METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS FINAL REPORT

Deployment of Personalized and Dynamic Travel Demand Management Technology in the National Capital Megaregion

Advanced Transportation and Congestion Management Technologies Deployment Program

Revised January 2026

Metropolitan Washington
Council of Governments

MWCOG ATCMTD FINAL REPORT
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ACKNOWLEDGEMENTS
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PROJECT SUMMARY

Project Description

The Washington, D.C.-Maryland-Virginia (DMV) megaregion was ranked as the #1 most congested urban area in the U.S. by the 2014 TTI Urban Mobility Report. Annually, the average auto commuter in the DMV megaregion suffers through 63 hours of congestion delay, 26 gallons of excess fuel consumption, and $1,419 of congestion-related cost. Such severe congestion has significantly deteriorated transportation affordability and accessibility to work, home, healthcare, education, entertainment, and other opportunities. Congestion across the DMV megaregion is expected to grow by yet another 54-77% in the next twenty years. With roadway and transit infrastructure capacity expansion severely limited by funding, travel demand management (TDM) strategies are required to optimize the spatial, temporal, and modal distribution of travel demand.

If TDM programs can successfully nudge even a small number of travelers to utilize non-single occupant vehicle (SOV) modes, off-peak departure times, less congested routes, and telecommuting options, they will be able to significantly reduce congestion, energy use, and emissions. An often-cited example, published in The Washington Post and based on field measurements by state Departments of Transportation (DOT) in the region, recalls Pope Francis's September 2015 visit to Washington, D.C. Anticipating "increased congestion" due to the visit, travel demand on the visit day actually decreased by 1% all day and by 2% during the peak period. These small vehicle travel demand reductions led to a 5% reduction in all-day travel delay, a 14% improvement in all-day freeway travel reliability, and an impressive 27% reduction in peak-period congestion.

The Metropolitan Washington Council of Governments (COG) and the National Capital Region have been leaders in deploying TDM strategies to reduce congestion, energy use, and emissions and promote multimodal travel choices for all system users by employing a regional collaborative approach and leveraging technology innovations. This Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) Initiative project was created with a vision to: (1) leverage the best available technology to maximize the cost-effectiveness of a megaregion TDM program; (2) integrate and expand existing TDM programs through a shared technology platform among all public and private-sector partners; (3) provide personalized, timely, and accurate travel information to all residents and visitors, including rural communities, opportunity zones, and elderly and disabled populations across five states and D.C. in the proposed service area; and (4) enhance multimodal transportation access and system performance for all user groups with rewards and gamification.

In collaboration with state and local governments in the District of Columbia, Maryland, and Virginia, the private sector represented by the Greater Washington Partnership, more than 8,000 existing employer partners, and the University of Maryland, this ATCMTD project leverages the latest advances in real-time big data, artificial intelligence, and advanced computing technologies to deliver personalized and dynamic traveler incentives and to implement a first-in-the-nation, coordinated TDM deployment in an entire megaregion covering three metropolitan areas: the DMV megaregion of Washington, D.C., Baltimore, MD, and Richmond, VA metropolitan areas and surrounding rural counties in D.C., DE, MD, PA, VA, and WV. The technology was packaged into the

incenTrip mobile application – and at the end of the project, re-released as the CommuterCash mobile application.

Project Scope

The project's scope consisted of several tasks implemented over the course of the project's life. Many of the tasks were developed in a linearly progressive manner, meaning the competition of initial tasks led to the possibility to introduce more complex and impactful subsequent tasks.

CONTEXT: CORE FUNCTIONALITY OF INCENTRIP

The ATCMTD project sought to improve the pre-existing incenTrip mobile application. IncenTrip was built by University of Maryland as a dynamic travel behavior app designed to reduce congestion and emissions by incentivizing smarter travel choices. The app integrates real-time traffic, transit schedules, and ridesharing data to provide personalized trip recommendations. When an end-user opens the app, they enter their trip details or allow the app to detect their travel patterns. End-users must plan their trips in the app to identify the various travel options available for their unique trip. While the project only rewards points for commute trips, any type of trip may be planned/explored in the app.

IncenTrip then suggests optimal travel options—such as carpooling, public transit, biking, or traveling during off-peak hours—based on current conditions and user preferences. Each time a user selects an eco-friendly or congestion-reducing option for their commute trips, they earn points that can be redeemed for rewards, creating a tangible incentive to shift behavior. The app continuously updates recommendations throughout the day, helping users save time, reduce costs, and minimize environmental impact. By combining real-time data with behavioral incentives, incenTrip empowers travelers to make informed, sustainable choices while contributing to regional transportation goals.

TASK A: DEPLOYMENT OF PERSONALIZED AND DYNAMIC TDM IN EXISTING SERVICE AREAS

This task fully deployed personalized and dynamic TDM with the incenTrip technology in the current COG Commuter Connections TDM service area, following a year-long successful pilot launched in May 2018. Deployment also occurred within the entire state of Maryland via collaboration with Maryland Department of Transportation (MDOT). The technology was fully developed, tested, validated, and deployed for the Commuter Connections and MDOT service areas. Dynamic data information, such as real-time Washington Metropolitan Area Transit Authority (WMATA) and the Marily Transit Administration (MTA) transit services information, was integrated and deployed into the incenTrip technology.

TASK B: TECHNOLOGY DEPLOYMENT IN THE ENTIRE DMV MEGAREGION AND ADJACENT RURAL COUNTIES

The project team expanded the TDM service area to cover the entire DMV megaregion. Since many commute trips with work locations in the DMV megaregion originate from rural areas outside of the three metropolitan areas, the expanded service area will also include rural counties located in the DMV megaregion commute shed, including most rural counties in northern and central Virginia near D.C., the Richmond metro area, the entire state of Delaware, and selected counties in eastern West Virginia and southern Pennsylvania. The focus of these "exurban" areas will be on those commuting into the Washington, DC and Baltimore metropolitan regions. Network model development was

completed for the entire expanded network. Data elements included the megaregion street network, real-time traffic data, and fixed-route transit. The network created comprises of 490,720 roadway links; 289,327 nodes, and 9,563 Traffic Analysis Zones (Figure 2).

