outreach
- Employers in service-oriented industries with a significant proportion of low wage and non-traditional workers that participate in Employer Outreach
- Employees at Employer Outreach worksites
- Employees at Employer Outreach worksites in EEAs
- Employees at Employer Outreach worksites within service-oriented industries with a significant proportion of low wage and non-traditional workers

Differentiating New and Maintained Impacts

The TDM analyses for Employer Outreach define two categories of Employer Outreach impacts: “maintained” impacts and “new/expanded” impacts. The EO goals are again being re-set in this current evaluation cycle to reflect 2023 impacts. For the 2026 analysis, maintained impacts will include those from employers that joined EO before July 1, 2023 (the start of the FY 2024 – FY 2026 evaluation period) and made no changes to their TDM offerings since that date. These impacts are considered part of the FY 2024 – FY 2026 baseline for EO. New impacts will include those from employers that joined the EO program after June 30, 2023. Expanded impacts will include those for employers that were involved in EO before the start of the evaluation period but expanded their

commute services since June 30, 2023. Additionally, impacts from program reductions will be “back-filled” from new or expanded programs.¹¹

The 2023 evaluation included a further breakdown of expanded programs to separate employers that expanded only their telework program—which was a large group. Since these expansions were likely primarily pandemic related, only 10 percent of those impacts were credited to EO. While EO account representatives might have provided information or assistance that smoothed the telework expansion for these employers, the telework increase was predominately prompted by workplace shutdowns related to the coronavirus pandemic. The remaining telework increase was assumed to have been related only to the pandemic, rather than to EO actions.

It seems unlikely to expect that the EO database will show substantial further expansion of telework since June 2023. However, it will still be necessary to examine when EO employers implemented telework and adjust the EO credit assigned for telework expansion that occurred during the pandemic. In the 2023 evaluation, it was reasonable to assign full credit to Commuter Connections for telework implemented before the start of the evaluation period because it entirely pre-dated the pandemic. It would not be reasonable to do so in the 2026 evaluation because much of the telework that would be defined as “continued” could have been COVID-19 pandemic-related.

Apply Batch Methodology for COMMUTER Model (v2.0) Runs

The TDM analysis runs the COMMUTER Model (v2.0) in a batch format that allows each employer’s program to be modeled separately and that calculates trip reduction for each employer individually. This method enables Commuter Connections to determine individual employers’ contributions to the impacts.

Employer Outreach for Bicycling

In the 2002 and 2005 TDM evaluations, bicycle programs offered by employers were evaluated separately from other Employer Outreach services under the Employer Outreach for Bicycling (EOB) program element. EOB was later incorporated into the overall EO element and will be addressed similarly in the 2026 evaluation.

PERFORMANCE MEASURES

The following performance measures are recommended to evaluate Employer Outreach:

Participation, Satisfaction, and Utilization Measures

- Number of employer clients (employers with commuter assistance programs and employers with bicycle programs): total and new/expanded
- Number of employer clients in EEAs
- Number of employer clients within service-oriented industries that have a significant proportion of low wage workers and/or non-traditional (9-to-5) commuters
- Number of employees at client worksites (worksites with commuter assistance programs and bicycle programs): total and new/expanded
- Number of employees at client worksites in EEAs

¹¹ The 2023 evaluation included a further breakdown of expanded programs to separate employers that expanded ONLY telework. Since their TW was likely primarily pandemic related, only 10 percent of those impacts were credited to Commuter Connections.

- Number of employees at client worksites of service-oriented industries that have a significant proportion of low wage workers and/or non-traditional (9-to-5) commuters
- Level/extent of employers' commuter assistance programs
- Non-drive alone mode use at worksites with commuter assistance programs (placements)
- Mode shift placements rate from drive alone at worksites with commuter assistance programs
- Employer satisfaction with outreach assistance and services
- Level/extent of employers' commuter assistance programs segmented by diverse employer groups
- Non-drive alone mode use at worksites with commuter assistance programs (placements) segmented by diverse employer groups
- Mode shift placements rate from drive alone at worksites with commuter assistance programs segmented by diverse employer groups
- Employer satisfaction with outreach assistance and services segmented by diverse employer groups

Program Impact Measures

- Daily vehicle trips reduced
- Daily VMT reduced (in miles)
- Daily emissions reduced (in tons of pollutants)
- Mode shift placement rate from drive alone

DATA NEEDS AND SOURCES

The following data items will be used to assess EO program impacts. Each data source is described in **Section 6**.

Data Need	Data Source
Employers participating in Employer Outreach	ACT! database
Employers in EEAs participating in Employer Outreach	ACT! database and COG EEA boundaries
Employers in service-oriented industries with a large proportion of low wage and non-traditional commuters participating in Employer Outreach	ACT! database
Employers that offer bicycling services	ACT! database
Employer characteristics	ACT! database
Commuter assistance services at worksite	ACT! database
Starting Average Vehicle Ridership (AVR)	Employee baseline surveys
Ending AVR (modeled)	EPA COMMUTER Model 2.0
Average travel distance	SOC survey

Proposed Timing of Data Collection

- ACT! Database: Ongoing
- Employee baseline surveys: Ongoing; data to be compiled in FY 2026
- SOC survey: April-June 2025

Use of COMMUTER Model as an Analysis Tool

The Employer Outreach program element is the only TDM program element for which placement rates and VTR factors are not directly used to determine the number of new participants, vehicle

trips reduced, or VMT reduced. This is because sufficient employee survey data are not available to assess employees' post-program travel behavior. These missing evaluation elements are modeled using the EPA COMMUTER Model (v2.0). To determine impacts, employers' starting mode shares and commuter assistance program strategies are input into the COMMUTER Model (v2.0) and the model projects "after" mode split and average vehicle ridership, that is, with the program in place.

CONSISTENCY OF THE COMMUTER MODEL WITH MWCOC REGIONAL MODEL

The COMMUTER Model uses time and cost coefficients that are compatible with coefficients used by MWCOC in regional transportation modeling. In 2007, COG and the evaluation team adjusted the cost coefficients used in the model, to correct for the COMMUTER Model's tendency to overestimate the likely impacts of financial incentives on shifts to non-drive alone modes. During 2010-2012, MWCOC developed a new regional travel model used for regional transportation planning and forecasting. To ensure that the COMMUTER Model was consistent with the new regional model, MWCOC modeling staff reviewed the COMMUTER Model cost and time coefficients that had been used in the 2011 evaluation. They concluded that no further coefficient adjustments were needed for the 2014 or 2017 TDM analyses to be consistent with the new regional model.

MWCOC continues to use this regional model and to add updates as the model evolves. In 2020 and again in 2022, the research team reviewed regional model guidance documents prepared by MWCOC to determine if any regional model updates might indicate a needed change in the COMMUTER model coefficients to remain compatible with the regional approach. The review identified numerous model modifications, but none that would affect the validity of the current coefficients for the COMMUTER Model. Most of the changes were made to improve the efficiency and speed of the operation of the model, rather than the model results. And the changes that did alter the model results primarily adjusted assumptions related to bike and walk access to transit, particularly in suburban areas. As these changes were not cost related, the research team concluded that the coefficients used for the EO analysis in 2023 could be carried over to the 2026 evaluation.

REVIEW OF OTHER POSSIBLE MODELS FOR EMPLOYER OUTREACH ANALYSIS

In 2025, the research team examined several other models to determine if any other options would be as reliable and efficient as the COMMUTER model for the Employer Outreach analysis. This review found that none of the alternative models offered both the capability to analyze the wide range of TDM strategy combinations that were implemented by EO employers as well as the capability to analyze efficiently impacts for individual employers. The research team previously developed a technique to run the COMMUTER model for large numbers of individual employers in "batch" mode, allowing an independent impact analysis for each employer, in a highly efficient process. Without this capability, it would be cumbersome and more expensive to analyze the more than 2,000 employers in the EO analysis. Thus, the project team will use the COMMUTER Model for the FY 2024–FY 2026 EO calculation, with the revised coefficients referenced above.

ADJUST DEFAULT BASELINE MODE SPLITS

One required input for the COMMUTER Model analysis is the baseline "pre-commute program" mode split. If a worksite has conducted a survey, the actual mode split from that survey will be the baseline for that worksite, regardless of when the survey was conducted (consistent with previous analyses). Many employers in the ACT! Database have not conducted an employee survey, however, and a proxy or default baseline mode split must be defined for these employers.

Default baseline mode splits will be calculated following the method used in the 2023 analysis, as the average of mode splits of related worksites in the ACT! database that have conducted baseline

surveys. Worksites will be aggregated into six groups by the primary work type (office or non-office) and the transit service level (low, moderate, or high) in the area around the worksite. For each of the six combinations of these two variables, for example, non-office employers with high transit or office employers with moderate transit, an average mode split will be derived from the survey data of worksites that had conducted commuter surveys.

In evaluations prior to 2020, the default baseline mode splits were derived from all employee surveys conducted since 1997. To create default values that more closely represent current infrastructure and travel opportunities, the default values were recalculated in the 2023 evaluation, excluding surveys that were conducted prior to 2009 and adding data from approximately 200 additional baseline worksite surveys that had been conducted by local jurisdiction staff after 2005, but which had not yet been entered into the employer database. This expanded both the total number of employers on which the default values were based and increased the sample of surveys that reflected more recent local conditions, raising the confidence of the default calculations. Overall, the actual default values changed only slightly, however, suggesting pre-TDM baseline conditions are not dramatically different than those applied to past TDM evaluations. The 2026 evaluation will follow this protocol, updating the mode split database with any new baseline surveys.

Mass Marketing

PROGRAM DESCRIPTION

In 2003, Commuter Connections 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, television, social media, digital media, direct mail, transit advertising, and other media are used to create a new level of public awareness and to provide a call to action to entice commuters to switch to non-drive alone modes.

Four other marketing-related programs and events have been added to the evaluation of this program element since it was first implemented:¹²

- Bike-to-Work Day added for the FY 2005–FY 2008 evaluation
- 'Pool Rewards carpool incentive program added for the FY 2008–FY 2011 evaluation
- 'Pool Rewards vanpool incentive program added for the FY 2015–FY 202017 evaluation
- CommuterCash (formerly incenTrip) reward and trip tracking application added for the FY 2021–FY 2023 evaluation

The objectives of the Mass Marketing program element are to:

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

¹² The Car-Free Day event is being removed for this evaluation, as the program is being discontinued.

EVALUATION METHODOLOGY CHANGES SINCE FY 2021–FY 2023

The methodology for the incentive component (CommuterCash mobile application, Flextime Rewards incentive, and CarpoolNow mobile application) has been revised to use impact multipliers derived from the Commuter Connections Applicant Placement Rate Survey.

STATED GOALS

Commuter Connections has established the following regional goals for Mass Marketing for 2026:

- Encourage 14,500 commuters to switch modes
- Reduce 3,590 daily vehicle trips
- Reduce 65,820 daily vehicle miles of travel
- Reduce 0.0135 daily tons of NOx
- Reduce 0.0108 daily tons of VOC

NATURE OF EVALUATION

The Mass Marketing program element has numerous populations of interest:

1. All commuters in the Commuter Connections air quality non-attainment service area
2. Commuter Connections rideshare and GRH applicants who were influenced by the marketing campaign to request Commuter Connections services
3. Commuters who participate in regional special events (e.g., Bike-to-Work Day)
4. Commuters who participate in Commuter Connections incentive programs (‘Pool Rewards carpool/vanpool incentive program, Flextime Rewards incentive program, and/or CommuterCash (formerly incenTrip) rewards mobile application)
5. Commuters who register with the CarpoolNow dynamic ridematch mobile application

The Mass Marketing element presents two challenges not encountered in most of the other program elements. First, it is more difficult to assess the influence of a strategy, such as a marketing campaign, that is applied to the general commuting public, than it is to identify and track known participants in a registration-based program such as GRH. Second, when commuters who changed travel behavior can be identified, it is still necessary to identify what motivated their change. The critical issue for this element is identifying and attributing reported changes in attitudes and behavior to the mass marketing campaign, another program element, or to some other outside influence.

Type of Changes Addressed

The Mass Marketing evaluation method examines impacts from several components, which are assessed separately in five categories of changes.

1: “DIRECTLY INFLUENCED” CHANGES

These are mode shifts that are made when Mass Marketing (MM) ads directly motivate commuters to change mode with no intermediate contact with Commuter Connections. An example of this type of change would be a carpool formed when a commuter hears the ad and asks a co-worker to carpool. Direct influences can only be assessed through a regional survey of commuters that asks about recent mode changes and the reasons for the changes.

This influence of MM on the general commuting population will be assessed through questions in the State of Commute survey that determine the incidence of mode shifting in the region and the motivation for the shift. If a mode shift is attributed to a Mass Marketing campaign message, the

associated vehicle trip, VMT, and emissions reductions can be credited to the campaign. Note that this calculation needs to correct for double counting with commuters who also cite influence of other program elements on their travel change.

2: “REFERRED” CHANGES

These are mode shifts that occur when a commuter is influenced by an ad to contact Commuter Connections for assistance, such as when a commuter hears a radio ad for GRH and registers for the program. Under the evaluation method, any mode change the commuter makes in response to GRH advertising would be defined through the GRH assessment, but a portion of the influence for that change would be credited to MM, which provided the information about GRH. Two types of referred influence will be assessed:

- **GRH Referred Influence:** Ad influence on use of GRH will be assessed through the 2025 GRH survey. The survey will ask respondents if they recalled GRH advertising and if the advertising had influenced them to register for GRH. The analysis will estimate the share of total GRH impacts generated by commuters who joined GRH during the evaluation period. This portion of GRH impacts will be assigned to the MM program element as a referred influence and subtracted from the GRH impacts to avoid double counting.
- **Commuter Operations Center Referred Influence:** A similar approach will be used to estimate the portion of the Commuter Operations Center impacts related to MM actions. The 2023 Applicant Placement Rate survey asked registrants how they learned about Commuter Connections; the share who reported a Mass Marketing source will be applied to the total assisted commuters who were new to the Commuter Operations Center during the evaluation period. This credit will be assigned to MM and subtracted from the Operations Center total.

3: “SPECIAL EVENT” CHANGES

These are changes that occur following an event like Bike-to-Work Day. Special events are typically short-term (e.g., over the course of one day) but the influence of these events can be long-term. The purpose of special events such as these are to introduce commuters to a new travel option, with the goal that some will continue using the new mode after the event or benefit period ends. Impacts for events will be calculated using data from post-event participant surveys that identify changes in commuters’ travel during the event and ongoing use of the mode in the months after the event.

4: “INCENTIVE PROGRAM” CHANGES

These are generated from commuters’ participation in programs such as the ‘Pool Rewards and/or CommuterCash (formerly incenTrip) incentive programs. Incentive programs offer financial motivation to switch to a non-drive alone mode. Some incentives provide the benefit for a short-term, start-up period, such as ‘Pool Rewards, which offers incentives to new carpoolers for a three-month enrollment period. Others, such as ‘Pool Rewards for vanpools, provide an on-going monthly incentive. Flextime Rewards offers an incentive to registered commuters who travel to/from work outside the peak commuting period on days when traffic is disrupted by a roadway incident or closure. CommuterCash (formerly incenTrip) provides incentives for using and logging non-drive alone mode commute trips. As with special event programs, incentive programs can encourage both short-term and long-term impacts if commuters continue using the new mode after the benefit period ends.

Impacts for the carpool component of the ‘Pool Rewards incentive will be calculated using data from a post-enrollment participant survey that identifies changes in commuters’ travel during the program and ongoing use of the mode in the months after the incentive period. Impacts for the vanpool

component of 'Pool Rewards will be estimated using pre-vanpool mode information provided in program applications and trip information provided through vanpool logs.

Impacts for the CommuterCash (formerly incenTrip) incentives will be estimated using multiplier factors derived from the Applicant Placement Rate survey. Program-specific modules were included in the November 2023 Applicant Placement Rate survey to examine use of CommuterCash (formerly incenTrip) and commute mode changes of registered users. Trips made using CommuterCash (formerly incenTrip) can be for commute and/or non-commute purposes, thus, the Applicant Placement Rate survey module for this program examined frequency of program use for both trip purposes. The impact multiplier factors derived for CommuterCash (formerly incenTrip) will include only commute trip impacts.

5: "DYNAMIC RIDEMATCH" CHANGES

This component includes impacts from the CarpoolNow mobile application. In this application, registered users can request a ride (participate as a passenger) or a rider (participate as a driver) for a one-time carpool arrangement. Because each request is for a single trip, the impact of a commuter's participation could be limited. However, as with events and incentives, the influence of the service could be ongoing either by repeated use of the service or by encouraging commuters to seek more permanent carpool arrangements with commuters they meet through the service. The component also includes a driver financial incentive to encourage more commuters to offer rides.

The impacts for this service will be analyzed using data from the Applicant Placement Rate survey. In the CarpoolNow module, registered users were asked about frequency of use of the service for commuting and non-commuting, successful one-time carpool trips formation, and formation of ongoing carpools for commuting.

PERFORMANCE MEASURES

The following performance measures are recommended to evaluate the Mass Marketing program element:

Direct/Referred Impacts: Participation, Satisfaction, and Utilization Measures

- Percentage of regional commuters who are aware of ad campaign and messages
- Percentage of commuters with positive attitudes toward alt modes (e.g., willingness to try)
- Percentage of regional commuters aware of Commuter Connections programs/services
- Number of contacts to Commuter Connections (e.g., call volumes, web hits, registrants)
- Direct change placement rates (temporary and continued change)
- Share of regional commuters from underrepresented groups aware of ad campaign and messages
- Share of regional commuters from underrepresented groups with positive attitudes toward alt modes
- Share of regional commuters from underrepresented groups aware of Commuter Connections programs/services
- Number of contacts to Commuter Connections from underrepresented groups

Special Events: Participation, Satisfaction, and Utilization Measures

- Number of riders participating in Bike-to-Work Day
- Participants' frequency of bike commuting before and after the Bike-to-Work Day event
- Commuters' satisfaction with Bike-to-Work Day

- Number of riders from underrepresented groups participating in Bike-to-Work Day
- Participants' frequency of bike commuting before and after the Bike-to-Work Day event, segmented by demographic groups
- Commuters' satisfaction with Bike-to-Work Day, segmented by demographic groups

Incentive Programs: Participation, Satisfaction, and Utilization Measures

- Number of commuters participating in 'Pool Rewards
- Number of commuters from underrepresented groups participating in "Pool Rewards
- Participants' frequency of non-drive alone mode use before, during, and after 'Pool Rewards, segmented by demographic groups
- Number of commuters participating in Flextime Rewards
- Number of commuters from underrepresented groups participating in Flextime Rewards
- Participants' frequency of peak period travel before and during Flextime Rewards and share of trips with time shifts, mode shifts, and trip elimination (telework), segmented by demographic groups
- Number of commuters participating in CommuterCash (formerly incenTrip)
- Number of commuters from underrepresented groups participating in CommuterCash (formerly incenTrip)
- Participants' frequency of non-drive alone mode use before and during CommuterCash (formerly incenTrip) enrollment, segmented by demographic groups
- Share of CommuterCash (formerly incenTrip) trips made for commute vs non-commute
- Share of CommuterCash (formerly incenTrip) trips from underrepresented groups made for commute vs non-commute
- Commuters' satisfaction with incentive programs (e.g., 'Pool Rewards, Flextime Rewards, CommuterCash (formerly incenTrip)), segmented by demographic groups

Dynamic Ridematch Programs: Participation, Satisfaction, and Utilization Measures

- Number of commuters participating in CarpoolNow
- Number of commuters from underrepresented groups participating in CarpoolNow
- Participants' frequency of carpool use before and during CarpoolNow enrollment, segmented by demographic groups
- Share of new carpool trips made for commuting
- Share of new carpool trips from underrepresented groups made for commuting
- Commuters' satisfaction with incentive programs (e.g., CarpoolNow), segmented by demographic groups

Program Impact Measures (all components)

- Daily vehicle trips reduced
- Daily VMT reduced (in miles)
- Daily emissions reduced (in tons of pollutants)
- Mode shift placement rate from drive alone

DATA NEEDS AND SOURCES

Advertising Campaign

Data Need	Data Source
Regional commuters aware of ads / messages	SOC survey
Percentage of commuters who make non-drive alone mode changes after ads	SOC survey
Influence of ads on mode change	SOC survey
Contacts to CC info sources	SOC survey and COC tracking
MM placement rates (temporary and continued)	SOC survey and COC tracking
MM VTR factors	SOC survey, GRH survey, CC Applicant Placement Rate survey

Bike-to-Work Day (BTWD)

Data Need	Data Source
Number of BTWD participants	BTWD survey
Bike use before, during, and after event	BTWD survey
Average travel distance	BTWD survey

'Pool Rewards

Data Need	Data Source
Number of carpool/vanpool 'PR participants	'PR database
Carpool use before, during, and after enrollment	'PR database
Vanpool use before and during enrollment	'PR database
Average travel distance, carpool/vanpool	'PR database

Flextime Rewards (FR)

Data Need	Data Source
Number of FR participants	Flextime Rewards database
Peak period trips adjusted	CC Applicant Placement Rate survey
Average travel distance	CC Applicant Placement Rate survey

CommuterCash (formerly incenTrip)

Data Need	Data Source
Number of CommuterCash participants	CommuterCash database
Non-SOV modes for commuting before/after use	CC Applicant Placement Rate survey
Average travel distance	CC Applicant Placement Rate survey
CommuterCash share of commute trips	CC Applicant Placement Rate survey

CarpoolNow (CPN)

Data Need	Data Source
Number of CPN participants	CarpoolNow database
Carpool use before and since enrollment	CC Applicant Placement Rate survey
Average travel distance	CC Applicant Placement Rate survey
CPN share of commute trips	CC Applicant Placement Rate survey

Proposed Timing of Data Collection

- SOC survey: April-June 2025
- CC Applicant Placement Rate survey: November 2023 (next survey scheduled for November 2026)
- GRH Applicant survey: FY 2026
- Commuter Operations Center (COC) tracking: Ongoing
- Bike-to-Work Day (BTWD) event survey: FY 2026
- 'Pool Rewards program mode use: Ongoing
- Flextime Rewards service use: Ongoing
- CommuterCash (formerly incenTrip) service use: Ongoing
- CarpoolNow service use: Ongoing

Commuter Program Operations

PROGRAM DESCRIPTION

Since 1974, MWCOC has offered basic commute information and assistance, such as the regional ridematching database, to commuters living and/or working in the Washington metropolitan region. The function of Commuter Program Operations is to increase commuters' awareness of non-drive alone modes through regional and local marketing and outreach programs and to encourage and assist commuters to form ridesharing arrangements. The goals of this TDM program element are to encourage commuters who drive alone to shift to non-drive alone modes and to assist commuters who use non-drive alone modes to continue to do so (such as by offering ridematching and transit assistance when carpools break up or commuters' travel patterns change).