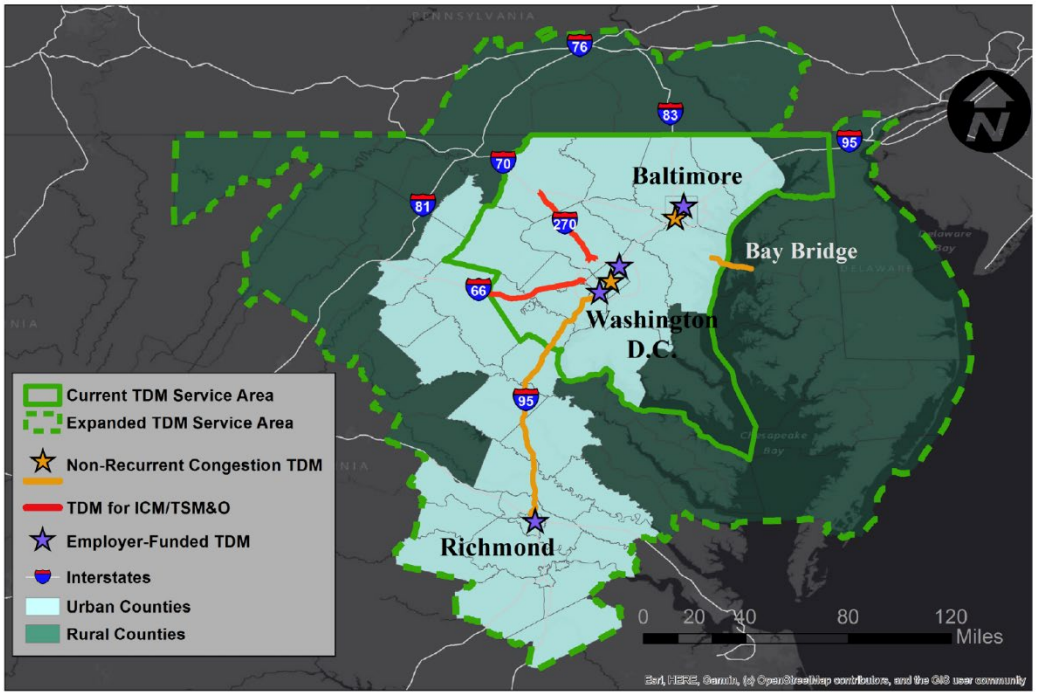

Figure 1: Map of existing and expanded project service area

After the network was completed, the project team undertook a large-scaled transportation systems modeling effort. This work leveraged the network model and the University of Maryland (UMD) team's parallel work in travel demand modeling, which allowed the team to construct a large-scale transportation systems model that empowered incenTrip's operations in the expanded TDM service areas. The expertise from Arizona State University (a project subcontractor) in developing such models was employed to ensure the quality of the model and computational efficiency after the model has been expanded to such a large scale.

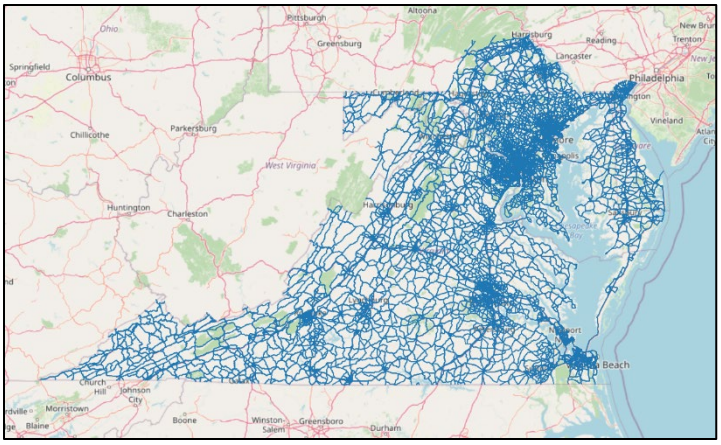

Figure 2: Macro-network covering the project deployment areas. (Courtesy UMD)

Figure 3, below, summarizes the trip data processing workflow that feeds the model. The figure shows a workflow that converts raw sighting data (i.e., raw location data collected from individuals through mobile devices or sensors) into a validated trip dataset for travel demand analysis. It begins with data preprocessing, including quality checks, home/workplace identification, and device

deduplication. Next, the trip roster generation phase identifies tours and trips, determines travel mode and trip purpose, calculates distances, and applies multi-level weighting to represent the population accurately. Finally, the validation stage ensures reliability through calibration, reasonableness checks, and internal/external quality control. The result is an optimized trip demand model that estimates travel demand within Traffic Analysis Zones (TAZ) that comprise the geographic footprint of incenTrip.

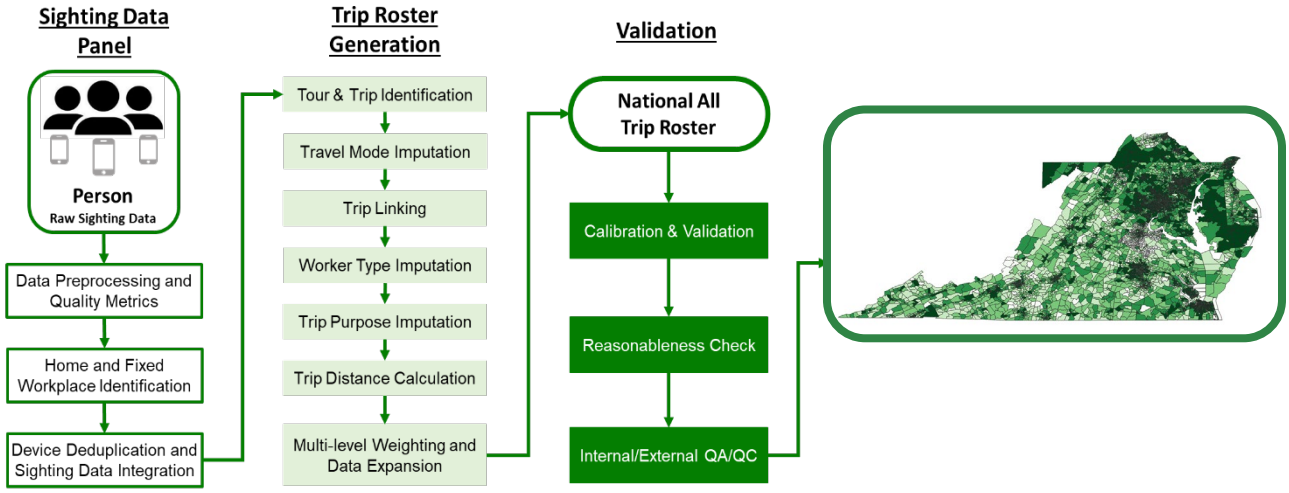

Figure 3: Summary flow of network model development (Courtesy UMD)

Time-varying transportation data collected from the UMD's RITIS (Regional Integrated Transportation Information System) was employed to calibrate and validate the systems model. Special attention was given to the expansion areas, such as those remote areas and rural areas that are not previously modeled and served by incenTrip to ensure the travelers information and incentives are accurate and effective for those more than 1.2 million rural residents.

TASK C: MULTIMODAL REWARD AND PAYMENT INTEGRATION

Several new reward and payment options were integrated into the program, including PayPal, gift cards, Nift local business gifts, WMATA SmarTrip Credits, Capital Bikeshare credits, and Virginia E-ZPass credits. These incentives were integrated into the program after substantial stakeholder coordination and outreach to project partners. Reward tiers and thresholds were incorporated into a design plan vetted by the project's stakeholder group. End-users tracked their trips incenTrip after planning the most effective and optimal routes using the app's trip planning feature and were awarded points according to the impact of their trip. Low-impact trips such as transit, carpooling, biking, and walking were awarded more points than high-impact trips, such as driving alone. Figure 4 shows one of the rewards menus in the incenTrip app, as viewed by an end-user. Processing and fulfillment flows were developed by COG staff to ensure diligent review and screening of end-user trip log data prior to fulfilling an incentive request.

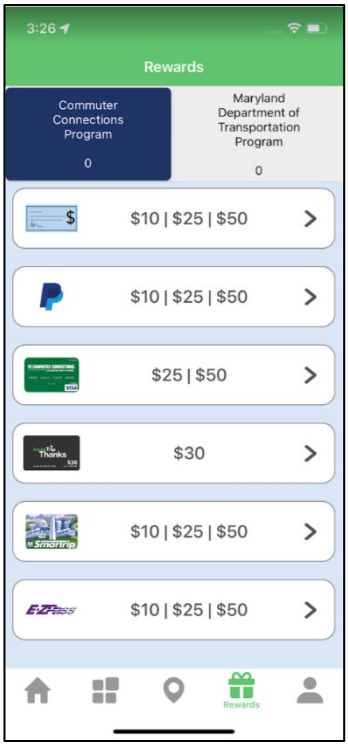

Figure 4: Incentive offerings

TASK D: TDM DEPLOYMENT FOR NON-RECURRENT CONGESTION MITIGATION

The project sought to develop and deploy (a) personalized and dynamic incentives and (b) traveler information to mitigate non-recurrent congestion in the region. The project team explored methods for integrating travel notifications for events such as major accidents, dangerous weather, work zones, and special events where travel/access could be restricted. Alerts would be coupled with a shift in mode, departure time, and/or route.

Following multiple stakeholder feedback sessions, the project team determined integrating the "Flextime Rewards" program into incenTrip would best meet the goals of this task. Flextime Rewards monitored congestion levels using UMD's RITIS technology to anticipate higher-than-expected levels of congestion. If congestions along a commuter's route were anticipated to exceed 20% of normal levels, commuters received an in-app push notification and email alert from incenTrip encouraging the end-user to flex their trip to a route or time when congestion levels would be less severe. The commuter was rewarded with incentive points if they demonstrated properly following the Flextime Reward directive. Due to the complexity of monitoring and predicting congestion on the road network, this feature was rolled out on select corridors in the megaregion, including portions of I-495, I-66, DC-295, I-95, I-695, and I-895. Figure 5 demonstrates the workflow of the program from an end-user's perspective within the incenTrip mobile app.

TASK E: CORRIDOR LEVEL TDM DEPLOYMENT FOR MULTIMODAL ICM AND TSM&O

The project explored methods for using TDM as an integral part of corridor-level solutions for Integrated Corridor Management (ICM) and Transportation Systems Management & Operations (TSM&O). The incenTrip app was improved to include features that encourage travel mode shift away from drive-alone vehicles in designated corridors. Efforts focuses on improving commuters' awareness of multimodal choices and park-and-ride options along selected corridors. Pilot corridors selected for deployment were I-270 and I-66.

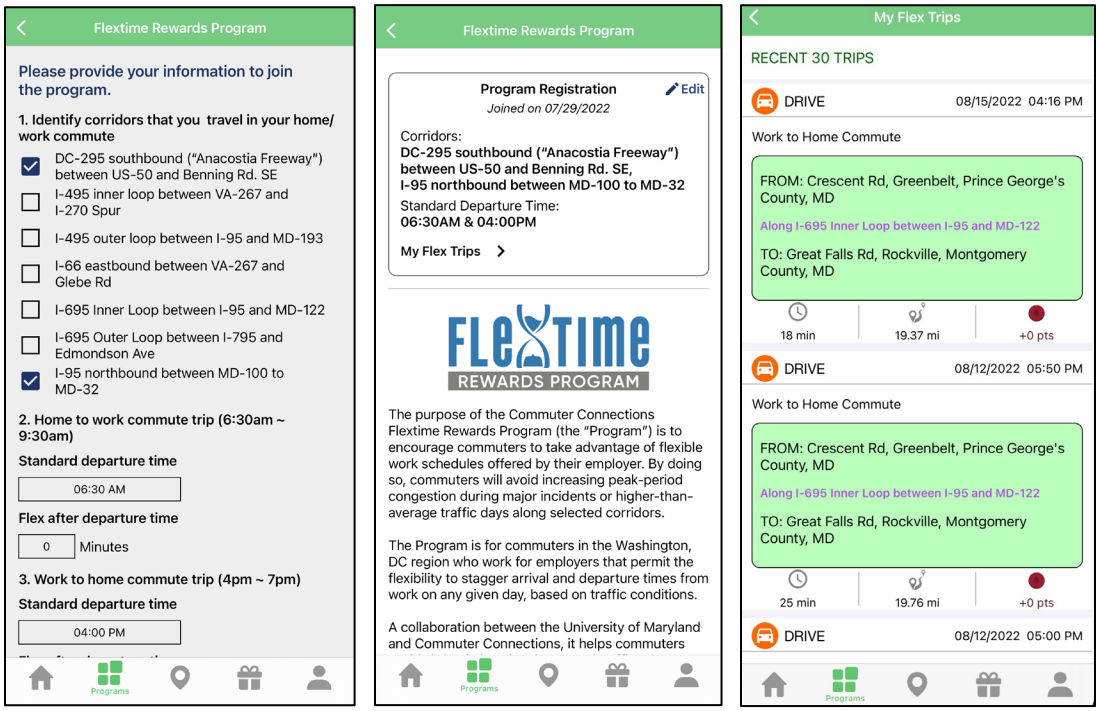

Figure 5: Flextime Rewards program

"Challenges" were created within incenTrip that offered incentives to commuters who started new carpools, expanded existing carpools, checked-in to park-and-ride lots to find casual carpool opportunities, or took public transportation. Figure 6 shows a list of challenges that were made available to all end-users within incenTrip. The feature was designed in a manner to add new challenges for specific corridors with minimal administrative work, thus permitting duplication and scalability. The feature can be deployed in bottleneck corridors, during major construction projects, or anywhere that is plagued by recurrent congestion that also has access to drive-alone alternatives, such as park-and-rides or commuter bus.