Commuter Operations Center (COC)

Commuter Connections program services provided by the Commuter Operations Center (COC) include carpool and vanpool matchlists, transit route and schedule information, information on park and ride lot locations and HOV lanes, telework information, commute program assistance for employers, GRH, and bicycling route and walking information. Commuters obtain services and information primarily through the Commuter Connections website which features Google translate for non-English speaking individuals. Commuters can also call a toll-free telephone number with English or Spanish options or contact a local partner assistance program for personal assistance from a commuter services representative.

Integrated Rideshare-Software Upgrades

When it began, Integrated Rideshare provided improvements to the quality and delivery of non-drive alone mode information. Commuter Connections added transit, park and ride, telecenter/co-working center, and bicycling information to carpool/vanpool ridematch lists to inform commuters of the range of travel options that were available. These additional services have been available on a self-service basis through the online TDM information system since 2008.

EVALUATION METHODOLOGY CHANGES SINCE FY 2021–FY 2023

No changes since FY 2021–FY 2023.

STATED GOALS

Commuter Connections set the following goals for Commuter Program Operations for 2026:

- Register/assist 54,600 commuters
- Reduce 19,670 daily vehicle trips
- Reduce 313,500 daily vehicle miles of travel
- Reduce 0.0706 daily tons of NO_x
- Reduce 0.0633 daily tons of VOC

NATURE OF EVALUATION

The primary components of the **Commuter Operations Center** are ridematching and mode information assistance provided to commuters to help them plan their commutes. Since some Commuter Connections ridematching and information services were available in 1997 when the first new TDM program elements were developed, this evaluation component seeks to credit the COC with any increases in effectiveness due to program enhancements not covered by other TDM program elements. Thus, the basic approach is to determine the total impacts for Commuter Operations Center services as if they stood alone, then subtract the portion of impacts that overlaps with GRH, Mass Marketing, and any other Commuter Connections TDM program element. The balance is credited to the COC.

The **Integrated Rideshare Software Upgrade** component is directed to a subset of Commuter Connections clients; applicants who remember receiving transit and/or park and ride, telecenter/co-working locations, and bicycling information along with other ridematching information from the Commuter Operations Center. This program is aimed at improving the quality and availability of commute information and encouraging commuters to try transit, bicycling, and telework, even if they did not have these options in mind when they contacted Commuter Connections.

Integration of transit and park and ride, telecenter/co-working locations, and bicycling information into the TDM system will be evaluated through the Applicant Placement Rate survey, described in **Section 6**. From this survey, a separate placement rate can be derived for those who shifted to a non-drive alone mode after receiving transit or park and ride, telework, and bicycling information.

PERFORMANCE MEASURES

The following performance measures are recommended to evaluate Commuter Program Operations:

COC (Basic): Participation, Satisfaction, and Utilization Measures

- Number of commuters who use the online information system
- Distribution of services accessed (e.g., ridematch, transit, bicycle, telework)
- Online system placement rate
- Applicant satisfaction with online service

Integrated Rideshare-Software Upgrades Project: Participation, Satisfaction, and Utilization Measures

- Number of applicants who remember receiving or accessing transit, P&R, telework, or bicycle information through the online system or via mail from Commuter Connections
- Number of applicants who use transit, P&R, telework, or bicycle information that was received but not specifically requested
- Software upgrade placement rate (percentage of applicants who use the software upgrade information to shift to a non-drive alone mode)

Program Impact Measures (basic COC and Software Upgrades)

- Daily vehicle trips reduced
- Daily VMT reduced (in miles)
- Daily emissions reduced (in tons of pollutants)
- Mode shift placement rate from drive alone

DATA NEEDS AND SOURCES

The following data items will be used to calculate program impacts for Commuter Program Operations, including the improved transit information from the software upgrades. Each data source is described in **Section 6**.

Commuter Operations Center (Basic)

Data Need	Data Source
Commuter Connections (CC) online system users	CC online TDM system database
COC placement rate	CC Applicant Placement Rate survey
COC VTR Factor and average travel distance	CC Applicant Placement Rate survey
COC retained placement rate	CC Retention Rate survey
COC retained VTR Factor and average travel distance	CC Retention Rate survey
Vehicle trips/VMT assigned to other program elements	Results of other element evaluations

Integrated Rideshare – Software Upgrades (IR-SU)

Data Need	Data Source
Database applicants	CC online TDM system database
Applicants who remember receiving transit, P&R, bicycle information	CC Applicant Placement Rate survey
IR-SU placement rate	CC Applicant Placement Rate survey
IR-SU VTR Factor and average travel distance	CC Applicant Placement Rate survey

Proposed Timing of Data Collection

- Commuter Connections database: Ongoing
- CC Applicant Placement Rate survey: November 2023 (next survey scheduled for November 2026)
- CC Retention Rate survey: FY 2026

Double counting is avoided by subtracting the credit assigned to the Integrated Rideshare-Software Upgrades from the impacts calculated for Commuter Program Operations (Basic).

SECTION 6 DESCRIPTIONS OF DATA SOURCES

Much of the data needed to perform the evaluation outlined in this framework is available from two basic types of sources. Program participation data will be obtained from ongoing monitoring activities of Commuter Connections and its partners, including application and registration records for various programs. Travel impact and attitudinal data will be obtained through surveys of applicants, service users, or the public-at-large. All the surveys proposed for FY 2024–FY 2026 have been used in past years. Previously administered surveys will be reviewed and modified as needed for the 2026 evaluation. The data sources and surveys can be divided into two groups: ongoing monitoring and resident and user surveys.

Ongoing Monitoring:

- Commuter Connections GRH registrant database and archived GRH database (GRH)
- ACT! Employer Contact database (Employer Outreach and Telework)
- Commuter Operations Center activity tracking (Mass Marketing)
- Bike-to-Work Day participant records (Mass Marketing)
- 'Pool Rewards registrant database (Mass Marketing)
- Flextime Reward registrant database (Mass Marketing)
- CommuterCash (formerly incenTrip) registrant database (Mass Marketing)
- CarpoolNow registrant database (Mass Marketing)
- Commuter Connections online information user database (COC, IR SU)

Resident and User Surveys:

- Maryland Telework assisted employer follow-up survey
- State of the Commute survey
- GRH registrant survey
- Employee commute surveys (voluntarily administered by employers)
- Commuter Connections Applicant Placement Rate survey
- Bike-to-Work Day participant survey
- Retention rate survey
- 'Pool Rewards registrant survey

Each data source, survey, and analysis tool are described below, noting the TDM program element or elements 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: TDM program element tracking (monitors use of and user satisfaction with the elements) and impact analysis (refers to the calculation of transportation, air quality, energy, and cost impacts of the element).

Table 1: Data Collection Activities, Applicable TDM Program Elements and Uses of the Data

Evaluation Activity/Tool	Applicable Element	Use of Data
Ongoing Monitoring		
GRH registrant / archived database	Guaranteed Ride Home	TDM element tracking, impact analysis
ACT! Employer Outreach & Telework Contact Database	Employer Outreach & Telework	TDM element tracking, impact analysis
COC website and call volume tracking	Mass Marketing (Secondary: COC, GRH)	TDM element tracking, impact analysis
Documentation of media/marketing activities	Mass Marketing	Impact analysis
Bike-to-Work Day participant records	Mass Marketing (BTW component)	TDM element tracking, impact analysis
'Pool Rewards participant records	Mass Marketing ('PR component)	TDM element tracking, impact analysis
Flextime Rewards participant records	Mass Marketing (FR component)	TDM element tracking, impact analysis
incenTrip participants records	Mass Marketing (IT component)	TDM element tracking, impact analysis
CarpoolNow participant records	Mass Marketing (CPN component)	TDM element tracking, impact analysis
CC online TDM information system user database	COC, Integrated Rideshare-Software Upgrades (Secondary: Mass Marketing)	TDM element tracking, impact analysis
Resident and User Surveys		
Maryland Telework assisted employer survey	Telework	TDM element tracking, impact analysis
State of the Commute survey	Telework, Mass Marketing	Commute trends, impact analysis
GRH registrant survey	Guaranteed Ride Home	Impact analysis
Employee commute surveys (employer-administered)	Employer Outreach	Impact analysis
CC Applicant Placement Rate survey	COC, Integrated Rideshare-Software Upgrades and Mass Marketing	Program satisfaction, impact analysis
Retention Rate survey	Guaranteed Ride Home and COC	Impact analysis
Bike-to-Work participant survey	Mass Marketing (BTW component)	Program satisfaction, impact analysis
'Pool Rewards participant survey	Mass Marketing ('Pool Rewards component)	Impact analysis

Ongoing Monitoring

Program activity and utilization tracking is an ongoing function already performed by Commuter Connections 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), tracked for each program element. These tracking data become an important input to the program evaluation.

The information gathered in the ongoing tracking process is summarized in a quarterly Commuter Connections “report card” that shows participation and utilization data and applies factors generated from the most recent Applicant Placement Rate survey to measure travel, air quality, energy, and consumer savings benefits for the quarter. This tool is used primarily by COG/TPB staff and staff of regional Commuter Connections partner programs as a quarterly check of progress in various activity and program areas. Annual Commuter Connections evaluation results also are reported to other policy-makers and to program funding agencies. Additional details on how Commuter Connections evaluation results will be reported are presented in **Section 8**.

Commuter Connections will be establishing a new monitoring tool during the FY 2023–FY 2026 analysis period: an interactive program monitoring dashboard which will provide updated program participation and utilization data.

GRH REGISTRANT / ARCHIVED DATABASE

Ongoing tracking of registered and one-time exception GRH users. Database includes contact information, mode at time of registration, and GRH uses. *(Used for GRH program element.)*

ACT! EMPLOYER CLIENT DATABASE

Tracks the number of employers participating in Employer Outreach Program and the commuter assistance services they offer in worksite programs, including Telework. Sales representatives who assist employers to begin and maintain commuter assistance programs update the database when new employers join the program and when employers already participating in EO change their commuter assistance services. The database includes information on employer characteristics (e.g., number of employees, location, transit accessibility) and on the strategies that the employer offers (e.g., transit subsidies, GRH, preferential parking, teleworking). *(Used for Employer Outreach and Telework program elements)*

DOCUMENTATION OF COMMUTER CONNECTIONS MEDIA / MARKETING ACTIVITIES

Ongoing tracking of the dates and types of media activities (radio/tv media buys, direct mail, Internet and social media outreach, etc.) and the number and time distribution of information requests made to Commuter Connections via telephone, Internet, social media, and other sources.

Maintained/compiled by Commuter Connections staff, staff of GRH online system vendor, and COG marketing consultant. *(Used for Mass Marketing program element; secondary use for GRH program element and Commuter Program Operations, including Integrated Rideshare-Software Upgrades Project)*

BIKE-TO-WORK DAY REGISTRATION RECORDS

Provides contact information on commuters who register to participate in Bike-to-Work Day. *(Used for Mass Marketing program element)*

‘POOL REWARDS REGISTRANT RECORDS

Provides information on commuters who register to participate in ‘Pool Rewards carpool and vanpool incentive program. Data include contact information, mode used for commuting prior to registration, and carpool and vanpool days recorded during the enrollment period. Data on actual vanpool use (e.g., number of riders) and travel patterns (e.g., vanpool miles traveled) are used directly to calculate vanpool impacts. Data from the carpool program are used in combination with data from a follow-up survey of program participants to estimate impacts of the carpool component. *(Used for Mass Marketing program element)*

FLEXTIME REWARDS REGISTRANT RECORDS

Provides information on commuters who register to participate in Flextime Rewards incentive program. Data include contact information, typical commuting time (departure/arrival), mode used for commuting prior to registration, and trips shifted/eliminated by day/time. *(Used for Mass Marketing program element)*

COMMUTERCASH (FORMERLY INCENTRIP) REGISTRANT RECORDS

Provides information on commuters who register for CommuterCash (formerly incenTrip) rewards program. Data include contact information, trips made by day/time, mode used for each trip, and travel distance. *(Used for Mass Marketing program element)*

CARPOOLNOW REGISTRANT RECORDS

Provides information on commuters who register to participate in CarpoolNow dynamic ridematch program. Data include contact information, trips requested/offered, and trips accepted by day/time, travel distance, and driver incentives provided. *(Used for Mass Marketing program element)*

COMMUTER CONNECTIONS ONLINE TDM INFORMATION SYSTEM DATABASE

Ongoing tracking of commuters who establish accounts for the online information system to receive ridematching, GRH, incentive programs, or other information from Commuter Connections). Includes contact information. *(Used for Commuter Operations Center, including Integrated Rideshare-Software Upgrades Project; secondary use for GRH and Mass Marketing program elements)*

Resident and User Surveys

Several surveys are conducted by Commuter Connections to follow-up with program applicants and assess user satisfaction. These surveys also provide program impact data. Some of the surveys, such as the online TDM system Applicant Placement Rate survey and GRH survey, also provide information used by COG/TPB staff to finetune program operations and policies.

MARYLAND TELEWORK ASSISTED EMPLOYER SURVEY

Sent to employers in Maryland that received telework assistance from Commuter Connections to determine if and how they used the information they received. Specifically, the survey asks if the employer has started or expanded a telework program since receiving the information and the approximate number of employees who were teleworking before the employer received assistance and after assistance. This information is used to estimate the number of teleworkers who were indirectly influenced by Commuter Connections Telework Assistance. *(Used for Telework program element)*

STATE OF THE COMMUTE SURVEY

The SOC survey, a random sample survey of employed adults in the Washington metro region, paints a picture of commuting in the region. It analyzes trends in commuting behavior, such as commute mode and use of telework, and examines awareness of and attitudes about transportation services that are available to commuters in the region. To this end, it will be compared to data from past SOC surveys (2010, 2013, 2016, 2019, and 2022). Additionally, as a survey of the general commuting population, it provides an opportunity to compare behavior and attitudes of commuters who use and those who do not use regional and local commuter services, establishing a context for the interpretation of program evaluation data.

SOC survey data also are used to assess the impacts of TDM program elements that have a possible influence on the population-at-large. Specifically, the survey generates information for the Mass Marketing and Telework program elements, both of which have broad application and for which it is not possible to identify all users from any Commuter Connections database. The survey is also used to assess awareness of the regional GRH program.

By querying respondents about their attitudes about non-drive alone modes and reasons for choosing or not choosing non-drive alone modes, the survey also suggests how commuter service programs and marketing efforts influence commuting behavior in the region. In this way, it helps to establish the influence of the Mass Marketing advertising messages on mode switching and use of Commuter Connections services, provides opinion research data that could contribute to assessment of broad social and personal benefits of commute programs, and offers an opportunity to test concepts for new services.

The SOC survey is a triennial survey and will be conducted in April-June 2025. The survey will be conducted via Internet, with a random sample of households in each of the 11 MWCOC jurisdictions receiving a postcard invitation specifying the survey website link. The card will provide two unique passwords, allowing up to two adult household members to participate in the survey. *(Used for Telework and Mass Marketing program elements)*

GRH APPLICANT SURVEY

Commuters who registered with the GRH program or used a one-time exception trip will be surveyed to establish if and how the availability and use of GRH influenced their decision to use a non-drive alone mode. The also includes questions to gauge users' satisfaction with GRH services. Some data collected in the survey, such as current and previous mode, travel distance, and access mode, will be used to develop the GRH placement rate and VTR factor.

As in the past four GRH surveys, the 2025 GRH survey will be conducted by a combination of Internet and telephone methods. Current and past registrants who provided an email address will be invited to take a web-based survey. Telephone interviews will be conducted with GRH respondents who did not provide an email address. The data from these methods will be combined for analysis of the GRH survey and used to calculate impacts for the GRH program element.

EMPLOYEE COMMUTE SURVEYS

Some employers conduct baseline surveys of employees' commute patterns before the worksite begins to offer commuter assistance programs. Commuter Connections staff makes the results of these surveys available to the research team through an employer survey database. *(Used for Employer Outreach program element)*

COMMUTER CONNECTIONS ONLINE TDM SYSTEM USER APPLICANT PLACEMENT RATE SURVEY

Since 1997, Commuter Connections has conducted Applicant Placement Rate surveys to assess effectiveness of the Commuter Operations Center and users' perceptions of and satisfaction with services provided. Data from the Applicant Placement Rate surveys are used primarily to derive placement rates and VTR factors for the Commuter Operations Center, Integrated Rideshare Software Upgrades, and the Mass Marketing program element (referred impacts and incentive programs).

A new component of the November 2020 survey was to collect data on use of the Flextime Rewards, CommuterCash (formerly incenTrip), and CarpoolNow components of Mass Marketing. The survey included follow-up questions about use of and commute travel changes resulting from these services. These data will be used to estimate placement rates and VTR factors for the incentive programs as well as facilitate determination of overlap among these and other Commuter Connections TDM program elements (information needed to allocate impact credits to program elements).

The Applicant Placement Rate survey conducted in November 2023 will be used in the FY 2024–FY 2026 evaluation period. 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. *(Used for Commuter Program Operations (Basic), and Software Upgrades; secondary use for Mass Marketing and GRH program elements)*

RETENTION RATE SURVEY

In Commuter Connections evaluations prior to 2017, mode shifts motivated by TDM program elements during an evaluation period were not carried over to the next evaluation cycle. But numerous surveys conducted for past TDM program analyses suggested that commuters who made mode shifts continued using the new modes for more than three years, so some additional impacts could be retained from one three-year evaluation cycle to the next. To address this opportunity, in 2016, Commuter Connections conducted a new "Retention Rate" survey to estimate the share of past service users who continued to use non-drive alone modes during the current cycle.

The survey interviewed Commuter Connections online system users and GRH users who last participated in these programs prior to the start of the FY 2018–FY 2020 evaluation period. Users were asked about their current modes, how long they had used the modes, and what Commuter Connections services they received. Commuters who were still using non-drive alone modes were asked if and how Commuter Connections services influenced them to continue to use non-drive alone modes. These survey data were used to develop "retained" placement rates and other factors for GRH and for the Commuter Operations Center and the 2017 TDM analysis calculated "retained" impact credits for each of these program elements.