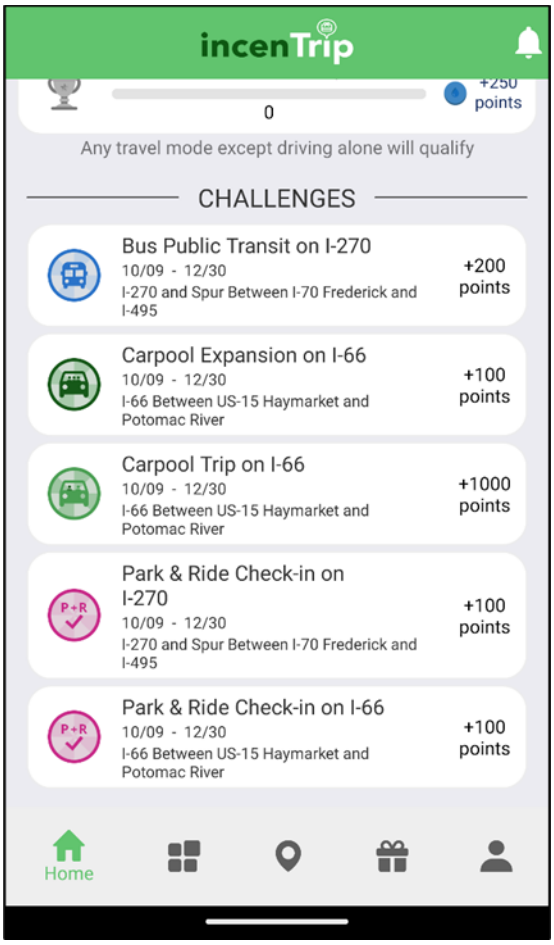

Figure 6: Corridor Challenges

TASK F: INTEGRATION OF EMPLOYER FUNDED TDM FOR SHARED PLATFORM DEPLOYMENT

As this project is primarily focused on home/work commutes (and vice versa), attempts were made to partner with employers to introduce the technology to employers who may wish to leverage public incentives to encourage sustainable and efficient commuting among their employees. An Employer Module was developed to allow employers to create and deploy custom programs within incenTrip. Custom requirements, such as travel mode types, quantity of trip logs, and employer-sponsored rewards were developed so employers could better encourage participation in ways that resonate with their employees. Employers were given the ability to view a dashboard to monitor employee participation.

While several employers explored the possibility of participating in a shared deployment relationship with incenTrip, the project team was unsuccessful in fully partnering with a direct employer. Alternatively, two campaigns were developed: the "Ride for the Region Commuter Challenge" in March 2024, which saw eight employers use the platform to compete for prizes. The "goDMV Commuter Competition" was developed and implemented following incenTrip's transition to CommuterCash by COG in March 2025. Forty employers participated in this campaign, a much larger and more impactful use of the new technology.

TASK G: CUSTOMIZED MULTIMODAL TRIP PLANNER FOR OLDER ADULTS AND PERSONS WITH DISABILITIES

A customized trip planner within incenTrip was adapted to help meet the needs of older adults and persons with disabilities that may need specialized transportation services. The trip planner was enhanced to leverage an existing referral service, Reach a Ride, that is also owned and maintained by COG. The Reach a Ride program intakes various requirements on behalf of a traveler and recommends a service that will meet their needs. An Application Program Interface (API) was created

to feed information from the Reach a Ride database to incenTrip end-users. The API connects the Reach a Ride database to the trip planner service within incenTrip. End-users who require specialized transportation services are alerted of potential providers that operate in the service area inputted by end-users. Figure 8 shows how an incenTrip end-user may find specialized transportation service within the app.

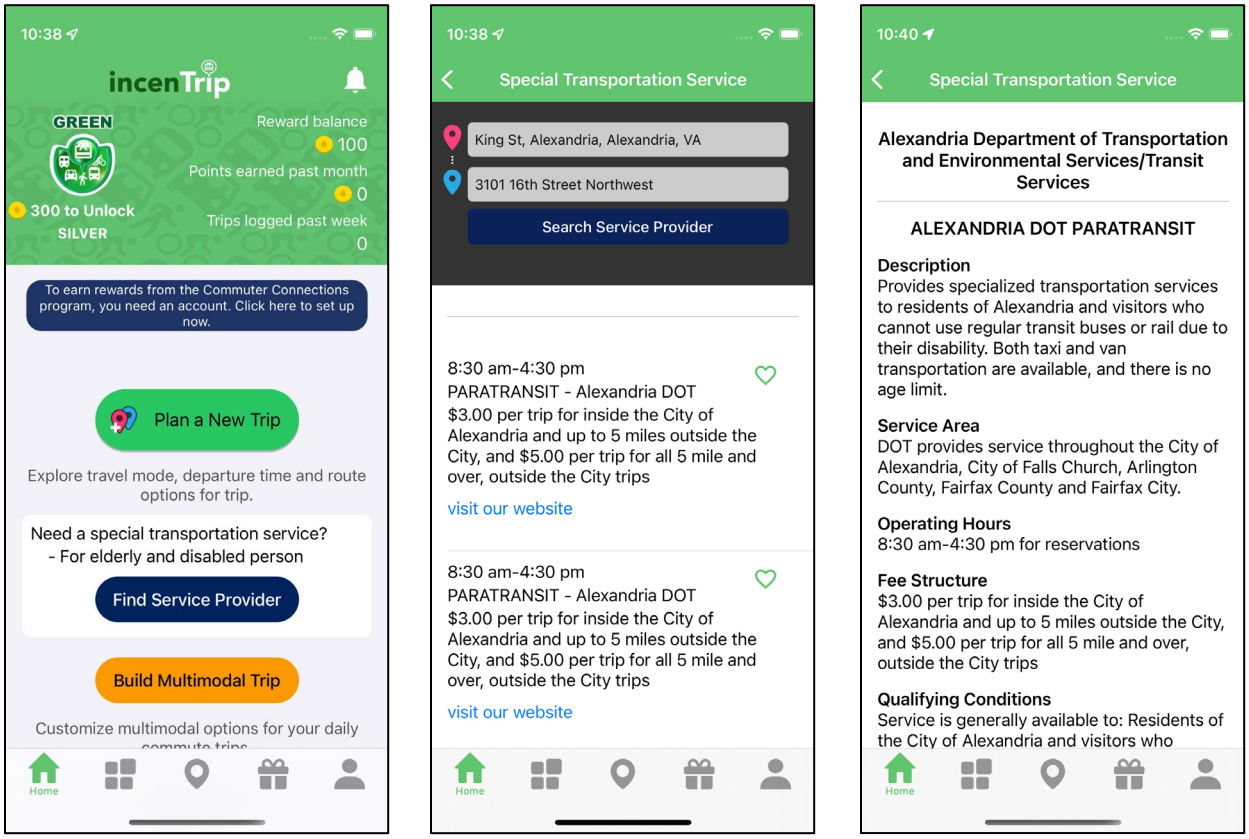

Figure 7: Reach a Ride provider lookup

NON-TECHNICAL TASKS

A variety of non-technical tasks were associated with the project. Marketing efforts helped grow the usership of the program. This was a difficult task, considering the project period occurred during a time when congestion within the Washington, DC megaregion was artificially low. Active incenTrip end-users grew from 2,876 in November 2020, when the project commenced, to 4,365 in December 2024. An additional 2,484 accounts were created in the CommuterCash app, which was the rehabilitated incenTrip app transferred to COG for long-term operations. CommuterCash underwent a soft launch in January 2025 with a full launch on March 1, 2025.Marketing samples are shown in Figure 8 below.

Figure 8: Social media marketing content for incenTrip and CommuterCash

Technology transfer was the final task of the project, yet it may have been one of the most challenging. Efforts to procure the incenTrip codebase on behalf of COG from UMD took nearly 1.5 years and required a contract amendment to see the assets fully transferred. A full transfer of source code, APIs, and database schema from UMD to COG was completed in September 2025. COG worked to build a new version of incenTrip, re-branded as CommuterCash, while UMD continued operating incenTrip. CommuterCash will be the long-term product operated by COG, and was made possible by the work completed on incenTrip as part of the ATCMTD project.

Project Timeline

Key milestones as identified in the Project Management Plan were accomplished as noted below:

Table 1: Project Timeline

Milestone	Completed Date
Project Commencement	November 11, 2020
incenTrip fully developed and deployed for existing Commuter Connections and MDOT service areas	November 2021
An expanded, calibrated, and validated transportation systems model for incenTrip backend coverage expansion to the entire DMV megaregion	November 2021
The design plan of the reward and payment integration developed and approved by the stakeholder group	August 2021
The reward and payment integration fully deployed	September 2022
incenTrip TDM for non-recurrent congestion mitigation deployed	December 2022
incenTrip corridor-level TDM for multimodal ICM and TSM&O deployed	December 2022
The design plan of the integration of employer-funded TDM in incenTrip fully developed and approved	December 2022
Integration of employer-funded TDM in incenTrip fully deployed	May 2023
Specialized transportation trip explorer fully deployed	November 2023
incenTrip source code, database, and APIs transferred from UMD to COG	September 2024
CommuterCash, COG's rehabilitated version of incenTrip, soft launch	January 2025
goDMV Commuter Competition launched in CommuterCash	March 2025
Project concludes	March 31, 2025
First Draft of ATCMTD Final Report	June 2025
ATCMTD Final Report	January 2026

PERFORMANCE METRICS, EVALUATION METHODS, AND DATA SOURCES

Project Goals

The below table outlines project goals as they relate to USDOT ATCMTD Goal Areas, along with the methods by which deployed technologies were expected to meet the goal.

Table 2: Project Goals

USDOT ATCMTD Goal Area	Method for Meeting Goal
[1] USDOT Goal Reduced congestion and/or improved mobility Specific Project Goal Collection, dissemination, and use **of real time transportation-related information** to improve mobility, reduce congestion, and provide for more efficient and accessible transportation	Incentivize commuters through gamifications and meaningful rewards to reduce the number of single-occupant vehicle commute trips taken, which also reduces the amount of Vehicle Miles Travelled (VMT). Present incentives in a dynamic manner that shows real-time transportation related information, such as travel cost, time, mileage, and emissions, to help commuters understand the full breadth/impact of their commute. Compare real-time travel information across travel modes, such as transit, driving-alone, finding a rideshare partner, bike/walk, or a combination thereof. Offer dynamic incentives to commuters who opt to take sustainable modes of transportation that help increase roadway network efficiency, such as carpool, transit, bike, and walk commute modes.
[2] USDOT Goal Reduced environmental impacts Specific Project Goal Delivery of **environmental benefits** that alleviate congestion and streamline traffic flow	Shift commuters to more environmentally friendly travel modes and/or routes to reduce automobile energy use and emissions by offering greater value incentives when compared to less sustainable travel modes. This could include encouraging travel by transit, carpool, or bike/walk; or flexing a trip to non-peak hours when roadway congestion increases the length of time in a vehicle, which thereby increases tailpipe emissions.
[3] USDOT Goal	Develop an incentive program that motivates users to travel efficiently. This includes corridor-level

Improved system performance/optimized multimodal system performance Specific Project Goals Delivery of **economic benefits** by reducing delays, improving system performance and throughput, and providing for the efficient and reliable movement of people, goods, and services Integration of advanced technologies into **transportation system management and operations**	deployment of traveler incentives where recurring congestion is prevalent. Develop integrated gamification programs within a single mobile application that appeal to commuters with a variety of interests and commute habits. To improve system performance through voluntary transportation system management and operations, a wide audience must be attracted. Therefore, the incenTrip app was created to include many different sub-programs for participants who may be inclined to change their travel behavior.
[4] USDOT Goal Area Enhanced access to transportation alternatives – AND – [5] USDOT Goal Area Effectiveness of providing integrated real-time transportation information to the public to make informed travel decisions Specific Project Goal Collection, dissemination, and use **of real time transportation-related information** to improve mobility, reduce congestion, and provide for more efficient and accessible transportation	Disseminate personalized information to users in real-time. Notify users of anticipated excess congestion levels so trip modifications can occur before departure, such as encouraging end-user to choose non-SOV travel modes or to adjust departure time and/or route to avoid roadways with anticipated excess congestion.
[6] USDOT Goal Reduced costs	Employ travel demand management strategies to better maximize roadway efficiency and throughput. Managing demand may prevent the need to expand

Specific Project Goal **Reduced costs and improved ROI**, including through the enhanced use of existing capacity	capacity through roadway expansion or new construction. Estimate cost savings for end-users of the incenTrip technology by comparing their incentivized, sustainable travel choice to a standard single-occupant vehicle option.

Performance Measurement

Performance measures were created for each project goal. Some goals were affiliated with a specific measure, others had many measures contributing to the evaluation.

Most data for performance measures were sourced directly within the incenTrip mobile application. The app is a gateway of self-reported user data, as end-user trip log data is required to earn incentives through the app. Self-reported data gathered from incenTrip is verified by backend controls, such as accelerometer, motion, and GPS tools comprising mobile devices. These controls were enacted to improve validity of data gathered from consenting end-users who knowingly used the application to track/monitor their trips. Trips that did not comply the route and travel mode assigned by the app were disqualified from the analysis and did not award incentive points to end-users.

A limited amount of data was collected from a small survey conducted in June 2025. This survey sought to better understand end-users' experience with the CommuterCash app (the COG successor to incenTrip), and how it affected their travel choices.

A listing of performance measures is summarized below, along with the data sources and collection time period.

Table 3: Project Performance Metrics

Goal Area	Performance Measure	Information Source/Method	Data Collection Time Period
Reduced congestion and/or improved mobility	PM 1.1: total VMT reduced	Trips logged within incenTrip for commuters who shifted modes from SOV	January 2022 – December 2024
Reduced congestion and/or improved mobility	PM 1.2: total vehicle trips (VT) reduced	Trips logged within incenTrip for commuters who shifted modes from SOV	January 2022 – December 2024
Reduced environmental impacts	PM 2.1: total Nitrous Oxides (NOx) reduced	Trips logged within incenTrip for commuters who shifted modes from SOV	January 2022 – December 2024
Reduced environmental impacts	PM 2.2: total Carbon Dioxide (CO2) reduced	Trips logged within incenTrip for commuters who shifted modes from SOV	January 2022 – December 2024