Commuter Connections conducted a second Retention Rate survey in February 2021, following the same method as for the 2017 survey. Results from this survey will be used to update the multiplier factors for GRH and for the Commuter Operations Center for the 2023 analysis. **Section 6** provides additional details on the Retention Rate survey. *(Used for Commuter Operations Center (Basic) and for GRH program element)*

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, as well as commute distance and travel on non-bike days. The survey also collects data on participant satisfaction with the event and shares the data with other organizations that sponsor and promote the event. *(Used for Mass Marketing program element)*

‘POOL REWARDS PARTICIPANT SURVEY

Registered participants in the ‘Pool Rewards carpool incentive program are surveyed after they complete their three-month enrollment period. Carpoolers participating in ‘Pool Rewards log their carpool trips during the enrollment period, thus the focus on the survey is to determine the share of participants who continue to carpool after the incentive ends. The survey also collects data on participant satisfaction with the program. *(Used for Mass Marketing program element)*

Analysis Tools

The COMMUTER model uses time and cost coefficients that are compatible with coefficients used by MWCOG in regional transportation modeling. In 2007, MWCOG and the evaluation team adjusted the cost coefficients used in the model to correct the COMMUTER model’s tendency to overestimate the likely impacts of financial incentives on shifts to non-drive alone modes. During 2010-2012, MWCOG developed a new travel model for regional transportation planning and forecasting. To ensure consistency with the new regional model, MWCOG/TPB modeling staff reviewed the COMMUTER model’s cost and time coefficients and concluded that no further coefficient adjustments were needed for the 2014 or 2017 TDM analyses to be consistent with the new regional model.

MWCOG continues to update the regional model, and the research team reviewed regional model guidance documents in 2020 to determine if any updates necessitated a change in the COMMUTER model coefficients to remain compatible with the regional approach. The review identified changes to enhance the efficiency and speed of model operation, but no modifications that would affect the validity of the current cost COMMUTER Model coefficients. Thus, the research team concluded that no additional COMMUTER model adjustments were needed for the 2020 evaluation.

During the previous two triennial reviews, the research team examined several other models to determine if any other options would be as reliable and efficient as the COMMUTER model for the Employer Outreach analysis. These reviews found that none of the alternative models offered both the capability to analyze the wide range of TDM strategy combinations that were implemented by EO employers as well as the capability to analyze efficiently impacts for individual employers. Thus, the project team used the COMMUTER Model for the FY 2018–FY 2020 and FY 2021–FY 2023 EO calculations. The project team undertook another model review at the outset of the FY 2024–FY 2026 triennial evaluation framework development to determine whether any other models have surpassed the COMMUTER model in utility and efficiency—again, the project team does not recommend moving away from the COMMUTER model because it has been extensively calibrated and there are no better options. Calibrating existing models of mode choice against surveys is the best that can be done for modeling these types of estimates, and the EO evaluation is already doing this well.

SECTION 7 BASIC METHOD FOR CALCULATING PROGRAM IMPACTS

This section presents the methodology for calculating and quantifying the travel, emissions, energy, and commuter cost impacts of the TDM program elements. Following are the basic calculation steps that apply a series of multiplier factors to the participation count for the program element. This method is consistent across program elements, with two exceptions. Employer Outreach uses a modeled method applied to known commute services offered at worksites. And Mass Marketing uses information from the State of the Commute and COC activity tracking to assess mode change due to Mass Marketing advertising campaign activities. Specific examples of the evaluation calculations and unique methodological elements for each TDM program element are presented in Appendices D through J:

- **Appendix D:** Maryland Telework Assistance
- **Appendix E:** Guaranteed Ride Home
- **Appendix F:** Employer Outreach
- **Appendix G:** Mass Marketing
- **Appendix H:** Commuter Program Operations
- **Appendix I:** Integrated Rideshare (Software Upgrades) Impacts
- **Appendix J:** Societal Benefits Generated by TDM Program Impacts

Documenting Program Participation and Utilization

The evaluation of program impacts requires first an accurate documentation of the participation of employers and commuters in each TDM program element. The calculation methodology begins with consistent and continuous tracking of the number of participants or users of each element:

- **Employers participating in telework activities:** Participation in Commuter Connections' Maryland telework program is tracked through telework contact records maintained by Commuter Connections and in the regional ACT! database. Telework placement rate (proportion of employees at the worksites who become teleworkers) and VTR factor will be developed from data in the Maryland telework EO follow-up survey.
- **GRH registrants and one-time exception users:** A GRH placement rate and VTR factor will be developed from the 2025 GRH survey for registrants who participated in GRH during the evaluation period. This is tracked separately from Commuter Connections online system applicants. Placement rates and VTR factors will be derived for commuters who participated in GRH and whose registration expired prior to the start of the evaluation period through the FY 2026 Retention Rate survey.
- **Employers participating in Employer Outreach:** Commuter Connections tracks details about the number of employees, geographic location, transit access, and commute assistance services offered at the worksite for participating employers.
- **Commuters participating in Bike-to-Work Day and other one-time special events/programs:** Commuter Connections tracks the total number of commuters who register to participate in the event and the number of actual participants, if different from the registration count.
- **Commuters participating in 'Pool Rewards carpools and vanpools:** Commuter Connections tracks counts of participants, starting mode, pool occupants, and total carpool and vanpool days during the incentive period.

- **Commuters participating in Flextime Rewards:** Commuter Connections tracks counts of participants and the number and locations of trips shifted/eliminated on roadway incident days.
- **Commuters participating in CommuterCash (formerly incenTrip):** Commuter Connections tracks counts of participants and trips taken by location, mode, and by day/time of day.
- **Commuters participating in CarpoolNow:** Commuter Connections tracks counts of participants and rides/riders requested and accepted by location and day/time of day.
- **Commuters who request or access Commuter Connections assistance through online TDM information system:** Commuter Connections tracks the number of participants, dates of assistance/requests, and type of information requested (e.g., ridematching, transit information, telework assistance, bicycle information). Using the results of the online TDM system user placement survey and other surveys conducted under this project, a separate placement rate can be derived for those who shifted to a non-drive alone mode after receiving transit or park and ride, telework, and bicycling information; and separate placement rates can be developed for the Commuter Operations Center and for the Software Upgrade components. Commuter Connections also retains information on commuters who received services from the online system prior to the evaluation period—placement rates and VTR factors will be derived for these commuters through the FY 2026 Retention Rate survey.

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

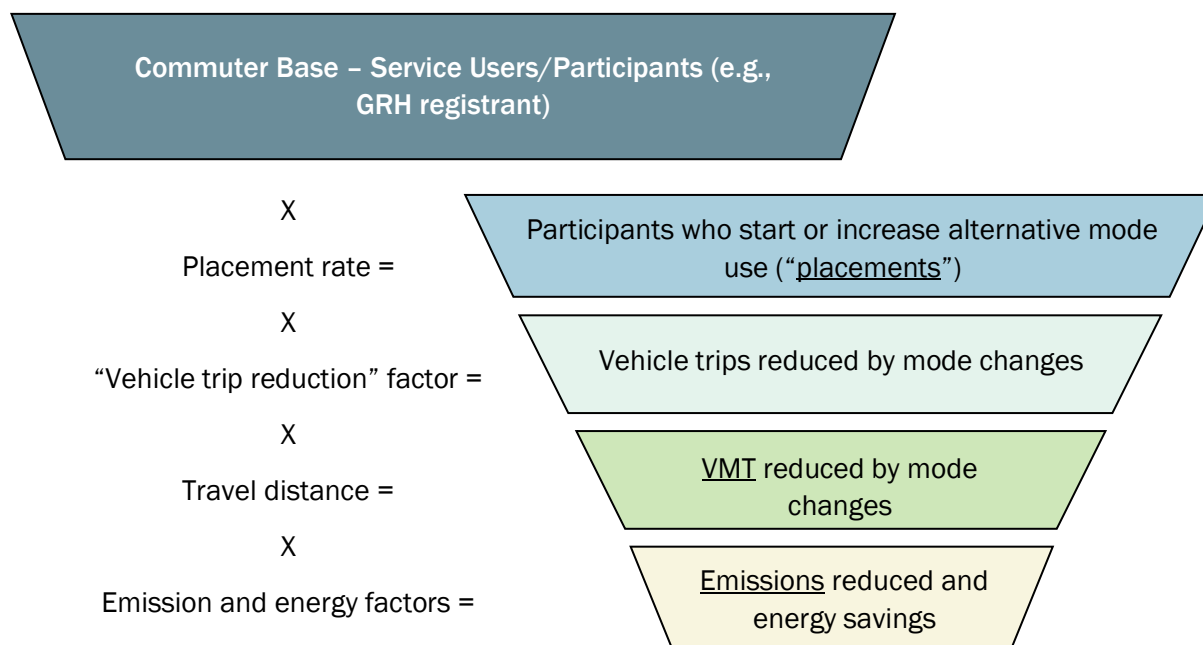
Information on participation and utilization will be included in the quarterly and annual program summaries. The intent is for Commuter Connections and its partners to input participation results, credited to each program element, into a form that allows for the calculation of impacts. This is accomplished with a simple spreadsheet that includes the factors discussed below. Additionally, Commuter Connections will be establishing a new monitoring tool during the FY 2023–FY 2026 analysis period: an interactive program monitoring dashboard which will provide updated program participation and utilization data.

Calculating Program Impacts

Section 4 of this evaluation framework describes performance measures in several categories. The final category defines travel, emissions, and energy impacts that would be generated by travel behavior changes made by TDM service users. The Commuter Connections TDM evaluation framework utilizes a basic method that measures the impact for individual TDM program elements, then combines the individual impacts (with discounts to account for overlap between services) into a program total. **Figure 2** illustrates the method as applied to a single program element. The calculation for a specific service begins with a base service user or participant count for the service. Several multiplier factors derived from a survey of service users are then applied to the participant count, in sequential calculations to estimate impacts from travel behavior change.

This method is applicable for any TDM program element for which participation can be tracked and multiplier factors can be developed. Each program element will have a unique set of factors, depending on the characteristics of the users and the service, but the basic calculation method is the same for all services. Tailored surveys have been developed for each of these services to produce unique placement rates and VTR factors for each element.

Figure 2: Impact Calculation Multiplier Steps



Nine basic steps, described below, are used to calculate program impacts. These steps are summarized in **Figure 3**[Error! Reference source not found.](#), and a hypothetical application of the steps is presented in **Figure 4**.

STEP 1: COMMUTER POPULATION BASE

The first step establishes the population base, or population of interest, relevant to the specific program element. This is the population that potentially could have been influenced by the element. Depending on the element being evaluated, this could be all commuters, GRH applicants, teleworkers, or some other population. The population bases for GRH and Commuter Program Operations will include both current registrants/users and past participants who continue to use non-drive alone modes, as identified by the Retention Rate survey. In the example shown in **Figure 4**, the population base is 8,000 commuters.

STEP 2: PLACEMENT RATE

Step 2 derives the placement rate for the population base exposed to the TDM program element. The placement rate is equal to the percentage of commuters in the population base who shift to a non-drive alone mode (carpool, vanpool, transit, walk, bike, telework) after receiving assistance under the element. Placement rates are derived from user survey data.

Two placement rates are derived for each program element to account for the length of time the commuter uses the non-drive alone mode after shifting: the continued rate is based on continuing to use the new non-drive alone mode through the evaluation period and the temporary rate is based on trying the new non-drive alone mode but shifting back to the original mode within the evaluation period. For simplicity, **Figure 4** shows only one placement rate: 20 percent. This means that 20 percent of the commuters in the population base made a change to a non-drive alone mode because of the element.

STEP 3: NUMBER OF NEW PLACEMENTS

Step 3 estimates the number of new commuter placements in non-drive alone modes. This is the actual number of commuters who are likely to have made the shift to non-drive alone modes because of the element. 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 the example in **Figure 4**, the calculation of placements is as shown below:

$$\begin{aligned}\text{Placements} &= 8,000 \text{ commuters (population base)} \times 20\% \text{ (placement rate)} \\ &= 1,600 \text{ placements}\end{aligned}$$

STEP 4: VTR FACTOR

The vehicle trip reduction (VTR) factor is next derived based on the same survey data used to calculate placement rate. The VTR is equal to the average daily vehicle trips reduced per placement. As described in **Section 4**, not all types of commuter placements reduce the same number of trips. Three types of commute shifts are captured in the VTR factor:

1. Drive alone applicants shifting to non-drive alone modes
2. Non-drive alone mode users shifting to different non-drive alone modes (e.g., carpool to bus or bus to vanpool)
3. Non-drive alone mode users increasing the number of days they use non-drive alone modes

The number of trips reduced also depends on the frequency with which they use the non-drive alone mode, compared to the number of days they used it before. The VTR factor combines the varied trip reduction results of all commuter placements to develop an average reduction per placement. A numeric example of how VTR is derived is provided in **Appendix A**. VTR factors may vary by program element. As shown in **Figure 4**, the VTR factor for the element in the hypothetical example is 0.7. This means that for each placement, this program element reduces 0.7 vehicle trips per day on average.

STEP 5: DAILY VEHICLE TRIPS REDUCED

The number of daily vehicle trips reduced for the program element is then measured by multiplying the number of commuter placements from Step 3 by the VTR factor from Step 4. The calculation of vehicle trips reduced for the example shown in **Figure 4** would be as follows:

$$\begin{aligned}\text{Vehicle trips reduced} &= 1,600 \text{ placements} \times 0.7 \text{ trips reduced per placement} \\ &= 1,120 \text{ daily vehicle trips reduced}\end{aligned}$$

STEP 6: DAILY VMT REDUCED

The total daily VMT reduced is computed by multiplying the number of daily vehicle trips reduced (Step 5) by the average commute distance for the population of interest. The average commute distance for the population is obtained from the same survey data used to derive the placement rate and VTR factor. The example in **Figure 4** 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:

$$\begin{aligned}\text{VMT reduced} &= 1,120 \text{ vehicle trips reduced} \times 25 \text{ miles per trip} \\ &= 28,000 \text{ daily VMT reduced}\end{aligned}$$

STEP 7: ADJUSTED VEHICLE TRIPS AND VMT (FOR SOV ACCESS)

Some commuters who use non-drive alone modes for the bulk of their commute drive single occupancy vehicles (SOV) to access their bus, train, vanpool, or carpool at a transit stop or meeting point. These trips are called “SOV access” trips, which each create a “cold start” and “hot soak” of their vehicle (see Step 8 for more details) and expend SOV VMT.

The SOV access trips must be subtracted from the vehicle trip reduction (otherwise attributed to the bulk of the commute being made using the non-drive alone mode) to assess the air quality impact of the cold starts and hot soaks. Emission reduction, as explained in Step 8, is computed by multiplying vehicle trips reduced and VMT reduced by emission factors. The length of the SOV access trips must be subtracted from the VMT reduced to obtain an accurate VMT reduction count. It is these “adjusted” vehicle trips reduced and VMT reduced, rather than the initial totals, that are used to calculate emissions reduced.

In the **Figure 4** example, it is assumed that 60 percent of the commuter placements drive alone to the rideshare or transit meeting point and that the average distance to this point is five miles. Using these figures, the “adjusted” vehicle trips reduced and VMT reduced are shown below:

$$\begin{aligned}\text{Adjusted vehicle trips reduced} &= 1,120 \text{ trips} - (1,120 \times 0.6 \text{ with SOV access}) \\ &= 1,120 \text{ trips} - 672 \text{ trips} \\ &= 448 \text{ vehicle trips reduced (for emissions calculation)}\end{aligned}$$

$$\begin{aligned}\text{Adjusted VMT reduced} &= 28,000 \text{ VMT} - (1,120 \text{ trips} \times 0.6 \text{ SOV access} \times 5 \text{ miles}) \\ &= 28,000 - 3,360 \\ &= 24,640 \text{ VMT reduced (for emissions calculation)}\end{aligned}$$

STEP 8: DAILY EMISSIONS REDUCED

Emissions reduced are estimated by applying two regional emission factors: a “trip end emissions” factor, applied to the number of vehicle trips (or “trip ends”) reduced, and a “running emissions” factor, applied to the VMT reduced, to determine the pollutants (in this case NO_x and VOC) reduced as result of the program. The trip end emission factor accounts for the emissions created from a “cold start” when a vehicle is first started and a “hot soak” 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. The emission factors¹³ used in the 2023 TDM analysis were:

<u>Emission Factors</u>	<u>NO_x</u>	<u>VOC</u>	<u>CO₂</u>
Start/Soak (<i>gm / one-way vehicle trip</i>)	0.9596	2.1585	208.68
Running (<i>gm / mile</i>)	0.1501	0.0575	348.43

¹³ The emission factors presented here are derived by MWCOG staff from the EPA’s MOVES emission model for the Washington metropolitan region. If the model parameters or inputs change, the emission factors also could change.

To compute total daily 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 daily 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 the sample emission factors in **Figure 4**, the total NOx reduced for our example is:

$$\begin{aligned}
 \text{NOx} &= 448 \text{ trips} \times 1.0309 \text{ g/trip} = 462 \text{ gr} \\
 &= 24,640 \text{ VMT} \times 0.1498 \text{ gr/VMT} = 3,691 \text{ gr} \\
 &= (462 \text{ gm} + 3,691 \text{ gr}) / 907,185 \text{ gr/ton} \\
 &= \mathbf{0.0046 \text{ daily tons NOx reduced}}
 \end{aligned}$$

The emission reductions for the other pollutants (VOC and CO2) are calculated similarly, using emission factors specific to each pollutant. However, emissions for CO2 are reported as annual reductions, rather than daily reductions. This additional calculation is made by multiplying daily impacts by 250 working days per year.

STEP 9: ENERGY AND COMMUTER COST SAVINGS

While travel and emission impacts are the primary focus of the TDM impact analysis, energy and consumer benefits also are real and tangible benefits. For this analysis, energy and commuter cost savings factors are applied to the VMT reduced.

- **Energy savings** are based on an average fuel consumption factor of 23.2 miles per gallon (as of the 2023 analysis) for the Washington metropolitan area fleet of light duty vehicles (data derived from TRIMMS™ model).
- **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 developed a composite national average cost as 23.0 cents per mile in 2020. When the 2026 TDM analysis is conducted, the cost per mile will be updated to reflect expenses at that time.

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 4**, the daily and annual energy and cost savings for the example element are as follows:

$$\begin{aligned}
 \text{Energy saving (gallons of fuel)} &= 24,640 \text{ daily VMT} / 18.0 \text{ mpg} \\
 \text{Daily saving} &= 1,369 \text{ gallons per day} \\
 \text{Annual saving (250 work days)} &= 342,250 \text{ gallons saved per year}
 \end{aligned}$$

$$\begin{aligned}
 \text{Commuter cost saving (\$)} &= 24,640 \text{ VMT} \times \$0.230/\text{mile} \\
 \text{Daily saving} &= \$5,667 \text{ per day} \\
 \text{Annual saving (250 work days)} &= \$1,416,800 \text{ saved per year} \\
 \text{Annual saving per commuter} &= \$886 \text{ saved per placement per year} \\
 \text{(based on 1,600 placements)} &
 \end{aligned}$$

Figure 3: Basic Program Impact Calculation Methodology Summary

- | | |
|--|--|
| 1. Estimate commuter “population base” for the element | = e.g., all commuters, GRH applicants, CC online system users, EO employees |
| 2. Derive placement rate (from user survey data) | = Proportion of commuters who made a travel change as a result of the element |
| 3. Estimate number of “placements” | = Population base x placement rate |
| 4. Derive VTR factor (from user survey data) | = Average daily vehicle trips reduced per placement |
| 5. Estimate vehicle trips (VT) reduced | |
| GRH, Commuter Program Operations, Telework, MM | = 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 |

Figure 4: Example of Basic Program Impact Calculation Methodology Steps for a TDM Program Element

1. Program element “population base”	= 8,000 commuters
2. Placement rate	= 20%
3. Number of “placements”	= 8,000 x 20% = 1,600 commuters placed
4. VTR factor	= 0.7 daily vehicle trips reduced per placement
5. Vehicle trips (VT) reduced	= 1,600 x 0.7 trips reduced per placement = 1,120 daily vehicle trips reduced
6. VMT reduced	= 1,120 vehicle trips reduced x 25 miles/trip = 28,000 daily VMT reduced
7. Adjusted 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. Emissions reduced (NO _x)	= 448 trips x 1.0309 g/trip = 462 g
Similar calculations used to estimate reductions in VOC and CO ₂	= 24,640 VMT x 0.1498 g/VMT = 3,691 gm = (462 gm + 3,691 g) / 907,185 gm/to = 0.0046 daily tons NO _x reduced
9. Energy and commuter savings	= 24,640 daily VMT / 18.0 mpg
Energy saving (gallons of fuel)	= 1,369 gallons per day x 250 workdays/year = 342,250 gallons saved per year
Commuter cost saving (\$)	= 24,640 VMT x \$0.230/mile = \$5,667 per day x 250 workdays/year = \$1,416,800 saved per year / 1,600 placements = \$886 saved per placement per year

Note: This is a hypothetical example; do not use the values or factors in this example for actual evaluation purposes.