Reduced environmental impacts	PM 2.3: total number of gasoline gallons estimated to be reduced	Trips logged within incenTrip for commuters who shifted modes from SOV	January 2022 – December 2024
Reduced environmental impacts	PM 2.4: estimated quantified cost of noise pollution reduction	Trips logged within incenTrip for commuters who shifted modes from SOV	January 2022 – December 2024
Improved system performance/optimized multimodal system performance	PM 3.1: ranking of incentives as reported by end-users	Incentive requests from end-users	November 2020 – December 2024
Improved system performance/optimized multimodal system performance	PM 3.2: % of end-users who indicate a change in travel patterns as a result of incenTrip incentives	Survey	Survey response in post-survey
Improved system performance/optimized multimodal system performance	PM 3.3: total estimated system level congestion reduction	Trips logged within incenTrip	November 2020 – December 2024
Enhanced access to transportation alternatives	PM 4.1: % of trips reported as non-SOV over time	Trips logged within incenTrip	November 2020 – December 2024
Enhanced access to transportation alternatives	PM 4.2: trip log mode splits tracked over time	Trips logged within incenTrip	November 2020 – December 2024
Effectiveness of providing integrated real-time transportation information to the public to make informed travel decisions	PM 5.1: % of trips altered based upon real-time travel information	Trips logged within incenTrip	April 2023 – December 2024
Reduced costs	PM 6.1: cost savings of congestion reduction	Trips logged within incenTrip	November 2020 – December 2024

PRIMARY DATA COLLECTION METHOD: INCENTRIP TRIP LOGS

As seen in the above table, voluntary trip logs by commuters within the incenTrip mobile app is the primary source for data generation. The below graph (Figure 9) shows how trip logs within the app

generally grew over time, as pandemic-era work from home (WFH) policies began to wane. The popularity of the app increased as marketing efforts commenced, and as the travel restrictions of the COVID-19 pandemic waned. Using linear regression analysis, trip logs grew an average of 400 per quarter over the life of the project.

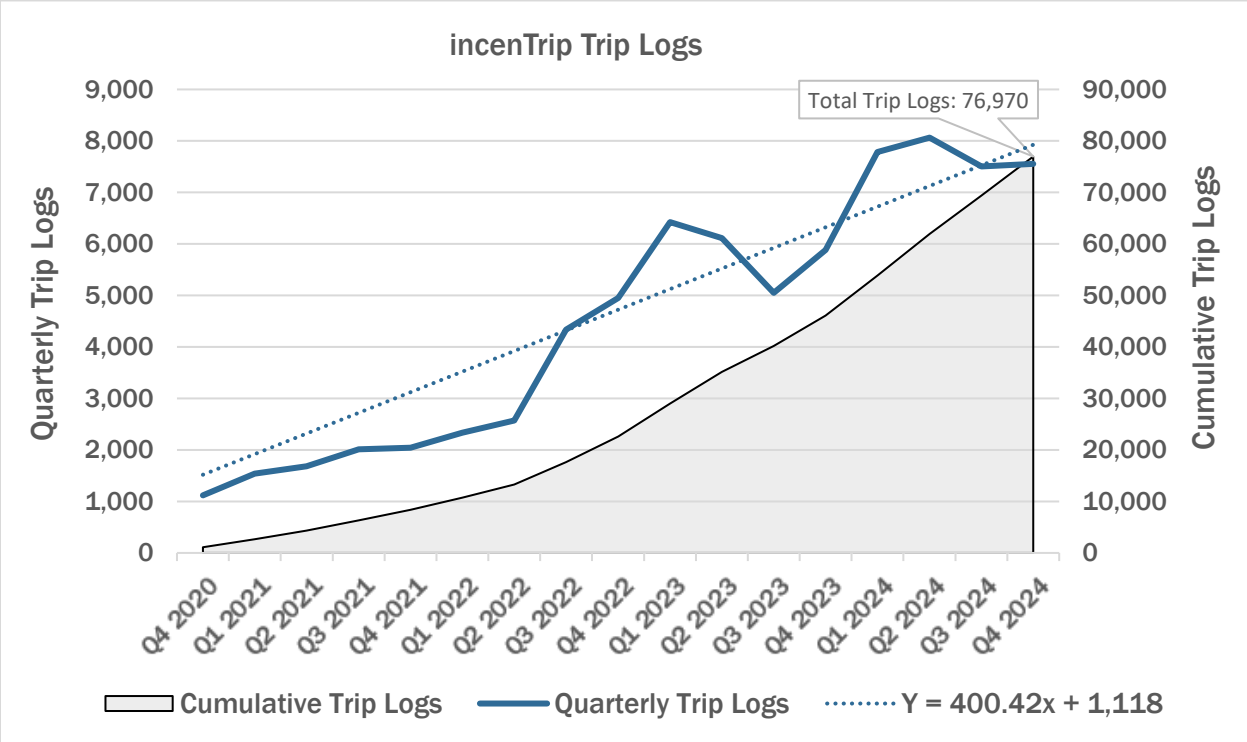

Figure 9: Tally of incenTrip trip logs

EVALUATION SAMPLE

During the project period, 1,489 commuters registered for incenTrip. The app was open to all commuters, regardless of their current travel mode. While individuals already using non-SOV options received modest incentives to reinforce sustainable habits, the primary focus was on encouraging SOV commuters to shift to alternatives such as transit, carpooling, biking, or walking. To maximize impact, incenTrip awarded greater rewards points to users transitioning from SOV travel, compared to those already using non-SOV modes. This targeted approach aimed to reduce congestion and improve air quality by motivating behavior change where it mattered most.

For the purposes of this evaluation, end-user engagement within incenTrip from 2022-2024 was analyzed. The sample was limited to end-users who met the following criteria:

(1) Sustained at least 15 weeks of trip logging engagement within the app.
    a. 225 unique end-users were included, accounting for about 16,000 trips
(2) Furthermore, end-users needed to indicate a preference to drive alone when they signed-up to use incenTrip in order to be included in this analysis.

Using these criteria, trip log data from **76 unique end-users** were used to calculate estimated impacts. For the purposes of establishing a baseline for these 76 end users, it was assumed (based on their expressed preferences) that all baseline trips were SOV. All impact calculations in the

subsequent sections of this report were made against this baseline. Impacts may be overstated if some of the baseline trips were non-SOV.

EVALUATION RESULTS

The project team assessed select quantitative measures to gauge the impact of incenTrip. However, low app usage during the COVID-19 pandemic significantly constrained the evaluation, resulting in limited findings. These activity levels mirror regional trends of reduced VMT and transit ridership during this period. [1] For context, a precursor effort (Sept–Dec 2019) produced metrics 5.4 times higher than those observed during the ATCMTD project. Following the pandemic's onset in March 2020, vehicle travel and congestion dropped sharply, reducing commuters' motivation to seek alternatives to driving alone—an external factor that influenced all project metrics.

Despite these challenges, trip log data from 76 unique end-users that met the evaluation criteria shown in the above "Evaluation Sample" section was analyzed against pre-defined performance metrics. Where qualitative measures were unavailable, descriptive statistics from the project dashboard are provided to illustrate observed impacts.

REDUCED CONGESTION AND/OR IMPROVED MOBILITY

Congestion reduction, as the linchpin of TDM, is the core focus of this project. Trips logged by end-users within incenTrip used geolocation services and internal controls to verify travel distance and mode (e.g., transit, drive-alone, carpool, bike/walk).