Sample Calculations of Impacts

Each program element has unique placement rates and VTR factors and some of the other methodological steps differ slightly. Specific examples are presented for each element in Appendices D through J, which are taken from the 2023 TDM Analysis Report. The actual FY 2024–FY 2026 values for placement rates, VTR factors, trip distances, SOV access percentages, emission factors, and other calculation variables will be computed after the appropriate surveys have been completed and could be different than the values shown in the appendices examples. The appendices are provided for illustrative purposes on the method and calculation steps only.

SECTION 8 REPORTING AND COMMUNICATION OF EVALUATION RESULTS

The objective of the TDM evaluation process is to provide data on the performance of TDM program elements to assess contributions to regional goals and assist regional and local decision-makers, funders, Commuter Connections program staff, and program partners to make sound program funding and operations decisions. To this end, the TDM evaluation produces a technical assessment of performance to apply to regional transportation and air quality planning and performance review efforts. Because the TDM program elements are offered, at least in part, to provide these benefits to the region, the evaluations focus on analyzing travel and emissions impacts from use of Commuter Connections program. However, the many surveys and analyses performed for the evaluation also collect a wealth of data on travel patterns and trends, traveler attitudes, and customer satisfaction that can be used to relate Commuter Connections' story to other audiences and to contribute to a broad range of regional transportation planning activities. By expanding the range of data transmitted and focusing the presentation of data on the needs and interests of other audiences, Commuter Connections expands the value of its data collection and analysis investment and provides value to various new audiences.

In the past, Commuter Connections used four main reporting mechanisms to disseminate evaluation results:

- **Survey reports and presentations for each data collection activity**, such as the GRH survey and State of the Commute survey
 - COG/TPB staff and/or a contractor produce technical reports including details of the methodology and results.
 - COG/TPB staff and/or the contractor prepare presentation materials to summarize highlights of the research for technical audiences, such as the TDM Evaluation Group, Commuter Connections Subcommittee, the Transportation Planning Board, and the TPB Technical Committee.
 - COG Office of Communications and/or Commuter Connections marketing contractor(s) use data and analysis in press releases and infographics in various communication formats.
- **Quarterly "Report Card"** prepared by Commuter Connections staff summarizing program status for use by internal staff and local jurisdiction program partners to assess on-going progress.
- **Program Annual Report** prepared by Commuter Connections staff distributed to COG/TPB staff, local jurisdiction program partners, and regional policymakers for administrative purposes.
- **Triennial TDM Analysis Report** that documents the impacts of the TDM program elements for the three-year TDM evaluation period—this is the report that this Evaluation Framework will ultimately inform.

During the FY 2024–FY 2026 evaluation period, Commuter Connections is implementing two new reporting mechanisms:

- In addition to a State of the Commute technical report, Commuter Connections will also produce an **interactive dashboard with the State of the Commute results**. This will allow COG/TPB staff, local jurisdiction program partners, and others to interact with the data in an easy-to-use online application to filter results and make custom tables and maps.

- Commuter Connections will be establishing a new monitoring tool during the FY 2023–FY 2026 analysis period: an **interactive program monitoring dashboard** which will provide updated program participation and utilization data.

Formal review of each of these reporting mechanisms is an integral part of the work program development for both COG/TPB staff and Commuter Connections program partners.

SECTION 9 EVALUATION SCHEDULE AND RESPONSIBILITIES

Evaluation activities fall into three categories, with various recommended frequencies as described in **Table 2**. The first column shows evaluation activities in three categories: ongoing monitoring/tracking, surveys, and reporting. The second column indicates the frequency for each activity. The specific schedule for all data collection activities has been established by Commuter Connections and is included as **Appendix K**. The final column indicates the party responsible for collecting or maintaining the data.

Reports will be prepared following each survey to document the results and update placement rates and VTR factors (if applicable) for the populations surveyed. In addition to these reports, internal activity and evaluation reports also are produced to report the progress of the Commuter Connections program as a whole and for individual TDM program elements. A full TDM Analysis Report will be developed every three years to document the TDM program element impacts during the previous three-year period.

The primary responsibility for performing quarterly and annual evaluations reside with COG/TPB staff. COG/TPB staff assume responsibility for managing regular and special Commuter Connections survey efforts conducted by outside contractors and conduct some surveys, such as the GRH satisfaction survey, using in-house staff. COG/TPB staff also assemble ongoing monitoring data, oversee all activities, and seek input to ensure consistency with accepted TDM analysis methods. Commuter Connections local jurisdiction program partners play a role in tracking some ongoing activities, especially in Employer Outreach, and review and provide input on TDM evaluation activities. Contractors may be used for some data collection and evaluation activities as directed by Commuter Connections staff. GRH service providers provide data on usage as required in their contracts. Finally, employers work with the Commuter Connections network members to provide information on program service utilization.

Table 2: Data Collection and Reporting Activities, Frequency and Responsibility

Evaluation Activity/Tool	Frequency	Responsibility
ONGOING MONITORING		
Telework assistance database	Ongoing	CC
GRH registrant/archived database	Ongoing	CC
ACT! employer contact database	Monthly	CC, Sales representatives
COC website and call volume tracking	Ongoing	CC
Documentation of media/marketing activities	Ongoing	CC, Contractor
Bike-to-Work Day participant records	Annual	CC
'Pool Rewards participant records	Annual	CC
Flextime Rewards participant records	Ongoing	CC
CommuterCash (formerly incenTrip) participant records	Ongoing	CC
CarpoolNow participant records	Ongoing	CC
Commuter Connections applicant database	Ongoing	CC, Contractor
COMMUTER/EMPLOYER/USER SURVEYS		
Telework-assisted employer follow-up survey	Triennial	CC, Contractor
State of the Commute survey	Triennial	Contractor
GRH registrant survey	Triennial	CC, Contractor
Employer commute surveys	Ongoing	CC, Sales representatives, Employers, Contractor
CC online TDM system Applicant Placement Rate survey	Triennial	CC, Contractor
Retention rate survey	Five-year	CC, Contractor
Bike-to-Work participant survey	Triennial	CC, WABA, Contractor
'Pool Rewards participant survey	Triennial	CC, Contractor
EVALUATION RESULTS REPORTING		
Commuter Connections "Report Card"	Quarterly	CC
CC Program Annual Report	Annual	CC
TDM Evaluation Report	Triennial	CC, Contractor
Commuter Connections survey reports	As produced	CC, Contractor

SECTION 10 APPENDICES

Appendix A Basic 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 an alternative mode
2. Commuters who currently use an alternative mode shifting to another alternative mode (e.g., from carpool to bus, train to bus, vanpool to carpool, etc.)
3. Commuters who currently use an alternative mode increasing their weekly frequency of alternative mode 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 derived for seven commuters who made the following travel changes:

- Placement 1 – shift from driving alone five days per week to a two-person carpool five days per week
- Placement 2 – shift from driving alone five days per week to transit five days per week
- Placement 3 – shift from driving alone five days per week to telework two days per week and driving alone three days per week
- Placement 4 – shift from driving alone five days per week to two-person carpool two days per week and driving alone three days per week
- Placement 5 – shift from a two-person carpool five days per week to transit five days per week
- Placement 6 – shift from transit five days per week to a two-person carpool five days per week
- Placement 7 – increase carpool frequency from one day per week to three days per week, driving alone the other two days

The VTR factor is derived by determining the number of vehicle trips all placements would reduce together and dividing that total by the number of placements. The calculation assumes that a commuter makes two trips a day, one from home to work and a second from work to home. Thus, a commuter who drives alone would make two vehicle trips each day. A commuter who carpools would make 0.5 vehicle trip to work and 0.5 trip back home, for a total of one vehicle trip per day. A commuter who uses bus, train, bike, or walk is assumed to make zero vehicle trips. A commuter who teleworks also makes zero vehicle trips for telework days.

Shown on the next page 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 an alternative mode 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 #6 increases weekly commute trips, because he shifts from a higher occupancy alternative mode (transit) to a lower occupancy alternative mode (carpool).

Sample VTR Calculation

Travel Modes Before and After Shifts to Alternative Modes

By Commuter and by Day of the Week

	Vehicle Trips					Vehicle Trips					Vehicle Trips					Weekly Change
	Before Shift					After Shift					Net Trips					
	<u>M</u>	<u>T</u>	<u>W</u>	<u>T</u>	<u>F</u>	<u>M</u>	<u>T</u>	<u>W</u>	<u>T</u>	<u>F</u>	<u>M</u>	<u>T</u>	<u>W</u>	<u>T</u>	<u>F</u>	
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 Adjustments to COMMUTER Model Coefficients and 2025 Review of Model for FY 2024–FY 2026 Analysis

Impacts for the Employer Outreach program element are calculated using the EPA COMMUTER model (v 2.0). Prior to the 2008 analysis, the default cost and time coefficients for the Washington DC region were used in model runs. At that time, the project team determined that the model overestimated the likely impacts of employers' strategies related to financial incentives and then examined possible adjustment to the COMMUTER model to give more conservative results. The most acceptable option found was to reduce the cost coefficient to a level that could be expected to produce a vehicle trip reduction (VTR) change that approximated employee survey results of employers for which before commuter programs were implemented and after implementation. Because "with program" employee survey data were not available for the MWCOC region, the team used data from the Seattle, WA metropolitan region and determined the Seattle cost coefficient that would have predicted the result found in the Seattle survey data. The team then applied a proportional reduction to the current MWCOC cost coefficient.

The team performed a coefficient sensitivity analysis to estimate the VTR result at various cost coefficient levels. Two sensitivity cases were run, to test two different employer situations. The first included employers that had maintained or expanded the services in their commute programs, regardless of their program level (Level 1-4). The second case included employers that would have been classified as Level 3 or Level 4 in the TDM analysis, regardless of the changes they had made in their program. This case was run because it was consistent with the TDM analysis methodology. **Table 3** shows the results for the Level 3-4 employer case, which was deemed more appropriate for this analysis.

Table 3: COMMUTER model Vehicle Trip Rate (VTR) change prediction by travel cost coefficient - Level 3 and 4 Employers (Sample size 609)

Travel Cost Coefficient	Survey VTR Change	COMMUTER VTR Change
-0.0009	-2.32	-1.89
-0.0013	-2.32	-2.19
-0.0015	-2.32	<u>-2.35</u>
-0.0019	-2.32	-2.66
-0.0024*	<u>-2.32</u>	-3.06
-0.0029	-2.32	-3.46
-0.0031	-2.32	-3.62
-0.0034	-2.32	-3.86
-0.0039	-2.32	-4.26
-0.0043**	-2.32	-4.58
-0.0047	-2.32	-4.9
-0.0049	-2.32	-5.06

Coefficient -0.0024 vs -.0015,
Difference of 0.0009
VTR change difference 0.74

VTR difference 0.74
Coefficient difference of 0.009
-0.0043 vs -0.0034

*Coefficient for Seattle

**Coefficient for MWCOC region

The VTR reduction estimated from the Seattle survey for these employers was -2.32. The COMMUTER model, using the Seattle cost coefficient of -0.0024, would have predicted a VTR result of -3.06, or a difference of about 0.74. To obtain a result of -2.32, the cost coefficient would have to have been -0.0015, or a reduction of 0.0009.

When the sensitivity results were plotted with the coefficient on one axis and the VTR change on the other, it was clear that the change in VTR was directly proportional to the change in coefficient. Thus, it was reasonable to apply the same 0.74 difference from the Seattle VTR results to the MWCOG predicted result to estimate the coefficient that would produce a proportionately accurate result in the MWCOG region.

The cost coefficient used with the COMMUTER model in the 2002-2005 TDM analysis was -0.0043; this would predict a VTR change of -4.58. Applying the 0.74 difference in the VTR change result from the Seattle case to the MWCOG coefficient would result in a new VTR change of -3.84. This number does not match the -2.32 VTR change result for the Seattle data, nor is it reasonable to expect that it would, since the Seattle area survey results reflect Seattle area conditions. It is not unreasonable to assume that the MWCOG area could have a higher VTR change when similar commuter program conditions are in place.

To obtain the -3.84 VTR value, the coefficient for MWCOG would have to be -0.0034. The VTR result of -3.84 would represent about a 16 percent reduction in impact compared to that produced using the -0.0043 cost coefficient. With these changes, the old (2005) and new (2008) coefficients used in the COMMUTER Model were as follows. No changes were made to the time coefficients.

	2008	2005
	<u>Coefficients</u>	<u>Coefficients</u>
IVTT- In-vehicle travel time - all modes (minutes)	-0.0300	-0.0300
OVTT - Transit walk time (minutes)	-0.0750	-0.0750
OVTT - Transit wait time (minutes)	-0.0750	-0.0750
Cost - Auto parking (cents)	-0.0034	-0.0043
Cost - Transit fare (cents)	-0.0034	-0.0043

Appendix C Assignment of Telework Impacts in Commuter Connections TDM Analysis

The triennial TDM analysis includes assessment of telework impacts that have been generated by telework-supportive activities of Commuter Connections staff and/or local jurisdiction partners. Some services are directed to individual workers in the region to increase their awareness of telework options. Others are directed to employers to encourage and assist establishment of worksite telework arrangements and policies.

Because the telework services are implemented under several Commuter Connections TDM program elements and for both commuters and employers, the TDM analysis calculates individual telework impacts for each element, correcting for double-counting when impacts would otherwise be counted in more than one category. The impacts are calculated separately for the commuter and employer target telework populations (**Figure 5**). Impacts are assigned to different TDM program elements depending on their location (District of Columbia, Maryland, Virginia) and the telework assistance services they received. Note that the calculated impacts do not reflect all telework in the region—only impacts that can be tied to a service provided by Commuter Connections or a Commuter Connections partner organization.

COMMUTERS

The left side of **Figure 5** shows assignment of impacts for commuters to one of three groups:

- Maryland Telework Program Element
- Commuter Program Operations
- Telework impacts not counted

The first step is to determine if a commuter was assisted or influenced by a CC service to start or increase teleworking. The State of the Commute survey includes a question asking teleworkers the information sources/resources they used to start teleworking. They also are asked a direct question to determine if they received TW information/assistance from MWCOG or Commuter Connections.

- If they did report MWCOG/CC as a source/resource, their impacts will be credited to MWCOG/Commuter Connections and they move to step 2.
- If they did not report MWCOG/Commuter Connections as a source/resource, their impacts are not credited to MWCOG/CC. They are, however, part of regional telework.

Assisted commuters are then separated into two categories by their residence and work locations:

- Impacts of assisted commuters who **live AND/OR work in Maryland** are assigned to the Maryland Telework TDM Program Element. Their vehicle trip and VMT reduction impacts are calculated from SOC data on their frequency of telework (days/week), modes used on non-telework days, and travel distance from home to non-telework work location.
- Impacts of assisted commuters who **live AND work outside Maryland** (e.g., DC, Virginia, or other state) are assigned to the Commuter Program Operations element. Their vehicle trip and VMT reduction impacts are calculated from SOC data on their frequency of telework (days/week), modes used on non-telework days, and travel distance from home to non-telework work location.

EMPLOYERS

The right side of **Figure 5** shows assignment of telework impacts for employers. Impacts are assigned to one of three groups:

- Employer Outreach
- Maryland Telework Program Element
- Telework impacts not counted

The first step is to determine whether an employer was assisted by Commuter Connections/partner program. The employer can receive telework assistance from several Commuter Connections-related sources:

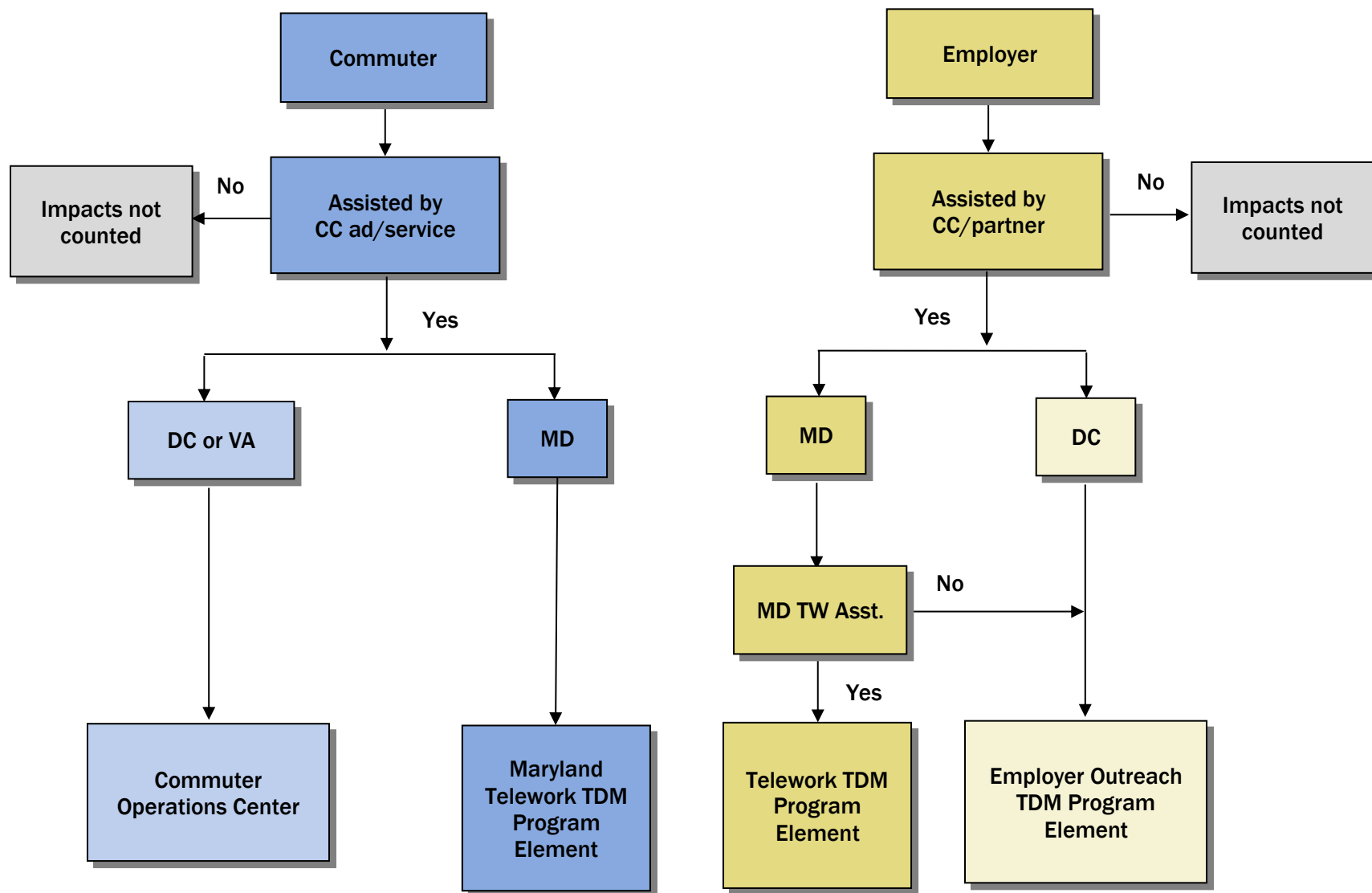
- **Maryland Telework** – Employer is in Maryland and is listed in MWCOG/CC assistance database (i.e., received assistance from MWCOG/Commuter Connections website, workshop, or other MWCOG/Commuter Connections resource). *Impacts are calculated and assigned in step 2.*
- **Employer Outreach** – Employer is a client of one of the Commuter Connections local jurisdiction partner programs and the ACT! Database reported telework for the employer. *Impacts are calculated and assigned in step 2.*
- **No reported assistance** – Employer did not receive MD Telework assistance and telework is not reported in the ACT! database. *Impacts not calculated.*

The next steps is to determined which assistance program was used. Assisted employers are separated into two categories based on the program used:

- Impacts of assisted employers who **received Maryland Telework assistance** are assigned to the Telework Program Element. These employers are surveyed by Commuter Connections in the Telework Assisted Employer survey to determine the number/percentage of employees who are teleworking. The telework impact is calculated as any increase in number of employees teleworking. Trips/VMT reduced are estimated by applying average telework frequency, drive-alone/carpool/vanpool mode use on non-telework days, and average commute distance from the SOC survey to the number of new telework employees at assisted worksites.
- Telework impacts of **assisted employers that did not participate in Maryland Telework** are assigned to the Employer Outreach TDM Program Element. Impacts of Employer Outreach assistance, both for telework and non-telework are estimated using the EPA COMMUTER model. The model estimates a final “with services” mode split that would be likely when a defined set of TDM services are offered to employees at the worksite with a starting “without services” mode split. The model estimates telework impacts from the percentage of employees who are reported to be teleworking and the mode split of employees on non-telework days.