The below metrics indicate impacts based on the selected sample:

- PM1.1: estimated Total VMT reduced of qualified sample: **16,274 miles**
  - Calculation: Total distance of non-SOV trips made by end-users who noted driving alone as their preferred commute mode
- PM1.2: estimated Total VT reduced of qualified sample: **4,833 trips**
  - Calculation: Total non-SOV trips made by users with drive alone as their preferred commute mode.

The limited impacts resulting from the pilot evaluation period are extrapolated and projected to have a greater impact in the contemporary commuting landscape. See "Conclusion" for a discussion of impacts resulting from the ATCMTD project that occur after the project concluded.

REDUCED ENVIRONMENTAL IMPACTS

The incenTrip dashboard calculated environmental impacts based on the amount of VT and VMT reduced, using incenTrip trip logs as the data source.

- PM2.1: estimated Total NOx reduced: **2,734g**
  - Calculation: NOx reduced = VMT reduction x NOx emission factor

[1] FTA Report No. 0268, Effects of the COVID-19 Pandemic on Transit Ridership and Accessibility. August 2024
MWCOG Transportation Impacts of the COVID-19 Pandemic in the National Capital Region. January 2021

    - NOx emission factor established as 0.168 grams per mile[2]
- PM2.2: estimated Total CO2 reduced: **5,685kg**
    - Calculation: CO2 reduced = VMT reduction x CO2 emission factor
    - CO2 emission factor established as 349.33 gram per mile[2]
- PM2.3: estimated total gasoline gallons reduced due to non-SOV travel: **721 gallons**
    - Calculation: gasoline gallons reduced = VMT reduction / Average Miles Per Gallon (MPG)
    - Average Miles per Gallon factor established as 22.6[3]
- PM2.4: estimated monetized value of noise pollution reduction: **Negligible**
    - Calculation:[4] $0.0051 * VMT reduction

IMPROVED SYSTEM PERFORMANCE/OPTIMIZED MULTIMODAL SYSTEM PERFORMANCE

incenTrip offers end-users financial incentives in return for commute behaviors that help mitigate congestion. The economic benefits of efficient person throughput on roadways are experienced by all travelers; incenTrip end-users also enjoy the benefit of incentives not to exceed $600 per year for their optimal travel choices.

PM3.1 sought to measure what incentives were influential in garnering behavior change. As shown in Figure 10 and Table 4 below, a total of **1,902 incentives** were requested from end-users throughout the life of the project. The most popular incentives were cash (87%) compared to transportation related incentives. Incentive values were kept constant throughout the project. A consideration for future implementation could be to create higher-value transportation related incentives that contrast with cash incentives to observe whether there is an increase in their popularity.

Table 4: Total Incentive Redemptions

Incentive Type	# Requests	% of Total Requests	Incentive Category
Check	849	44.7%	Cash
PayPal	809	42.6%	Cash
Gift Card	84	4.4%	Cash
Nift	2	0.1%	Cash
SmarTrip	123	6.5%	Transportation Credit
E-ZPass	22	1.2%	Transportation Credit
Capital Bikeshare	10	0.5%	Transportation Credit
TOTAL	**1,902**	**100%**	

[2] Source: https://www.bts.gov/content/estimated-national-average-vehicle-emissions-rates-vehicle-vehicle-type-using-gasoline-and

[3] Source: USDOT Bureau of Transportation Statistics

4 USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs. December 2023. This calculation was adopted following feedback from FHWA to consider referencing the aforelinked report. Prior to receiving this feedback, the project team considered using the TRIMMS model. Due to the relatively lower-than-anticipated VMT reduction generated by the program, the calculation was simplified to use a standard value of monetization for urban areas.

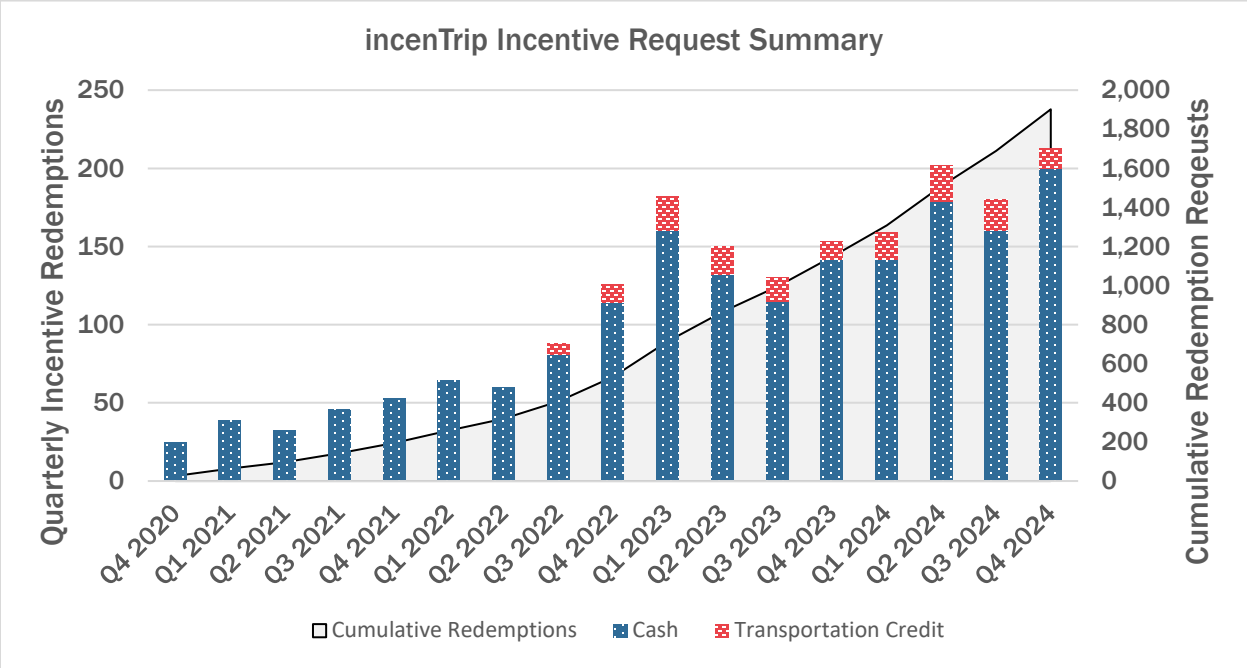

Figure 10: incenTrip Redemption Summary (by Incentive Category)

In a follow-up survey of participants in the goDMV Commuter Competition that was hosted in CommuterCash (incenTrip's successor) from March – May 2025, **46% of respondents indicated they either tried new transportation options and/or increased the number of sustainable trips taken** as a result of the gamification features with the app (*n=181*) (PM3.2). This seems to be a decent improvement in behavior change resulting from incentives and gamification features generated by the ATCMTD project. Scaling the app to additional commuters could have a noticeable impact on congestion levels in the region should similar levels of behavior change be possible.

incenTrip attempted to measure total system level congestion reduced throughout the megaregion. This metric was originally intended to quantify cumulative delay savings across the megaregion resulting from incenTrip user decisions. The app uses real-time traffic data and predictive algorithms to model how mode shifts, departure time changes, and route adjustments influence overall network performance. Each trip option is scored for its potential to reduce system-wide congestion, and these scores are aggregated to estimate total delay reduction. For example, incenTrip identified high-delay corridors such as I-270 (MD) and I-66 (VA) using recurrent and real-time data, then offered incentives for transit and HOV travel to minimize network impacts.