The final step in the calculation of assisted employer telework impacts is to check for overlap between Employer Outreach and the Maryland Telework program. The names and locations of MD Telework assisted worksites are compared against the employers/worksites reporting telework in the Employer Outreach Act! Database. If a MD Telework worksite is in the Act! Database with telework reported, the telework portion of their EO impact is deducted from the total Employer Outreach impact so that the telework impacts are counted only once, in the Maryland Telework Program Element. Impacts of other (non-telework) TDM services that the employer/worksites offers will continue to be included in the Employer Outreach calculation.

Figure 5: Assignment of Telework Impact to TDM Program Elements by Target Market, Location, and Services Received



Appendix D Sample Calculation of Maryland Telework Impacts

Two impact components:

- CC Assisted Telework – Maryland
- CC Assisted Telework – Non-Maryland

CC Assisted Telework – Maryland and Non-Maryland

Populations of Interest

All regional telecommuters	2,136,576	(from SOC survey)
Teleworkers with MD home or work	925,137	43.3% (from SOC survey)
Teleworkers not in MD	1,211,439	56.7% (from SOC survey)
Employees at TW assisted worksites (MD)	28,202	(from TW assistance survey/EO ACT! database)

Commuter Connections TW Placement Rates

Directly assisted TW

- Within Maryland 6.3% (% of TC assisted by CC, from SOC survey)
- Not in Maryland 4.4% (% of TC assisted by CC, from SOC survey)

TW at assisted worksites (MD only)

- Within Maryland 2.4% (% of new TC at sites, from TW assistance survey)
- Not in Maryland 0.0% Program not in effect outside of Maryland

TW Placements (Mixed home and Non-home based)

Maryland (credited to Telework Program Element)

- Directly assisted telecommuters 58,284 (regional TC x directly assisted placement rate)
- Telecommuters at TW assisted sites 677 (employees at assisted sites x assisted site placement rate)

Total assisted telecommuters - MD	58,961
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Not Maryland (to be credited to COC)

- Directly assisted telecommuters 53,303 (regional TC x directly assisted placement rate)
- Telecommuters at TW assisted sites 0 (employees at assisted sites x assisted site placement rate)

Total assisted telecommuters – Not MD 53,303

Placements by Location (home-based and non-home-based)

- % Home-based telecommuters 97% (from SOC survey)
- % Non-home (NH)-based telecommuters 3% (from SOC survey)

Maryland (credited to Telework Program Element)

- Home-based telecommuters 57,192 (total assisted TW x % Home-based TW)
- NH-based telecommuters 1,769 (total assisted TW x % NH-based TW)

Not Maryland (credited to COC)

- Home-based telecommuters 51,704 (total assisted TW x % Home-based TW)
- NH-based telecommuters 1,599 (total assisted TW x % NH-based TW)

Daily Vehicle Trips Reduced

VTR Factors

- Home-based factor – MD 0.43 (from SOC survey)
- NH-based factor – MD 0.05 (from SOC survey)
- Home-based factor – Not MD 0.29 (from SOC survey)
- NH-based factor – Not-MD 0.04 (from SOC survey)

Maryland (credited to Telework Program element)

- Home-based VT reduced 24,593 (HB TW x HB VTR factor)
- NH-based VT reduced 88 (NH-based TW x NH VTR factor)

Daily Vehicle Trips Reduced - MD 24,681

Not Maryland (credited to COC)

- Home-based VT reduced 14,994 (HB TW x HB VTR factor)
- NH-based VT reduced 64 (NH-based TW x NH VTR factor)

Daily Vehicle Trips Reduced – Not MD 15,058

Daily VMT Reduced

Ave one-way trip distance (mi) to main workplace

- Home-based – MD 19.9 (SOC survey)
- Home-based – Not MD 13.8 (SOC survey)

Ave one-way trip distance (mi) for non-home-based TW (MD and Not-MD)

- Non-home based – to main workplace 18.7 (SOC survey)
- Non-home based – to TW location 12.9 (SOC survey)
- Non-home based – net VMT reduced 5.8 (SOC survey)

VT reductions on TW days

Maryland (credited to Telework Program Element)

- Home-based VMT reduced 489,401 (HB VT reduced x average OW miles to main workplace)
- NH-based VMT reduced 510 (NHB VT reduced x net OW miles reduced per trip)

Daily VMT Reduced - MD	489,911
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Not Maryland (credited to COC)

- Home-based VMT reduced 206,917 (HB VT reduced x average OW miles to main workplace)
- NH-based VMT reduced 371 (NHB VT reduced x net OW miles reduced per trip)

Daily VMT Reduced – Not MD	207,288
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Maryland (credited to Telework Program Element)

Emissions Reduced – NOx (Daily), VOC (Daily) and CO2 (Annual)

NOx	23 Emission			23 Emission		
	Trips	Factor	VMT	Factor	Tot gm	Tot ton
• From Starts	24,681	0.9596			23,684	0.0261
• From Running			489,911	0.1501	73,536	<u>0.0811</u>
Total NOx reduced (tons)					Daily	0.1072

VOC	23 Emission			23 Emission		
	Trips	Factor	VMT	Factor	Tot gm	Tot ton
• From Starts	24,681	2.1585			53,274	0.0587
• From Running			489,911	0.0575	28,170	<u>0.0311</u>
Total VOC reduced (tons)					Daily	0.0898

CO2	23 Emission			23 Emission		
	Trips	Factor	VMT	Factor	Tot gm	Tot ton

• From Starts	24,681	208.68			5,150,431	5.677
• From Running			489,911	348.43	170,699,690	<u>188.164</u>
Total CO2 reduced (tons)					Daily	193.841
					Annual	48,460.3

Non-Maryland (credited to COC)

Emissions Reduced – NOx (Daily), VOC (Daily) and CO2 (Annual)

	23 Emission			23 Emission		
NOx	Trips	Factor	VMT	Factor	Tot gm	Tot ton
• From Starts	15,058	0.9596			14,450	0.0159
• From Running			207,288	0.1501	31,114	<u>0.0343</u>
Total NOx reduced (tons)					Daily	0.0502

	23 Emission			23 Emission		
VOC	Trips	Factor	VMT	Factor	Tot gm	Tot ton
• From Starts	15,058	2.1585			32,503	0.0358
• From Running			207,288	0.0575	11,919	<u>0.0131</u>
Total VOC reduced (tons)					Daily	0.0489

	23 Emission			23 Emission		
CO2	Trips	Factor	VMT	Factor	Tot gm	Tot ton
• From Starts	15,058	208.68			3,142,303	3.464
• From Running			207,288	348.43	72,225,358	<u>79.615</u>
Total CO2 reduced (tons)					Daily	83.079
					Annual	20,769.8

Appendix E Sample Calculation of Guaranteed Ride Home Impacts

Populations of Interest

FY 2021-23 Registrant Base (New credit)

• New GRH registrants (FY 2028-23)	1,568	(GRH database)
• Re-registrants from FY 2021	1,740	(Commuter Connections archive database)
• One-time exceptions (FY 2021-23)	<u>0</u>	(GRH database)
New FY 2021-23 GRH base	3,308	

Pre-FY 2018 Registrant Base (Retained credit)

• GRH registrants Pre-FY 2021	29,340	(COC GRH/Online databases)
• Valid contact percentage	68%	(Retention rate survey)
• Est percentage NOT full-time TW	70%	(Retention rate survey)
Retained Pre-FY 2021 GRH base	13,966	

Distribution of In/Out NAA

FY 2021-23 Registrant Base (New)

Within NAA	63%	2,084
Outside NAA	37%	1,224

Pre-FY 2021 Registrant Base (Retained)

Within NAA	63%	8,799
Outside NAA	37%	5,167

GRH Placement Rates and Placements (continued only) (NAA base x NAA placement rate)

FY 2021-23 Registrants (New)

• Within NAA rate	40.9%	852
• Outside NAA rate	44.1%	540

Pre-FY 2021 Registrants (Retained)

• Within NAA rate	14.7%	1,293
• Outside NAA rate	14.7%	760

Total Placements¹⁴	3,445
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¹⁴ Note that the total placements for purpose of VT and VMT calculations includes both FY 2021-FY 2023 registrants and past registrants from Pre-FY 2021. But only FY 2021-FY 2023 registrants are included in the participation count for comparison with the GRH goal, because the goal is set as number of registrants who were active in the program during the evaluation period.

VTR Factors and Daily Vehicle Trips Reduced (continued only) (NAA placement x NAA VTR factor)**FY 2021-23 Registrants (New)**

• Within NAA VTR factor	0.90	767
• Outside NAA VTR factor	0.98	529

Pre-FY 2021 Registrants (Retained)

• Within NAA VTR factor	0.40	517
• Outside NAA VTR factor	0.40	304

Total Daily Vehicle Trips Reduced		2,117
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Commute Distance and Daily VMT Reduced (NAA VT reduced x NAA distance)**FY 2021-23 Registrants (New)**

• Within NAA distance	27.6	21,169	
• Outside NAA distance survey)	27.6	14,600	(discount actual 50.0 miles from GRH

Pre-FY 2021 Registrants (Retained)

• Within NAA distance	23.5	12,150
• Outside NAA distance	23.5	7,144

Total Daily VMT Reduced		55,063
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Trip and VMT Adjustment for SOV Access to HOV Modes (reduce VT and VMT for AQ analysis)

Inside NAA

• SOV access percentage	80%	(GRH survey)
• SOV access distance (mi)	5.8	(GRH survey)

Outside NAA (Adjustments are not applicable, because all access VT and VMT occur outside NAA)

Adjusted VT Reduction – net of VMT access

• Total VT reduced	2,117	
• Within NAA access VT (deduct)	- 1,027	(Total VT reduction within NAA x SOV access %)
• Outside NAA access VT	0	No deduction (access trips are outside NAA)

Total VT for AQ analysis 1,090

Adjusted VMT Reduction – net of VMT access

• Total VMT reduced	55,063	
• Within NAA access VMT (deduct)	- 5,957	(SOV Access VT within NAA x SOV access distance)
• Outside NAA access VMT	0	No deduction (access VMT are outside NAA)

Total VMT for AQ analysis 49,106

Emissions Reduced – NOx (Daily), VOC (Daily) and CO2 (Annual)

NOx	23 Emission		23 Emission		Tot gm	Tot ton
	Trips	Factor	VTM	Factor		
• From Starts	1,090	0.9596			1,046	0.0012
• From Running			49,106	0.1501	7,371	<u>0.0081</u>
Total NOx reduced (tons)					Daily	0.0093

VOC	23 Emission		23 Emission		Tot gm	Tot ton
	Trips	Factor	VTM	Factor		
• From Starts	1,090	2.1585			2,353	0.0026
• From Running			49,106	0.0575	2,824	<u>0.0031</u>
Total VOC reduced (tons)					Daily	0.0057

CO2	23 Emission		23 Emission		Tot gm	Tot ton
	Trips	Factor	VTM	Factor		
• From Starts	1,090	208.68			227,461	0.251
• From Running			49,106	348.43	17,110,004	<u>18.861</u>
Total CO2 reduced (tons)					Daily	19.112
					Annual	4,778.0

Correction for Overlap with Mass Marketing

The GRH results were adjusted to eliminate double counting between GRH and Mass Marketing for new GRH applicants. About **eight percent** of the FY 2021–FY 2023 GRH impacts were assigned to Mass Marketing to recognize that 26 percent of new GRH applicants were influenced to apply for GRH after hearing a Mass Marketing advertisement. These new applicants accounted for 47 percent of the total GRH applicants (Reapply + New) during FY 2021–FY 2023. Impacts generated through Retained GRH users (35% of total GRH impacts) were excluded from the base. This calculation resulted in eight percent of the GRH credit being assigned to Mass Marketing (47% x 26% new apps x 65% non-retained impacts).

Total GRH apps FYs 21, 22, 23	3,308	
New GRH apps FY 21, 22, 23	1,568	47%
Estimated MM share of new GRH	26%	
FY 2021-23 VMT as % of total VMT	65%	(Exclude Retained credit from discount)
Estimated MM share of GRH impact	8%	

Net GRH = GRH Base Total – Mass Marketing credit

	GRH Base	GRH Excl	Mass Mkt	Net GRH
	Total	Retained	Credit*	Credit*
Placements	3,445	1,392	111	3,334
Vehicle Trips reduced	2,117	1,296	104	2,013
VMT reduced (mi)	55,063	35,769	2,862	52,201
Emissions Reduced				
NOx (daily tons)	0.0093	0.0060	0.0005	0.0088
VOC (daily tons)	0.0057	0.0037	0.0003	0.0054
CO2 (annual tons)	4,778.0	3,105.7	248.5	4,529.5

* Mass Marketing Credit = 8% of (GRH Base Total – GRH Excluding Retained Credit)

Net GRH Credit = GRH Base Total – Mass Marketing Credit

Appendix F Sample Calculation of Employer Outreach Impacts

Populations of Interest

Level 3 or 4 sites (data from ACT! database)

	<u>Employers</u>	<u>Employees</u>
• Programs unchanged since 2020	989	264,819
• Expanded non-telework programs in 2023	54	21,562
• Expanded telework programs in 2023	378	116,688
• New programs in 2023	745	109,876
• Deleted programs since 2020	573	106,406

Average Vehicle Occupancy (AVO)

Starting AVO from employee survey data, Final AVO from COMMUTER model

	<u>Starting AVO</u>	<u>Ending AVO</u>
• Programs unchanged since 2020	1.2049	1.3116
• Expanded non-TW programs – continued base	1.1465	1.1976
• Expanded TW programs – continued base	1.2685	1.4336
• Expanded non-TW programs – new impacts	1.1976	1.2428
• Expanded TW programs – new impacts	1.4336	1.4540
• New programs	1.1535	1.1998
• Deleted programs (Ending AVO lower than Starting)	1.4682	1.3462

Daily person trips

Total employees x 2 one-way trips per day; Starting (pre-program) and ending (with-program)

	<u>Starting</u>	<u>Ending</u>
• Programs unchanged since 2020	529,638	529,638
• Expanded non-TW programs (base and new)	43,124	43,124
• Expanded TW programs (base and new)	233,376	233,376
• New programs	219,752	219,752
• Deleted programs	212,812	212,812

Daily vehicle trips

Total employees / starting AVO); Starting (pre-program) and ending (with-program)

	<u>Starting</u>	<u>Ending</u>	<u>Difference</u>
• Programs unchanged since 2020	439,570	403,811	35,759
• Expanded non-TW programs – continued base	37,614	36,009	1,605
• Expanded TW programs – continued base	183,978	162,790	21,188
• Expanded non-TW programs – new impact	36,009	34,699	1,310
• Expanded TW programs – new impact	162,790	160,506	2,284
• New programs	190,509	183,157	7,352
• Deleted programs (Ending VT higher than Starting)	144,948	158,083	(13,135)

Total Daily Vehicle Trips Reduced

• Continued impacts from 2020	58,552
• New/expanded impacts	10,946
Net 2023 reduction	69,498

Daily VMT reduced

Results produced by COMMUTER model, assuming travel distance by mode from SOC survey

• Programs unchanged since 2020	639,298
• Expanded non-TW programs – continued base	29,154
• Expanded TW programs – continued base	380,390
• Expanded non-TW programs – new impact	23,572
• Expanded TW programs – new impact	42,306
• New programs	132,760
• Deleted programs	(237,705)

Total Daily VMT Reduced

• Continued impacts from 2020	1,048,842
• New/expanded impacts	198,638
Net 2020 reduction	1,247,480

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

• Non-SOV access percentage	78%	(from 2022 SOC survey)
• SOV access percentage	22%	(from 2022 SOC survey)
• SOV access distance (mi)	2.6	(from 2022 SOC survey)

VT Reduction without SOV access – used as base for AQ analysis

(Total VT reduced x non-SOV access %)

- Continued impacts from 2020 45,671
- New/expanded impacts 8,538

VMT Reduction without SOV access

(Total VMT reduced – (Total daily VT reduced x SOV % x SOV access trip distance))

- Continued impacts from 2020 1,015,351
- New/expanded impacts 192,377

Emissions Reduced – Continued from 2020 - NOx (Daily), VOC (Daily) and CO2 (Annual)

NOx	23 Emission		23 Emission		Tot gm	Tot ton
	Trips	Factor	VMT	Factor		
• From Starts	45,671	0.9596			43,826	0.0483
• From Running			1,015,351	0.1501	152,404	<u>0.1680</u>
Total NOx reduced (tons)					Daily	0.2163

VOC	23 Emission		23 Emission		Tot gm	Tot ton
	Trips	Factor	VMT	Factor		
• From Starts	45,671	2.1585			98,581	0.1087
• From Running			1,015,351	0.0575	58,383	<u>0.0644</u>
Total VOC reduced (tons)					Daily	0.1731

Emissions Reduced – Continued from 2020 – NOx, VOC, CO2 (continued)

CO2	23 Emission		23 Emission		Tot gm	Tot ton
	Trips	Factor	VMT	Factor		
• From Starts	45,671	208.68			9,530,624	10.506
• From Running			1,015,351	348.43	353,778,749	<u>389.974</u>
Total CO2 reduced (tons)					Daily	400.480
					Annual	100,120.0

Emissions Reduced – New/Expanded – NOx (Daily), VOC (Daily) and CO2 (Annual)

NOx	23 Emission		23 Emission		Tot gm	Tot ton
	Trips	Factor	VTM	Factor		
• From Starts	8,538	0.9596			8,193	0.0090
• From Running			192,377	0.1501	28,876	<u>0.0318</u>
Total NOx reduced (tons)					Daily	0.0408

VOC	23 Emission		23 Emission		Tot gm	Tot ton
	Trips	Factor	VTM	Factor		
• From Starts	8,538	2.1585			18,429	0.0203
• From Running			192,377	0.0575	11,062	<u>0.0122</u>
Total VOC reduced (tons)					Daily	0.0325

CO2	23 Emission		23 Emission		Tot gm	Tot ton
	Trips	Factor	VTM	Factor		
• From Starts	8,538	208.68			1,781,710	1.964
• From Running			192,377	348.43	67,029,918	<u>73.888</u>
Total CO2 reduced (tons)					Daily	75.852
					Annual	18,963.0

Distribution of Employer Outreach Impacts to EO Base and EO for Bicycling

	Total EO	EO w/o bike	EO-bike
Vehicle Trips Reduced	69,498	69,093	405
VTM Reduced (miles)	1,247,480	1,245,657	1,823
Emissions Reduced			
NOx (daily tons)	0.2571	0.2564	0.0007
VOC (daily tons)	0.2056	0.2045	0.0011
CO2 (annual tons)	119,083.0	118,884.7	198.3

COMMUTER CONNECTIONS EMPLOYER SERVICES PARTICIPATION LEVELS

January 2024

Support Strategies

Likely range of trip reduction: 0%

- Expresses interest and/or distributes/displays information on Ozone Actions Days

Level 1 (Bronze)

Likely range of trip reduction: 0% to 1%

- Expresses interest in transit benefits, Smart Benefits, or other TDM information strategies
- Conducts Commuter Survey and creates a TDM plan
- Distributes alternative commute info to employees including any new hire orientation
- Posts alternative commute information on employee bulletin board(s), intranet sites, newsletter or e-mail
- Installs Electric Car Charging Station(s) at worksite
- Installs a permanent display case or brochure holders and stock with alternative commute information

Level 2 (Silver)

Likely range of trip reduction:

- 0% to 3% without Telework/Compressed Work Schedules
- 0% to 9% with Telework/Compressed Work Schedules

Implements two or more of the following strategies:

- Installs electronic screens or desktop feed of real-time travel information for transit and/or other alternative mode availability.
- Participates in the Capital Bikeshare Program as a Corporate Partner
- Provides preferential parking for carpools and vanpools
- Implements a telework program with 1-20% of employees participating
- Facilitates car/vanpool formation meetings
- Hosts/sponsors an alternative commute day or transportation fair or commuter benefit orientation
- Implements flex-time or staggered work schedule
- Implements compressed work week for 1-20% of employees
- Installs bicycle racks or lockers
- Installs or provides access to shower facilities for bicyclists and walkers
- Establishes an ETC who regularly provides alternative commute information to employees
- Becomes a Commuter Connections member and provides on-site ridematching or co-branding
- Supplements GRH program with payment for additional trips or own program
- Holds a Bike Safety class at client site
- Annual behavior/client challenge at worksite
- Facilitates a carpool/vanpool formation event in which 5% or more employees participate

Level 3 (Gold)

Likely range of trip reduction:

- 2% to 5% without financial incentive/disincentive, Telework/Compressed Work Schedules
- 5% to 20% with financial incentive/disincentive, Telework/Compressed Work Schedules

Implements at least one of the following (in addition to the two or more Level 2 strategies):

- Implements a telework program with more than 20% of employees participating
- Implements compressed work week for 21%+ of employees
- Implements a transit/vanpool benefit, Smart Benefits, Federal Bicycle Benefit, or parking "cash out" program
- Implements a carpool/bicycle/walk benefit
- Provides free or significantly reduced fee parking for carpools and vanpools (valid only for companies where employees pay for parking)
- Implements a parking fee (valid only for companies that previously did not charge for parking)
- Provides employee shuttle service, car share or TNC to transit stations
- Provides company vanpools for employees' commute to work
- Implements a comprehensive Bicycle/Walking program (includes installation of showers, bicycle racks/lockers, and financial incentives for bicycling and/or walking, or a Capital Bikeshare Station or Capital Bikeshare Corporate Membership) with 20% or more employee participation

Level 4 (Platinum)

Likely range of trip reduction:

- 2% to 8% without financial incentive, Telework/Compressed Work Schedules
- 5% to 30% with financial incentive, Telework/Compressed Work Schedules

Implements two or more of the Level 3 TDM programs (in addition to the two or more Level 2 strategies) and actively promotes these programs and alternative commuting.

Appendix G Sample Calculation of Mass Marketing Impacts

Six impact components:

- Part 1 – Commuters influenced by ads to change mode – no contact with CC (direct influence)
- Part 2 – ‘Pool Rewards carpool/vanpool incentive participants
- Part 3 – CommuterCash (formerly incenTrip) mobile application
- Part 4 – Bike-to-Work Day event
- Part 5 – Commuters influenced by ads to contact CC (referred influence)
- Part 6 – Commuters influenced by ads to join GRH (referred influence)

PART 1 – DIRECT AD INFLUENCE

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

Total commuters in region 2,055,050 (2022 SOC)

- % recall any commute message 28% (2022 SOC)
- % recall CC/COG commute message 5.9% (2022 SOC)
- % chg to alt mode after CC/COG ads 14.8% (2022 SOC)
- % changers influenced by ad 50% (2022 SOC)

Placements – no contact with CC 8,973 (Commuters x CC recall X change % x influence %)

Placement Rates

- Continued placement rate 28% (2022 SOC)
- Temporary placement rate 72% (2022 SOC)

Placements

- Continued placements 2,512 (Placements x continued placement rate)
- Temporary placements 6,461 (Placements x temporary placement rate)

Daily Vehicle Trips Reduced

- Continued VTR factor 0.65 (2022 SOC)
- Temporary VTR factor 0.65 (2022 SOC)
- Temporary duration factor 4% (2022 SOC)

- Continued VT reduced 1,633 (Continued placements x continued VTR factor)
- Temporary VT reduced 168 (Temporary placements x temporary VTR factor x 4% credit for temporary use – Ave use of 2 weeks/50 work weeks)

Total Daily Vehicle Trips Reduced	1,801
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Daily VMT Reduced

- Ave one-way trip distance (mi) 21.0 (2022 SOC)

Total Daily VMT Reduced	37,821
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Trip and VMT Adjustment for SOV Access to HOV Modes (reduce VT and VMT for AQ analysis)

- SOV access percentage 23% (2022 SOC – transit riders)
- SOV access distance (mi) 2.6 (2022 SOC – transit riders)

Adjusted VT Reduction

- SOV access VT 414 (Total VT x SOV access %)
- VT with no SOV access 1,387 (Total VT – SOV access VT)

Adjusted VMT Reduction

- SOV access VMT 1,076 (Total VT x SOV % x access distance)
- VMT with no SOV access 36,745 (Total VMT – SOV access VMT)

Total VT for AQ analysis 1,387

Total VMT for AQ analysis 36,745

PART 2 – ‘POOL REWARDS CARPOOL/VANPOOL PARTICIPANTS

Carpool Component

FY 2021-FY 2023 program participants 101

Pre-FY 2021 program participants 204

Vanpool Component

Vanpool program participants (FY 2021-23) 76

Placement Rates – by retention after program ended

Carpool Component

- Continued placement rate 98% (‘Pool Rewards follow-up survey)
- Temporary placement rate 2% (‘Pool Rewards follow-up survey)
- Pre-FY 21 retained placement rate 54% (‘Pool Rewards follow-up survey)

Vanpool Component

- Continued placement rate 100% (‘Pool Rewards NTD vanpool data)
- Temporary placement rate 0% (‘Pool Rewards NTD vanpool data)

Placements

Carpool Component

- Continued placements 99 (FY 21-23 participants x continued placement rate)
- Temporary placements 2 (FY 21-23 participants x temporary placement rate)
- Retained placements 110 (Pre-FY 21 participants x retained placement rate)

Carpool placements 211

Vanpool Component

- Continued placements 76 (Participants x continued placement rate)
- Temporary placements 0 (Participants x temporary placement rate)

Vanpool placements 76

Total 'Pool Rewards placements	287
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Daily Vehicle Trips Reduced

Carpool Component

- Continued VTR factor 0.64 ('Pool Rewards follow-up survey)
- Temporary VTR factor 0.62 ('Pool Rewards logging data for program period)
- Temporary discount 50% (assumes 13 weeks of program + 13 weeks after program)
- Retained VTR factor 0.56 ('Pool Rewards follow-up survey)

- Continued VT reduced 63 (Continued placements x continued VTR factor)
- Temporary VT reduced 1 (Temporary placements x temporary VTR factor x 50% credit for temporary use)
- Retained VT reduced 62 (Retained placements x retained VTR factor)

Carpool VT Reduced 126

Vanpool Component

- Continued VTR factor 1.56 ('Pool Rewards NTD vanpool data)
- Temporary VTR factor N/A ('Pool Rewards NTD vanpool data)
- Temporary discount N/A (No temporary vanpools)

- Continued VT reduced 119 (Continued placements x continued VTR factor)
- Temporary VT reduced 0 (Temporary placements x temporary VTR factor x 50% credit for temporary use)

Vanpool VT Reduced 119

Total Daily Vehicle Trips Reduced	245
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Daily VMT Reduced

Carpool Component

- Ave cont/temp one-way trip dist (mi) 22.8 ('Pool Rewards follow-up survey)
- Ave retained one-way trip dist (mi) 24.7 ('Pool Rewards follow-up survey)
- Continued/Temp VMT reduced 1,459 (Continued VT reduced x continued trip distance)
- Retained VMT reduced 1,531 (Retained VT reduced x retained trip distance)

Carpool VMT Reduced 2,990

Vanpool Component

- Ave continued one-way trip dist (mi) 35.0 ('Pool Rewards NTD vanpool data)
- Ave temporary one-way trip dist (mi) N/A (No temporary vanpools)
- Continued VMT reduced 4,165 (Continued VT reduced x continued trip distance)
- Temporary VMT reduced 0 (Temporary VT reduced x temporary trip distance)

Vanpool VMT Reduced 4,165

Total Daily VMT Reduced	7,155
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Trip and VMT Adjustment for SOV Access to HOV Modes (reduce VT and VMT for AQ analysis)

- SOV access percentage (carpool) 69% (SOC survey)
- SOV access percentage (vanpool) 86% (Placement survey)
- SOV access distance (mi) (carpool) 6.0 (SOC survey)
- SOV access distance (mi) (vanpool) 7.0 (Placement survey)

Adjusted VT Reduction

Carpool Component

- SOV access VT 87 (Total VT x SOV access %)
- **VT with no SOV access 39** (Total VT – SOV access VT)

Vanpool Component

- SOV access VT 102 (Total VT x SOV access %)
- **VT with no SOV access 17** (Total VT – SOV access VT)

Adjusted VMT Reduction

Carpool Component

- SOV access VMT 522 (Total VT x SOV % x 6.0 mi access distance)
- **VMT with no SOV access 2,468** (Total VMT – SOV access VMT)

Vanpool Component

- SOV access VMT 714 (Total VT x SOV % x 7.0 mi access distance)
- **VMT with no SOV access 3,451** (Total VMT – SOV access VMT)

Total VT for AQ analysis 56

Total VMT for AQ analysis 5,919

PART 3 – COMMUTERCASH (FORMERLY INCENTRIP) PROGRAM

Populations of Interest

Number of active registrants	3,587	
% also registered in GRH	55%	(Credit for these registrants is counted in GRH)
Adjusted base without GRH	1,614	
% who logged commute trips	81%	
Adjusted base for commute impacts	1,307	

Placement Rates and Placements

• Continued placement rate	42.9%	(CC placement survey)
• Temporary placement rate	16.9%	(CC placement survey)
• Continued placements	561	(Registrants x continued placement rate)
• Temporary placements	221	(Registrants x temporary placement rate)

Total Placements	782
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Daily Vehicle Trips Reduced

• Continued VTR factor	0.38	(CC placement survey)
• Temporary VTR factor	0.38	(CC placement survey)
• Temporary discount	20.0%	(CC placement survey)
• Continued vehicle trips reduced	213	(Registrants x continued placement rate)
• Temporary vehicle trips reduced	17	(Registrants x temporary placement rate x temp discount)

Total Daily Vehicle Trips Reduced	230
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Daily VMT Reduced

• Continued distance (mi)	18.6	(CC placement survey)
• Temporary distance (mi)	18.6	(CC placement survey)
• Continued VMT reduced	3,962	(Registrants x continued placement rate)
• Temporary VMT reduced	316	(Registrants x temporary placement rate x temp discount)

Total Daily VMT Reduced	4,278
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SUMMARY OF PARTS 1, 2, 3

Travel Impacts

	<u>Total 1,2,3</u>	<u>Direct Ads</u>	<u>'Pool Rewards</u>	<u>incenTrip</u>
Placements (ongoing)	10,042	8,973	287	782
Vehicle Trips Reduced	2,276	1,801	245	230
VMT Reduced (miles)	49,254	37,821	7,155	4,278
Air Quality Adjusted VT / VMT				
Vehicle Trips Reduced	1,673	1,387	56	230
VMT Reduced (miles)	46.942	36,745	5,919	4,278

Emissions Reduced – NOx (Daily), VOC (Daily) and CO2 (Annual)

NOx	Trips	23 Emission Factor	VMT	23 Emission Factor	Tot gm	Tot ton
• From Starts	1,673	0.9596			1,605	0.0018
• From Running			49,254	0.1501	7,393	<u>0.0081</u>
Total NOx reduced (tons)					Daily	0.0099

VOC	Trips	23 Emission Factor	VMT	23 Emission Factor	Tot gm	Tot ton
• From Starts	1,673	2.1585			3,611	0.0040
• From Running			49,254	0.0575	2,832	<u>0.0031</u>
Total VOC reduced (tons)					Daily	0.0071

CO2	Trips	23 Emission Factor	VMT	23 Emission Factor	Tot gm	Tot ton
• From Starts	1,673	208.68			349,122	0.3848
• From Running			49,254	348.43	17,161,571	<u>18.9174</u>
Total CO2 reduced (tons)					Daily	19.3022

Annual 4,825.6

PART 4 - BIKE-TO-WORK DAY CREDIT

Participants' riding percentage and frequency

Number of riders	14,265	(BTWD registration data, 2020, 2021 and 2022 adjusted for some participation in previous year)
% biking to work before event	85.9%	(BTWD survey)
% new riders	6.5%	(BTWD survey)
Number of new riders	927	
% who increase riding days	15.3%	(BTWD survey)
Number of increased riders	2,183	
Total placements	3,110	(Total new + increased riders)

Change in Bike Days

Summer Biking

% new riders in summer	5.4%	(BTWD survey)
Weekly new bike days summer	1.1	(BTWD survey)
Weekly new bike days summer summer)	847	(total riders x % new ride summer x ave days biking summer)
% increased riders in summer	13.3%	(BTWD survey)
Weekly increased bike days summer	1.6	(BTWD survey)
Weekly increased bike days summer	3,036	(total riders x % inc ride summer x ave days biking summer)

Winter Biking

% new riders biking winter	5.1%	(BTWD survey)
Weekly new bike days winter	1.0	(BTWD survey)
Weekly new bike days winter	728	(total riders x % new ride winter x ave days biking winter)
% increased riders biking winter	10.9%	(BTWD survey)
Weekly increased bike days winter	1.6	(BTWD survey)
Weekly increased bike days winter	2,488	(total riders x % incr ride winter x ave days biking winter)

Additional Bike Days (New and Increased Riding)

• NEW/INC bike days summer	3,883	(weekly new and increased bike days summer)
• NEW/INC bike days fall-winter	3,216	(weekly new and increased bike days winter)
• Total additional bike days summer	108,724	(new/inc weekly summer days x 28 weeks – Apr-Oct)
• Total additional bike days winter	70,752	(new/inc weekly winter days x 22 weeks – Nov-Mar)
• Total additional bike days - year	179,476	(summer bike days + winter bike days)
• Additional bike trips - year	358,952	(annual bike days x 2 trips per day)

Additional Bike Trips and Vehicle Trip and VMT Reductions

• Ave new daily bike trips	1,436	(Annual new bike trips / 250)
• % Drive alone/CP/VP on non-bike days	44%	(BTWD survey)

BTWD Daily Vehicle Trips Reduced	632	(daily new bike trips x DA/CP/VP percentage)
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Daily VMT Reduced

• Ave trip distance (mi)	7.8	(BTWD survey)
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BTWD Daily VMT Reduced	4,930	(vehicle trips reduced x average trip distance)
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Emissions Reduced – NO_x (Daily), VOC (Daily) and CO₂ (Annual) – Bike-to-Work Day

NO _x	23 Emission		23 Emission		Tot gm	Tot ton
	Trips	Factor	VMT	Factor		
• From Starts	632	0.9596			606	0.0007
• From Running			4,930	0.1501	740	<u>0.0008</u>
Total NO_x reduced (tons)					Daily	0.0015

VOC	23 Emission		23 Emission		Tot gm	Tot ton
	Trips	Factor	VMT	Factor		
• From Starts	632	2.1585			1,364	0.0015
• From Running			4,930	0.0575	283	<u>0.0003</u>
Total VOC reduced (tons)					Daily	0.0018

CO ₂	23 Emission		23 Emission		Tot gm	Tot ton
	Trips	Factor	VMT	Factor		
• From Starts	632	208.68			131,886	0.145
• From Running			4,930	348.43	1,717,760	<u>1.894</u>
Total CO₂ reduced (tons)					Daily	2.039
					Annual	509.8

PART 5 – REFERRED INFLUENCE (COMMUTER OPERATIONS CENTER)

Mass Marketing received a 2.2% portion of the impacts calculated for the Commuter Operation Center. This credit recognized that 20% of commuters who were new COC applicants and made a commute change reported in the Applicant Placement survey that they learned of Commuter Connections through a Mass Marketing advertisement or action. New applicants accounted for 11.0% of the total COC applicants (Excluding Retained Past applicants). This calculation resulted in 2.2% of the COC credit being assigned to Mass Marketing (11.0% new apps x 20% influence).

Populations of Interest: Commuters influenced by ads to contact CC

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

- FY 2021 918 (CC database)
- FY 2022 2,134 (CC database)
- FY 2023 2,563 (CC database)

Total new applicants 5,615

Total CC applicants 51,018 (includes new, re-apply, and follow-up)

Populations of Interest – commuters influenced by ads to contact CC

New apps FY 2021-23 as % of total	11.0%	(new apps FY 2021-23 / total CC apps)
% influenced by ads to contact CC	20.0%	(COC applicant analysis; 2020 Applicant placement survey)
% ALL apps influenced by ads	2.2%	(11.0% new apps x 20.0% influenced by ads)

COC Impacts – MM Share (2.2% of total COC base for each impact below)

<u>Travel Impacts</u>	COC Base[^]	MM Share
• COC placements	28,756	633
• COC Vehicle trips reduced	6,209	137
• COC VMT reduced	143,428	3,155
<u>Emissions Impacts</u>	COC Base[^]	MM Share
• NOx reduced (daily tons)	0.0276	0.0006
• VOC reduced (daily tons)	0.0196	0.0004
• CO2 reduced (annual tons)	13,488.9	296.8

[^] COC Base included only FY 2021-FY 2023 impacts; it excludes retained credit

PART 6 – REFERRED INFLUENCE TO GRH – FROM GRH ANALYSIS

About 8% of the FY 2021–FY 2023 GRH impacts were assigned to Mass Marketing to recognize that 26% of new GRH applicants were influenced to apply for GRH after hearing a Mass Marketing advertisement. These new applicants accounted for 47% of the total GRH applicants (Reapply + New) during FY 21-23. Impacts generated through Retained GRH users (35% of total GRH impacts) were excluded from the base. This calculation resulted in 8% of the GRH credit being assigned to Mass Marketing (47% x 26% new apps x 65% non-retained impacts).

Total GRH apps FYs 21, 22, 23	3,308	
New GRH apps FYs 21, 22, 23	1,568	47%
Estimated MM share of new GRH	26%	
FY 2021-23 VMT as % of total VMT	65%	(Exclude Retained credit from discount)
Estimated MM share of GRH impact	8%	(47% of total applicants x 26% MM credit-new applicants x 65% new/reapply)

GRH Impacts – MM Share (6% of total GRH base for each impact below)

<u>Travel Impacts</u>	GRH Base~	MM Share
• GRH placements	1,392	111
• GRH Vehicle trips reduced	1,296	104
• GRH VMT reduced	35,769	2,862
<u>Emissions Impacts</u>	GRH Base~	MM Share
• NOx reduced (daily tons)	0.0060	0.0005
• VOC reduced (daily tons)	0.0037	0.0003
• CO2 reduced (annual tons)	3,105.7	248.5

~ GRH Base included only FY 2021-FY 2023 impacts; it excludes retained credit

MASS MARKETING – SUMMARY

TOTAL – SUM OF PART 1, PART 2, PART 3, PART 4, PART 5, PART 6

	Total MM	Direct Ad Infl	'Pool Rewards	incenTrip	BTW	COC Credit	GRH Credit
Placements	13,896	8,973	287	782	3,110	633	111
VT reduced	3,149	1,801	245	230	632	137	104
Perc total MM VT		50%	7%	6%	18%	4%	3%
VMT reduced	60,201	37,821	7,155	4,278	4,930	3,155	2,862
Emissions Reduced							
NOx (daily T)	0.0125		0.0099		0.0015	0.0006	0.0005
VOC (daily T)	0.0096		0.0071		0.0018	0.0004	0.0003
CO2 (annual T)	5,880.7		4,825.6		509.8	296.8	248.5

Appendix H Sample Calculation of Commuter Operations Center Impacts

Note: In the 2026 TDM Analysis, results for sample calculations in **Appendix H** (Commuter Operations Center Impacts) and **Appendix I** (Integrated Rideshare Impacts) will be combined into an aggregated summary of Commuter Program Operations impacts.

PART 1 – Commute Information Requests

Populations of Interest – Commuter Connections Rideshare Applicants

FY 2021-23 Applicant Base (New credit) New, Reapply, Transit/other, follow-up requests

• FY 2021	16,762	(CC database)
• FY 2022	17,317	(CC database)
• FY 2023	<u>16,939</u>	(CC database)

New FY 2021-23 assisted commuters **51,018**

Pre-FY 2021 Applicant Base (Retained credit)

• Applicants Pre-FY 2021	14,639	(CC database)
• Valid contact percentage	63%	(Retention rate survey)
• Est percentage NOT full-time TW	70%	(Retention rate survey)

Retained Pre-FY 2018 applicant base **6,456**

Distribution of In/Out NAA

FY 2021-23 Applicant Base (New)

Within NAA	45%	22,958	(Commuter Connections placement survey)
Outside NAA	55%	28,060	(Commuter Connections placement survey)

Pre-FY 2018 Applicant Base (Retained)

Within NAA	45%	2,905
Outside NAA	55%	3,551

COC Placement Rates and Placements

(NAA applicant base x NAA placement rate; calculated for continued, temporary, and retained cases)

FY 2021-23 Applicants (New)	PI Rate	Placements	
• Within NAA – continued rate	44.5%	10,216	(Commuter Connections placement survey)
• Within NAA – temporary rate	11.7%	2,686	(Commuter Connections placement survey)
• Outside NAA – continued rate	42.9%	12,038	(Commuter Connections placement survey)
• Outside NAA – temporary rate	13.6%	3,816	(Commuter Connections placement survey)

Pre-FY 2021 Registrants (Retained)

• Within NAA – continued rate	14.3%	415	(Retention rate survey)
• Outside NAA – continued rate	14.3%	508	(Retention rate survey)

Total Placements	29,679
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VTR Factors and Daily Vehicle Trips Reduced (continued only)

(NAA cont placement x NAA cont VTR factor); (NAA temp placement x NAA temp VTR factor x temp discount)

FY 2021-23 Applicants (New)	VTR Factor	VT Reduced	
• Temporary discount	20.0%		
• Within NAA – continued VTR factor	0.23	2,350	(Commuter Connections placement survey)
• Within NAA – temporary VTR factor	0.50	269	(Commuter Connections placement survey)
• Outside NAA – continued VTR factor	0.25	3,010	(Commuter Connections placement survey)
• Outside NAA – temporary VTR factor	0.76	580	(Commuter Connections placement survey)
Pre-FY 2018 Applicants (Retained)			
• Within NAA – continued VTR factor	0.80	332	(Retention rate survey)
• Outside NAA – continued VTR factor	0.80	406	(Retention rate survey)
Total Daily Vehicle Trips Reduced		6,947	

Commute Distance and Daily VMT Reduced

(VMT reduced is calculated as number of vehicle trips reduced x one-way travel distance; individual calculations are performed for continued, temporary, and retained placements and for both Within the NAA and Outside the NAA)

FY 2021-23 Applicants (New)

Distances in miles derived from Commuter Connections placement survey

	O-W Dist	VMT Reduced	
• Within NAA - continued distance	23.1	54,285	
• Within NAA – temporary distance	23.1	6,214	
• Outside NAA – continued distance	23.1	69,531	(Actual outside distance 49.0 miles)
• Outside NAA – temporary distance	23.1	13,398	(Actual outside distance 49.0 miles)

Pre-FY 2018 Applicants (Retained)

Distances in miles derived from Commuter Connections placement survey

• Within NAA – continued distance	19.6	6,507
• Outside NAA – continued distance	19.6	7,958
Total Daily VMT Reduced		157,893

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

FY 2021-23 Applicants (New)

<u>Inside NAA</u>	<u>Cont</u>	<u>Temp</u>
• SOV access percentage	64%	64% (Placement survey)
• SOV access distance (mi)	3.1	3.1 (Placement survey)

Outside NAA (N/A - all access VT and VMT occur outside NAA)

Pre-FY 2021 Applicants (Retained)

	<u>Cont</u>	
• SOV access percentage	70%	(Retention survey)
• SOV access distance (mi)	4.6	(Retention survey)

Adjusted VT Reduction – net of drive alone access

(Calculated as Within NAA VTs x SOV access % for continued, temporary, and retained placements)

• Total VT reduced	6,947	Calculated above
• Within NAA access VT (deduct)	- 1,908	(Total SOV access VTs for cont, temp, retained cases)
• Outside NAA access VT	<u>0</u>	No deduction (access trips are outside NAA)

Total VT (net of SOV access) 5,039

Adjusted VMT Reduction – net of VMT access

• Total VMT reduced	157,893	Calculated above
• Within NAA access VMT (deduct)	- 6,262	(Total SOV access VMTs for cont, temp, retained cases)
• Outside NAA access VMT	<u>0</u>	No deduction (access VMT are outside NAA)

Total VMT (net of SOV access) 151,631

Total VT for AQ analysis 5,039

Total VMT for AQ analysis 151,631

Emissions Reduced – NOx (Daily), VOC (Daily) and CO2 (Annual)

NOx	23 Emission			23 Emission		
	Trips	Factor	VT	Factor	Tot gm	Tot ton
• From Starts	5,039	0.9596			4,835	0.0053
• From Running			151,631	0.1501	22,760	<u>0.0251</u>
Total NOx reduced (tons)					Daily	0.0304

VOC	23 Emission			23 Emission		
	Trips	Factor	VT	Factor	Tot gm	Tot ton
• From Starts	5,039	2.1585			10,877	0.0120
• From Running			151,631	0.0575	8,719	<u>0.0096</u>
Total VOC reduced (tons)					Daily	0.0216

CO2	23 Emission			23 Emission		
	Trips	Factor	VT	Factor	Tot gm	Tot ton
• From Starts	5,039	208.68			1,051,539	1.159
• From Running			151,631	348.43	52,832,789	<u>58.238</u>
Total CO2 reduced (tons)					Daily	59.397
					Annual	14,849.3

Correction for Overlap between COC Base and Other Program Elements

The COC supports several other TDM program elements, including Mass Marketing, Software Upgrades, GRH, incenTrip, and portions of the COC base impact are deducted from the COC and assigned to those program elements. Details of the determination of each credit are presented in the relevant appendices. The “Net COC Base” is calculated as the initial/total COC base minus the sum of credits for Mass Marketing, Software Upgrades, GRH, and incenTrip.

	COC Base	MM	Soft Upg	GRH	incenTrip	Net COC Base
Placements	29,679	633	3,596	8,904	227	16,319
Vehicle Trips Reduced	6,947	137	669	2,084	67	3,990
VT Reduced (miles)	157,893	3,155	15,454	47,368	1,241	90,675
Emissions Reduced						
NOx Reduced (daily tons)	0.0304	0.0006	0.0030	0.0091	0.0003	0.0174
VOC Reduced (daily tons)	0.0216	0.0004	0.0022	0.0065	0.0003	0.0122
CO2 (annual tons)	14,849.3	296.8	1,468.8	4,454.8	163.2	8,465.7

Notes:

- MM influenced commuters – from MM analysis (see Appendix 7)
- Share of COC assigned to GRH = 30% of COC credit; calculated as the share of COC apps that were new apps/reapps (42%) and who registered for GRH (72%) = $(72\% \times 42\% = 30\%)$. The GRH credit is not added to the GRH impact; rather it is assumed to be an overlap and is deducted from the COC impact to avoid duplication.
- Software Upgrade component is calculated in Appendix 8.
- Share of incenTrip that overlaps with COC (subtracted from COC base) = 29%; percentage of incenTrip users who also registered for COC (2020 Applicant Placement Rate survey)

PART 2 – Telework Credit (Non-Maryland origin / destination)

- Credit for telework assistance provided directly to commuters who do not live or work in Maryland; credit for Maryland residents/workers is assigned to the Telework Assistance program element

NOTE: Calculation details for the Non-Maryland Telework credits below are shown in Appendix 4 (Telework)

Number of regional teleworkers	2,136,576	(State of Commute survey)
% of non-MD teleworkers	57%	(% of regional TWers who live and work outside MD)
Number of teleworkers (non-MD)	1,211,439	
Share of TW credited to COC	4.4%	(% of TWers used TW from Commuter Connections)

Total TW placements credited to COC	53,303
Vehicle trips reduced	15,058
VMT reduced	207,288

Daily NOx reduced (tons)	0.0502
Daily VOC reduced (tons)	0.0489
Annual CO2 reduced (tons)	20,769.8

Final Commuter Operations Center Credit – Including Base COC and Telework Credit

Net COC = Net COC Base + Non-MD TW

	Net COC Base	Non-MD TW	Net COC
Placements	16,319	53,303	69,622
Vehicle Trips Reduced	3,990	15,058	19,048
VMT Reduced (miles)	90,675	207,288	297,963
Emissions Reduced			
NOx Reduced (daily tons)	0.0174	0.0502	0.0676
VOC Reduced (daily tons)	0.0122	0.0489	0.0611
CO2 (annual tons)	8,465.7	20,769.8	29,235.5

Appendix I Sample Calculation of Integrated Rideshare (Software Upgrades) Impacts

Note: In the 2026 TDM Analysis, results for sample calculations in **Appendix H** (Commuter Operations Center Impacts) and **Appendix I** (Integrated Rideshare Impacts) will be combined into an aggregated summary of Commuter Program Operations impacts.

Populations of Interest – Commuter Connections Rideshare Applicants

All data factors (Placement rate, VTR factors, trip distances) derived from Applicant Placement survey

Populations of Interest – Commuter Connections Rideshare Applicants

FY 2021-23 Applicant Base (New credit) New, Reapply, Transit/other, follow-up requests

• FY 2021	16,762	(CC database)
• FY 2022	17,317	(CC database)
• FY 2023 (through Dec 2022)	<u>16,939</u>	(CC database)

New FY 2021-23 assisted commuters 51,018

Within NAA (45%) 22,958

Outside NAA (55%) 28,060

COC Placement Rates

	In NAA	Out NAA	
• Continued rate	2.9%	4.1%	(CC placement survey)
• Temporary rate	3.6%	3.4%	(CC placement survey)

Placements (Continued and Temporary; In NAA and Outside NAA)

• Continued	666	1,150	(Applications x continued rate)
• Temporary	826	954	(Applications x temporary rate)

Total placements	3,596
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Daily Vehicle Trips Reduced (Continued and Temporary; In NAA and Outside NAA)

VTR Factors

	In NAA	Out NAA	
• Continued	0.23	0.25	(CC placement survey)
• Temporary	0.50	0.76	(CC placement survey)
• Temporary discount	20.0%	20.0%	(CC placement survey)

• Continued trips reduced	153	288	(Placements x cont. VTR factor)
• Temporary trips reduced	83	145	(Placements x temp VTR factor x temp discount)

Total VT reduced	669
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Daily VMT Reduced (Continued and Temporary; In NAA and Outside NAA)

Ave one-way trip distance (mi)	In NAA	Out NAA	
• Continued	23.1	23.1	(Actual Outside dist. 49.0 miles)
• Temporary	23.1	23.1	(Actual Outside dist. 49.0 miles)
• Continued VMT reduced	3,534	6,653	(Cont VT x ave trip distance)
• Temporary VMT reduced	1,917	3,350	(Temp VT x ave trip distance)
Total VMT Reduced	15,454		

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

	In NAA	Out NAA	
• SOV access % -Continued	64%	0%	(CC placement survey)
• SOV access dist (mi) – Continued	3.1	0.0	(CC placement survey)
• Non-SOV access % - Temporary	64%	0%	(CC placement survey)
• SOV access dist (mi) – Temporary	3.1	0.0	(CC placement survey)

Outside NAA – not applicable – all access outside NAA

VT Reduction	In NAA	Out NAA	
• Continued SOV access VT	98	0	(Total cont VT x SOV access)
• Temporary SOV access VT	53	0	(Total temp VT x SOV access)
• Continued VT (without SOV access)	55	288	(Total cont VT – SOV access VT)
• Temporary VT (without SOV access)	30	145	(Total temp VT- SOV access VT)
Total VT (net of SOV access)	518		

VMT Reduction	In NAA	Out NAA	
• Continued SOV access VMT	304	0	(Total cont VT x SOV % x access dist)
• Temporary SOV access VMT	164	0	(Total temp VT x SOV % x access dist)
• Continued VMT (without SOV access)	3,230	6,653	(Total cont VMT- SOV access VMT)
• Temporary VMT (without SOV access)	1,753	3,350	(Total temp VMT- SOV access VMT)
Total VMT (net of SOV access)	14,986		

Total VT for AQ analysis 518

Total VMT for AQ analysis 14,986

Emissions Reduced – NOx (Daily), VOC (Daily) and CO2 (Annual)

NOx	23 Emission			23 Emission		Tot gm	Tot ton
	Trips	Factor	VT	Factor			
• From Starts	518	0.9596				497	0.0005
• From Running			14,986	0.1501		2,249	<u>0.0025</u>
Total NOx reduced (tons)						Daily	0.0030

VOC	23 Emission			23 Emission		Tot gm	Tot ton
	Trips	Factor	VT	Factor			
• From Starts	518	2.1585				1,118	0.0012
• From Running			14,986	0.0575		862	<u>0.0010</u>
Total VOC reduced (tons)						Daily	0.0022

CO2	23 Emission			23 Emission		Tot gm	Tot ton
	Trips	Factor	VT	Factor			
• From Starts	518	208.68				108,096	0.119
• From Running			14,986	348.43		5,221,572	<u>5.756</u>
Total CO2 reduced (tons)						Daily	5.875
						Annual	1,468.8

Appendix J Sample Calculation of Societal Benefits Generated by TDM Program Impacts

TDM programs provide benefits to residents and commuters in societal objectives such as greenhouse gas emissions reductions, greater mobility, improved road safety, and enhanced transportation system performance. These benefits have joined congestion and air quality as forces shaping the region's transportation policies, making them also issues relevant to Commuter Connections partners and funders. Documenting the types and magnitude of these benefits demonstrates the broad value of Commuter Connections programs to the community and the value of investments made in the programs. Documenting these contributions also supports the regional response to the federally-mandated, performance-based planning and programming (PBPP) process required of states and MPOs. Under this requirement, COG must track a variety of performance indicators related to transportation system performance, such as hours of peak hour excessive roadway delay.

The FY 2021–FY 2023 TDM evaluation included an analysis component to estimate regional cost savings generated for selected societal benefits of the TDM program elements' travel and emissions impacts. These benefits include the following:

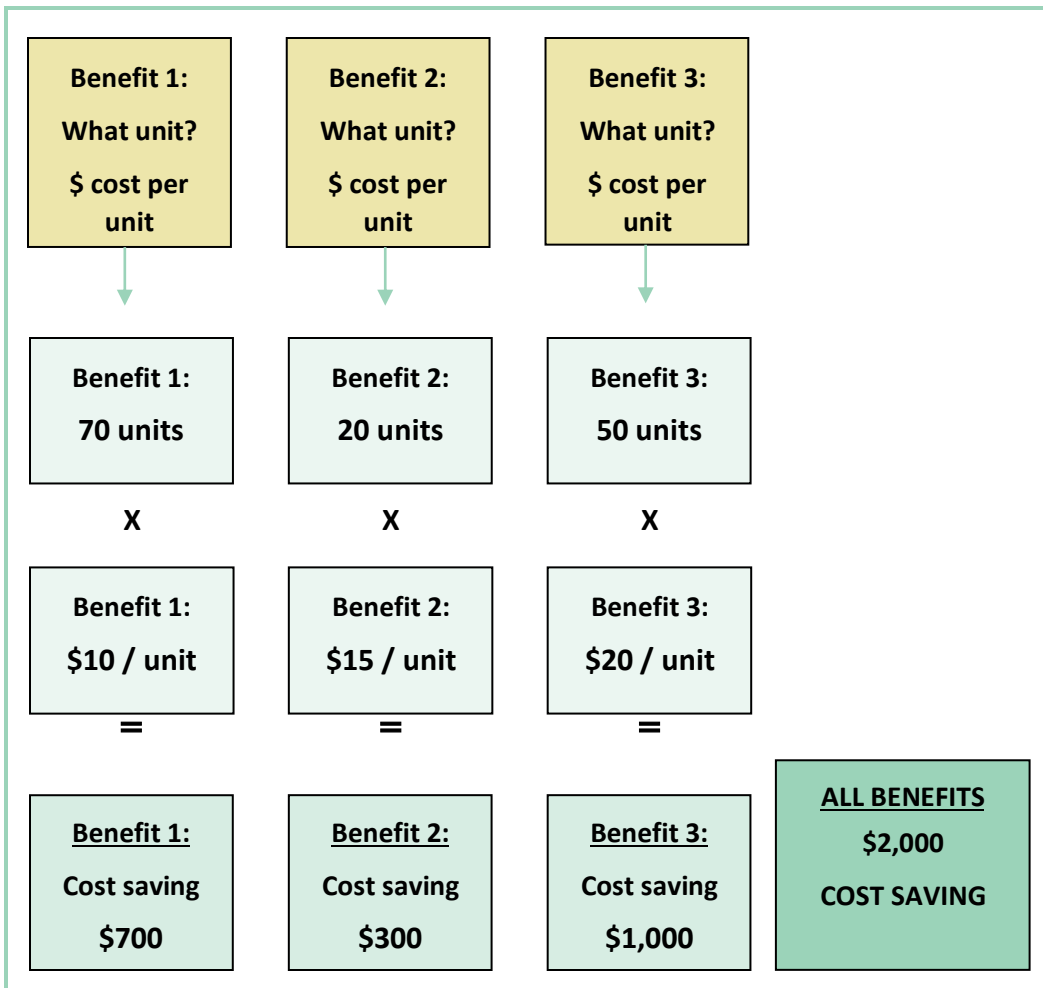
- Air pollution/emissions reductions in NO_x and VOC
- Greenhouse gas emissions (CO₂) reduction
- Reduction in congestion (reduced hours of travel delay)
- Reduction in fuel consumption (gasoline cost saving)
- Improved road safety (crashes reduced per 1 million VMT)
- Noise pollution reduction (reduced motor vehicle noise)

Figure 6 shows the basic method for calculating societal cost savings. The approach requires defining the unit of benefit associated with each type of benefit and cost per unit of benefit. The calculation then multiplies the benefit units by a unit cost factor and sums the individual benefit cost savings for a total across all benefits.

Define Units of Benefits and Cost Saving per Benefit Unit – First, the analysis must define a unit measure that represents performance for each benefit. For example, the benefit unit for traffic congestion reduction is the vehicle hours of peak period travel delay reduced and the unit of benefit for reduction in fuel consumption is gallons of gasoline saved (not used). The analysis also must define for each benefit the financial value, or societal cost saving, that a unit of benefit provides. For travel delay reduction, the unit cost is typically a value of time equal to an hourly wage rate. For fuel consumption saving, the unit cost would be the average cost of a gallon of gasoline.

Calculate Total Benefit Units – After the benefit units have been defined, the analysis calculates the number of units of benefits generated. The method to calculate units of benefit is specific to the benefit, so the methods can vary by benefit, but in this TDM analysis, all are derived from some measure of travel behavior impact, such as reductions in vehicle trips and/or vehicle miles traveled (VMT).

Figure 6: Example Calculation of Societal Benefits Cost Savings for Three Benefits



Continuing the example of travel delay reduction, the analysis calculates the number of hours of travel delay that the TDM program element eliminated. This count is made by estimating the VMT removed from congested roadway segments, then dividing that VMT count by a conversion factor of hours of delay reduced per 1,000 daily VMT. Other benefits have similar but unique formulas to convert travel changes into benefit units. These conversion methods are described later in this appendix.

Calculate Cost Saving for Each Benefit and Total Cost Saving – The societal cost saving for each benefit is then calculated by multiplying the number of benefit units by the cost saving per unit factor. The cost saving for delay reduction would be calculated by multiplying the hours of travel delay reduced by the average wage rate for workers in the region. Similar calculations are made for the other benefits in the TDM analysis, then the cost savings for individual benefits are summed to calculate the total cost saving for all benefits together. For most benefits, the method used to derive the units of benefit and the unit cost factors were obtained from the Trip Reduction Impacts of Mobility Management Strategies (TRIMMS™) 4.0 model developed by the Center for Urban Transportation Research (CUTR). TRIMMS™ estimates societal cost saving benefits of TDM actions for the societal benefits shown above.

AIR POLLUTION/EMISSIONS REDUCTIONS AND GREENHOUSE GAS REDUCTIONS

Air pollution has various adverse societal consequences for human health and for physical impacts on the environment. Health research has documented links between increased levels of pollution and higher levels of respiratory and cardiopulmonary illness, with the greatest risk and incidence occurring among children, the elderly, and people with related diseases. Air pollution also can have negative environmental impacts, through reduced visibility, and damage to agricultural and forest land. Motor vehicles contribute to air pollution through pollutants emitted while vehicles are starting and operating. Thus, TDM program elements that reduce vehicle emissions contribute to less polluted air and offer benefits from reduction in the healthcare costs associated with pollution-related illness and costs incurred to repair environmental damages.

The TDM analysis calculates the societal cost of two air quality pollutants: nitrogen oxides (NO_x) and volatile organic compounds (VOC). These pollutants are strongly associated with the health and environmental damage and with motor vehicle operation.

The TDM analysis also calculates the societal cost for greenhouse gas emissions, defined as tons of carbon dioxide (CO₂). Its environmental role is like that of other air pollutants, in that motor vehicle emissions are a primary contributor to the problem, but unlike VOC and NO_x emissions, which dissipate relatively quickly, greenhouse gas emissions accumulate over time in the atmosphere, effecting a cumulative increase in the average global temperature. A warming planet presents potentially serious and long-term environmental consequences, including more extreme drought but also more extreme storms, rising sea level that threatens coastal lands, and the loss of arctic sea ice and the ecosystems that rely on it, among other concerns.

The societal cost for emission reduction can be calculated by estimating the tons of pollutant emitted and multiplying by the societal cost of one ton of pollutant. For example, the equation for NO_x cost saving would be:

$$\text{Cost saving for NO}_x \text{ reduction} = ((\text{VMT reduced} \times \text{gm/mi NO}_x \text{ emission factor}) + (\text{VTrips reduced} \times \text{gm/trip NO}_x \text{ factor})) / \text{gm per ton conversion factor} \times \$ \text{ cost per tons NO}_x \text{ reduced}$$

Calculating Benefit Units and Cost per Unit of Benefit – The emission factors are related to the types and ages of vehicles being operated and the speed and other conditions of travel and will vary by metropolitan region. They are most accurately derived through runs of emission models, such as the Environmental Protection Agency’s MOVES (Motor Vehicle Emission Simulator) model used by MWCOG, which considers the types and ages of vehicles, the speed and operating conditions experienced by travelers, and atmospheric conditions, each of which can affect emission rates.

The dollar costs per ton of pollutant applied in the TDM analysis are taken from CUTR’s TRIMMS™ model. As described in the TRIMMS™ User Manual (Version 4.0), TRIMMS™ uses costs associated with damage to health, visibility, and physical impact on the environment. TRIMMS™ “adopted the costs estimates of Delucchi, who estimated costs for several impact categories for urban areas of the U.S. in 1991. Delucchi updated the original values in 2005 to account for changes in information about pollution and its effects. He customizes these estimates by using regional exposure scalars to get from the average exposure basis in U.S. urban areas to the average exposure in each of the metropolitan statistical areas.

According to Delucchi, population density is the best simple measure of exposure to air pollution. The original 2005 \$/Kg are converted to current dollar values using the consumer price index (CPI). These estimates are scaled to each individual region using the ratio of median household income of each area to the U.S. median household income.¹⁵

Cost Saving Calculation – TRIMMS™ methodology estimates benefits for various air pollution emissions. The model calculates emissions by multiplying exhaust tailpipe emission rates generated from the EPA Agency Motor Vehicle Emission Simulator (MOVES2010a) in grams per mile to the VMT reduced. But, because the TDM analysis estimates emissions using locally-specific emission factors derived by MWCOG or the regional conformity determination, the evaluation team calculated emission reductions outside of the TRIMMS™ model, but then applied the default daily costs per day by pollutant to the TDM emissions estimates to calculate air pollution societal benefit costs. The relevant emissions calculations are presented in **Table 4**. The daily benefit cost saving for all air pollutant components combined is \$787 per day, comprised of \$737 per day from NOx and \$50 per day from VOC. The daily cost saving for greenhouse gas reductions, defined by a benefit unit of tons of CO2 reduced, equals \$30,078 saved per day.

Table 4: Daily Air Pollution and Climate Change Societal Benefit Cost Savings Generated by FY 2021–FY 2023 TDM Program Elements and Commuter Operations Center Impacts

Societal Benefit	Benefit Unit	Benefit Base Units ¹⁾	Cost per Unit of Benefit ²⁾	Total Daily Cost Saving
Air pollution				
- Nox	Tons NOx removed	0.457 T	\$1,612	\$737
- VOC	Tons VOC removed	0.375 T	\$133	\$50
Total air pollution				\$787
Greenhouse gas	Tons CO2 removed	836.0 T	\$36	\$30,096

1) Daily tons of emissions reduced calculated in TDM analysis using MWCOG emission factors.

2) Cost per tons of emissions reduced obtained from TRIMMS™.

NOISE POLLUTION REDUCTION

The societal benefit for noise pollution reduction is related to the reduced noise associated with the vehicle travel that has been eliminated from the roadway. Noise costs refer to negative externalities associated with motor vehicle noise emissions such as noise from engine acceleration and vibration, tire contact on road surfaces, and horn usage. Traffic noise is an annoyance, but has real health effects from impaired hearing, increased stress, and sleep disruption, and can contribute to

¹⁵ TRIMMS™ User Manual, Version 4.0, Center for Urban Transportation Research, USF.

reduction in property values in areas with high or sustained noise levels. An analysis of cost saving from noise pollution reduction estimates how much noise will be reduced and multiplies that reduction by a unit cost factor that represents the cost of abatement for that noise level.

$$\begin{aligned} \text{Cost saving for noise reduction} &= \text{Total VMT reduced} \\ &\quad \times \text{Noise reduction per VMT reduced} \\ &\quad \times \$ \text{ cost per adjusted VMT} \end{aligned}$$

Calculating Benefit Units and Cost per Unit of Benefit – The TDM analysis applies the approach and benefit unit and unit cost factors from the TRIMMS™ model. TRIMMS™ applies a unit benefit factor of 1.0 to convert total VMT reduced to a noise reduction component. It then multiplies the adjusted VMT by a noise costs of \$0.022692 per mile for auto and vanpool and \$0.115205 per mile for transit (derived from a literature review) to estimate the societal cost savings. The composite cost of \$0.0223, which includes both health and property value impacts is scaled to account for cost-of-living differentials between national averages and the Washington metropolitan region.

This calculation estimates a total cost saving for noise pollution reduction of \$48,365 per day, as shown below:

Total daily VMT reduced by TDM program elements = 2,168,829

Noise pollution daily cost saving = 2,168,829 x \$0.0223 per VMT = **\$48,365 per day**

CONGESTION (DELAY) REDUCTION

A third societal benefit is cost savings from reductions in traffic congestion. Traffic congestion slows the flow of traffic, resulting in slower travel speeds and longer trip times. Longer trips create societal dis-benefit primarily through lower business productivity, reduced access to the workforce, and loss of personal time for travelers who travel in congested conditions. The impact of traffic congestion typically is defined by the additional travel time or travel delay experienced by vehicle operators. When TDM programs remove vehicles and VMT from congested segments of road, travel speeds on those road segments increase, resulting in shorter trip times and less delay. Because the Commuter Connections TDM analysis assesses benefits related to commuting travel, the benefit unit assigned to traffic congestion in the analysis is reduced vehicle hours of peak period travel delay.

The approach used to estimate vehicle hours of delay reduction estimates the percentage share of the TDM program elements' total VMT reduced that would have traveled on congested roadways and applies a per VMT delay factor to the reduced VMT to estimate the reduced hours of delay. For example, if 20% of the VMT reduced would have traveled on congested roadways during the peak period, how many additional hours of travel delay would be expected? The hours of delay reduced are then multiplied by a cost per hour of delay to estimate the total cost saving from reduced congestion.

$$\begin{aligned} \text{Cost saving for reduced congestion} &= \text{Congested VMT reduced} \\ &\quad \times \text{Marginal delay hours per VMT} \\ &\quad \times \$ \text{ cost per hour of delay} \end{aligned}$$

Calculating Benefit Units and Cost per Unit of Benefit – The calculation of “congested VMT” discounted the total VMT reduced to include only miles traveled on Interstate highways and major roadways in the Washington metropolitan region. The method additionally discounted to include only VMT that would have traveled in congested conditions to align with the marginal delay factor used by TRIMMS™ to convert VMT reduced into hours of delay reduction across the regional system. This factor is a national default value of **15.9 hours of marginal delay per 1,000 passenger car equivalent daily VMT**.

The unit cost of an hour of delay, often referred to as the value of travel time savings (VTTS), reflects the opportunity cost of time spent traveling that could be used for other activities. The demand for travel is derived from the benefit of accessing a destination, rather than the travel itself. Thus, time spent traveling has a negative value and a reduction in travel time represents a positive benefit. In its simplest form, the value of travel time saving includes costs to businesses in lost productivity and costs to travelers in lost personal time.

Transportation economic analyses typically value an hour of time saved as a labor wage rate. The VTTS will depend on the traveler, the circumstances of the trips, and the travel alternatives. The U.S. Department of Transportation (USDOT) published Departmental guidance regarding value of time for transportation economic analyses to “assist analysts in developing consistent evaluations of actions that save cost or time in travel.”¹⁶ For commuting, when travelers have a defined and non-discretionary trip purpose (getting to/from work), and for TDM strategies, which most often are available to a wide range of commuters, a cost saving analysis can reasonably approximate VTTS over the working population, using an average hourly wage rate over all commuters. USDOT guidance recommends using a VTTS of 100% of the median hourly wage rate, including benefit costs, for “on-the-clock” local business/ commercial travel and 50% of the median hourly wage rate, excluding benefits, for personal travel.

However, a consideration that is of great relevance to analysis of the TDM program elements is that the value travelers place on a congested minute appears to be different than the value for non-congested time, as much as 1.5 to 2.5 times the value of time spent in uncongested travel, depending on the extent of congestion. A substantial body of transit and mode choice research has documented differential values of in-vehicle travel time, out-of-vehicle wait time, and transfer times for transit. Travelers experience wait time and transfer time as longer than the actual time and experience travel time as shorter than actual time. For example, the USDOT guidance recommends that personal time spent walking or waiting, as is common for the rideshare, transit, bicycle, and walking trips generated by TDM strategies, also be valued at 100% of wage rate.

The average wage rate for the TDM analysis would be a composite rate comprised primarily of the local personal travel value, which would suggest a value closer to 50% than 100% of the local wage rate. However, as noted above, USDOT applies a 100% value to access/wait time for travel in non-drive alone modes, which are the focus of the TDM program elements. Finally, the role of congestion in commuting can be significant, suggesting the wage rate applied should be account be closer to

¹⁶ The U.S. Department of Transportation (USDOT), September 28, 2011, Memorandum Subject: Revised Departmental Guidance on Valuation of Travel Time in Economic Analysis.
https://www.transportation.gov/sites/dot.dev/files/docs/vot_guidance_092811c.pdf

100% than 50%. For simplicity, the TDM analysis uses a single VTTS of 100% of median hourly wage rate, excluding worker benefits. This number was chosen as an approximation because it is readily available from the U.S. Bureau of Labor Statistics.¹⁷

Cost Saving Calculation – The adjusted “major roadway” VMT calculation estimated that 181,169, or about 8.4% of the total VMT reduced by the Commuter Connections TDM program would have traveled on major roadways in congested conditions. When this “congested VMT” total is multiplied by the 15.9 hours of delay per 1000 VMT reduced, the estimated hours of delay reduced by the TDM program equals 2,881 daily hours of delay reduced:

Estimated delay reduction = $(181,341 \text{ mi} / 1,000) \times 15.9 \text{ hours per daily VMT} = \mathbf{2,883 \text{ daily hours delay reduced.}}$

These hours of delay were multiplied by the \$30.43 median hourly wage rate for all employees working in the Washington metropolitan region, as reported by the Bureau of Labor Statistics. When this cost is multiplied by the 2,883 daily hours of delay reduced, the total congestion (delay) reduction benefit equals **\$87,730 per day.**

EXCESS FUEL CONSUMPTION REDUCTION

A reduction in vehicle use results in a direct reduction in the amount of fuel consumed for travel. The TDM analysis defines the societal benefit of reducing fuel use as the cost saved when gallons of fuel are not purchased. Reduced vehicle use also results in other vehicle operating savings, such as reduced vehicle maintenance and depreciation, but these costs are excluded from the analysis. The cost saving for reduction in fuel use is calculated by converting the VMT reduction into gallons of fuel saved and multiplying by an average fuel cost per gallon:

Cost saving for reduced fuel consumption = Total VMT reduced

/ Fuel consumption factor (miles per gallon)

x \$ cost per gallon of fuel

Calculating Benefit Units and Cost per Unit of Benefit – Fuel consumption has a direct relationship with the number of vehicle miles traveled and is commonly defined by dividing the total VMT by the miles per gallon (mpg) fuel consumption rate. Fuel consumption per mile varies by vehicle type and by travel speed and operating conditions. For example, a large sport utility vehicle (SUV) uses more gasoline per mile or per hour than does a small compact car. And vehicles use different amounts of fuel when traveling at slow speeds than high speeds, with higher speeds generally more efficient use of fuel. The societal benefit calculation estimated a weighted average fuel economy by type of vehicle and model year and the percentage of each vehicle type in the national fleet in 2022. This calculation yielded an average of 23.2 miles per gallon fuel efficiency. This factor represents the

¹⁷ U.S. Department of Labor, Bureau of Labor Statistics (BLS) wage data May 2022 – median hourly wage rate for all occupations combined; https://www.bls.gov/oes/current/oes_nat.htm.

average fuel economy of a typical commuting vehicle in the passenger vehicle fleet, including both large and small vehicles, cars, SUVs, and vans and trucks used as commuting vehicles.¹⁸

The gallons of fuel saved by reduced VMT is multiplied by an average cost per gallon of fuel. The U.S. Energy Information Administration publishes average gasoline prices for various parts of the country. Over the three years covered by the evaluation period, the average fuel price reported for the Mid-Atlantic region was \$3.40 per gallon.¹⁹ The result of these calculations is as follows:

Total daily VMT reduced by TDM program elements = 2,168,829

Estimated gallons of fuel saved = 2,168,829 miles / 23.2 miles per gallon = 93,484 gallons

Excess fuel consumption daily cost saving = 93,484 gallons x \$3.40 per gallon = **\$317,846 per day**

The calculation estimates a fuel saving of 93,484 gallons per day and a cost saving from reduction in fuel use of \$317,846 per day.

IMPROVED ROAD SAFETY (CRASH REDUCTION)

A reduction in motor vehicle travel generates a benefit of improved road safety by reducing the likelihood of a motor vehicle crash occurring. Quite simply, as vehicles are removed from a roadway, the remaining vehicles have a reduced risk of crashes. The cost saving from reduced vehicle crashes is equal to the reduced risk of a crash multiplied by the economic cost of the average crash.

The TDM analysis applies the road safety/crash reduction approach from the Health and Safety element of the TRIMMS™ methodology. TRIMMS™ applies expected crash rates for crashes of various severities to estimate an overall crash probability per 1 million VMT. In the TDM analysis, this crash risk factor is multiplied by the total VMT reduced by the TDM program elements to estimate the number of likely crashes by severity that would have been avoided by the reduction in vehicle travel. The number of anticipated crashes is then multiplied by the average cost per crash to estimate the total cost saving:

Cost saving for improved road safety = Total VMT reduced

x Expected crashes per 1,000,000 VMT x \$ cost per crash

Calculating Benefit Units and Cost per Unit of Benefit – The value of reduced crashes is calculated by multiplying the estimated number of crashes by severity by the cost per occurrence of each crash type. TRIMMS™ estimates a composite cost per unit benefit (crash avoided) that includes vehicle crash-related monetary costs for property and personal injury damages caused by collisions, and nonmonetary costs, for pain and loss of productivity. The TRIMMS™ methodology starts with the VMT

¹⁸ Data on production shares and production-weighted fuel economy from the Bureau of Transportation Statistics. <https://www.bts.gov/content/productions-production-shares-and-production-weighted-fuel-economies-new-domestic-and>. Data for percentage of vehicles in the national fleet by model year from Hedges Company; <https://hedgescompany.com/blog/2022/02/how-old-are-cars/>. All data sourced on May 22, 2023.

¹⁹ Weekly Retail Gasoline and Diesel Prices, June 2020. U.S. Energy Information Administration. https://www.eia.gov/dnav/pet/pet_pri_gnd_dcus_r1y_m.htm.

reduction and applies a multi-level calculation that considers the occurrence probability of crashes with varying levels of severity (KABCO Injury Classification Scale)²⁰ and the average cost per type of crash. Crashes with minor property damage have a higher likelihood of occurring but a lower cost per occurrence. Conversely, crashes with serious or fatal injuries are less likely to occur but have a high societal cost when they do happen. **Table 5** shows crash types, occurrence probabilities and anticipated costs. The calculation produces an average composite risk of 1.01136 vehicle crashes per 1 million VMT and an average weighted cost per crash of \$15,952. Note that this crash cost accounts for both the high probability (1.0000 per 1M VMT) but low cost (\$3,650) of a no injury crash and the low probability (0.0076 per 1M VMT) but high cost (\$1.4 M) of a fatal injury cost.

Table 5: Crash Costs by Injury Severity and Weighted Cost of Crashes

KABCO Injury Classification Scale	Probability per 1 M VMT	Cost per Occurrence	Expected Cost per 1 M VMT ¹⁾
No injury (O)	1.00000	\$3,650	\$3,650
Possible injury (C)	0.00055	\$55,768	\$31
Non-incapacitating evident injury (B)	0.00011	\$2,828	\$3
Incapacitating injury (A)	0.00194	\$783,341	\$1,520
Fatal injury (K)	0.00776	\$1,408,533	\$10,930
Overall probability and cost	1.01136		\$16,134
Weighted cost per 1 M VMT ²⁾			\$15,952

1) Expected cost per 1 million VMT = Probability of occurrence in 1 million VMT x average cost per occurrence.

2) Weighted cost per 1 million VMT = Overall cost ÷ Overall probability.

²⁰ Federal Highway Administration. (2017, June 30). *KABCO Injury Classification Scale and Definitions*. Retrieved from FHWA Highway Safety Improvement Program - Safety Performance Management :

<https://safety.fhwa.dot.gov/hsip/docs/fhwasa18001.pdf> Table 9 on p30 has comprehensive crash costs in 2017 dollars. Table 39 <https://safety.fhwa.dot.gov/hsip/docs/fhwasa17071.pdf> shows costs per state.

The TDM analysis estimates that 2.193 crashes will occur over the 2.169 million VMT reduction. At a per occurrence cost of \$15,952, the total cost saving from crash reduction is \$34,983 per day.

Total daily VMT reduced by TDM program elements = 2,168,829

Expected crash occurrence = (2,168,829 miles / 1,000) x 1.01136 crash per 1000 VMT = 2.193 crashes

Health and Safety daily cost saving = 2.193 crashes x \$15.952 per crash = **\$34,983 per day**

TOTAL SOCIETAL BENEFIT COST SAVING

Table 6 presents the cost saving associated with each type of benefit and the overall societal cost saving calculated for the four TDM program elements and the Commuter Operations Center combined. The combination of the TDM program elements and Commuter Operations Center generate about \$519,807 of daily cost saving across the societal benefits included in the calculation. The largest share of the cost saving is in reduction of excess fuel used; this benefit is valued at over \$317,846 per day, or about 61% of the total daily benefits. Reduction in hours of travel delay accounts for about 17% of the total daily benefit (\$87,730). Noise pollution reduction generates about 9% and the air pollution/ greenhouse gas reduction combined benefits and road safety crash reduction benefits are responsible for about 6% and 7%, respectively, of the total cost saving.

Table 6: Societal Benefit Cost Savings Generated by TDM Program Elements (FY 2021–FY 2023)

Societal Benefit	Benefit Unit	Benefit Base Units	Cost per Unit of Benefit	Total Daily Cost Saving
Air pollution				
- NOx	Tons NOx removed	0.457 T	\$1,612	\$737
- VOC	Tons VOC removed	0.375 T	\$133	\$50
Greenhouse	Tons CO2 removed	836.0 T	\$36	\$30,096
Noise pollution	Total VMT reduced	2,168,829	\$0.0223	\$48,365
Congestion	Hours of delay reduced	2,883 hours	\$30.43	\$87,730
Excess fuel used	Gallons of fuel saved	93,484 gal	\$3.40	\$317,846
Health/safety ¹⁾	Crashes avoided/1 M	2.193	\$15,952	\$34,983
All benefits				\$519,807

1) Health and safety benefit base units and cost per unit are weighted averages of crash occurrences by severity.

Appendix K Commuter Connections TDM Evaluation Schedule

TDM Program Element	Data Collection Activity	FY Completion
Telework	2025 State of the Commute Survey	FY 2026
	Maryland Employer Telework Assistance	FY 2026
Employer Outreach	Database Information Analysis from ACT!	FY 2026
GRH	GRH Applicant Survey Washington region	FY 2026
	GRH Applicant Survey Baltimore	FY 2026
	Retention Rate Survey	FY 2027
Commuter Operations Center	Placement Rate Survey	FY 2026?
	Retention Rate Survey	FY 2027
Mass Marketing	2025 State of the Commute Survey	FY 2026
	2025 Bike-to-Work Day Participant Survey	FY 2026
	'Pool Rewards CP Survey	FY 2026
ALL	2024-2026 Framework Methodology	FY 2025
	2025 State of the Commute Survey	FY 2026
	2021-2023 TDM Analysis Report	FY 2027

Appendix L Glossary of Acronyms

CC	Commuter Connections
CCWP	Commuter Connections Work Program
CO2	Carbon dioxide (primary greenhouse gas)
COC	Commuter Operations Center
COG	Council of Governments
DDOT	District of Columbia Department of Transportation
FAST Act	Fixing America’s Surface Transportation Act
FHWA	Federal Highway Administration
GRH	Guaranteed Ride Home
HOV(s)	High Occupancy Vehicle(s)
MTA	Maryland Transit Administration
MDOT	Maryland Department of Transportation
MWCOG	Metropolitan Washington Council of Governments
NOX	Nitrogen Oxides
P & R	Park and Ride
PM	Particulate Matter
PM2.5	Particulate Matter, 2.5 microns
SOC	State of the Commute
SOV	Single Occupant Vehicle
TDM	Transportation Demand Management
TERM	Transportation Emission Reduction Measure
TIP	Transportation Improvement Program
TMA	Transportation Management Association
TPB	Transportation Planning Board
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