If all logged trips had qualified for mode-shift credit, incenTrip could have reduced congestion by an estimated 19,892 hours (PM3.3). However, due to pandemic-related travel declines and limited app adoption, only a small fraction of users demonstrated verifiable shifts attributable to the app. These constraints, combined with the complexity of retroactive modeling, make this metric unreportable.

ENHANCED ACCESS TO TRANSPORTATION ALTERNATIVES

incenTrip was enhanced to include real-time transit information for all fixed-route transit services within the Washington, DC megaregion. Park and Ride lots were added to the app to boost carpool

feasibility, encouraging both formal and informal methods. Bike routing was also integrated. Each of these modes were favored over drive-alone to end-users by offering higher incentives to commuters who chose non-drive-alone travel options. While it was not possible to measure the extent to which end users tried new transportation modes, alternative travel options resonated with end users: an overwhelming **73,211 of the 76,790 trips logged into incenTrip were either transit, carpool, bike/walk, or multimodal (95%)** (PM4.1, PM4.2).

EFFECTIVENESS OF PROVIDING INTEGRATED REAL-TIME TRANSPORTATION INFORMATION TO THE PUBLIC TO MAKE INFORMED DECISIONS

The project sought to deploy "Congestion Alerts" to commuters who typically travel on select corridors that experience recurring congestion (see Task D, pg. 4). This program was branded the "Flextime Rewards" program, which provided incentives to commuters to flex their commute time to avoid peak congestions levels on a select corridor. The technology was deployed in April 2023 and delivered 3,332 alerts. The alerts did not influence a change in travel behavior for eligible commuters (PM5.1).

There are many challenges to changing travel behavior for commuters who routinely travel on the same route. One potential reason for the lack of change was the incentive amount: Commuters who changed flexed their time were offered an incentive valued at $8. It is possible that commuters who have the resources to drive alone are not notably influenced by an $8 incentive. Other challenges are less tangible. For instance, a commuter may not be able to flex their trip due to scheduling obligations. Or, a commuter may simply wish not to deviate from a comfortable, habitual travel behavior.

The app's ability to effectively provide integrated real-time transportation to the public in a way to genuinely influences behavior change will need to be explored and tested using different methods in CommuterCash.

REDUCED COSTS

The below metrics show total estimated cost savings for the 76 unique end-users who indicated mode shift while using incenTrip:

- PM6.1: estimated total cost savings for commuters: **$13,345**
    - Calculation: cost savings = VMT x Average vehicle operating cost per mile
    - Average cost of operating a light-duty vehicle: $0.82 per mile (includes fuel, maintenance, tires, depreciation, and insurance).[5]

CONCLUSION

The *Deployment of Personalized and Dynamic TDM Technology in the National Capital Megaregion* project had mixed outcomes. The most successful element of the project was the new technology developed and incorporated into the incenTrip application. All technology advancements were scoped under the insightful oversight from the project's stakeholder group, leading to potentially impactful features such as real-time trip planning, dynamic incentivization, corridor-focused TDM, employer-based TDM, and geographic expansion throughout the megaregion. Even with these

[5] Source: "Your Driving Costs", AAA, 2024

advancements, however, lack of end-users limited the effectiveness of the project during the deployment period of November 2020 – December 2024.

Overall effectiveness of the project fell short of expectations as originally envisioned in 2019. Estimates generated in 2019 did not account for the COVID-19 pandemic that would abruptly and magnificently alter the commuting landscape throughout the region while the project was active. A severe reduction in commuters meant a similar reduction in the need for TDM. However, software development continued nonetheless, with anticipation that roadway congestion would once again become a pain point for commuters in the megaregion.

The ATCMTD project has delivered a transformative, scalable TDM technology framework that can be deployed in regions across the nation at minimal cost. All development work completed within the project period is fully open source, enabling MPOs, DOTs, Transportation Management Associations, and other agencies to implement personalized, dynamic TDM strategies without starting from scratch. UMD developers have provided source code and licensing to COG for broad distribution, allowing agencies to leverage a proven foundation while adding custom features to meet local needs. In 2025, COG became the first organization to operationalize this approach by launching the CommuterCash app, built on the incenTrip codebase. Since March 2025, the app has engaged over 1,750 commuters and supported more than 86,000 sustainable trips, demonstrating real-world impact and scalability. Interest from other MPOs in California and Ohio underscores the technology's potential for replication across regions. While discussions have not yet formalized, COG remains committed to partnering with public agencies nationwide to accelerate adoption and maximize the return on the FHWA's investment.

DEPLOYMENT AND OPERATIONAL COSTS COMPARED TO BENEFITS

While a formal Benefit-Cost Analysis (BCA) was not conducted, the project team acknowledges the importance of comparing costs and benefits. The ATCMTD grant funded development and deployment of incenTrip, including technology enhancements, corridor-level features, and incentive programs. Operational costs during the project were absorbed by COG's Commuter Connections program and remained modest relative to the scale of technology development.

On the benefits side, the project delivered measurable reductions in VMT (16,274 miles), emissions (5,685 kg CO_2, 2,734 g NO_x), and fuel consumption (721 gallons), along with estimated commuter cost savings of **$13,345**.

The initial development and deployment costs exceeded the immediate benefits realized during the project period, given the unusually low travel demand and limited opportunities to observe behavior change at scale. While pandemic-era conditions limited short-term benefits, the groundwork laid by this project positions COG to achieve significant congestion and emissions reductions as commuter volumes normalize. In qualitative terms, the operational cost of maintaining CommuterCash is minimal compared to the potential regional benefits of reduced congestion, improved air quality, and enhanced multimodal access.

Lessons Learned & Future Adaptations

This section highlights key lessons learned during the ATCMTD project and outlines future adaptations to strengthen technology deployment and impact. While the project faced unique challenges, including pandemic-era constraints, behavioral adoption hurdles, and technology transfer complexities, it also demonstrated significant successes, such as rapid scalability during the

Return-to-Office surge and sustainable integration into existing commuter programs. These insights provide a roadmap for improving incentive design, addressing usability across urban, suburban, and rural areas, enhancing real-time evaluation, and fostering stronger partnerships for technology sharing. The following subsections explore these themes in detail, beginning with how the project leveraged technology during a critical period of regional change.

LEVERAGING TECHNOLOGY DURING RETURN-TO-OFFICE SURGE

An unexpected opportunity to maximize the technology emerged in early 2025 as RTO efforts dramatically increased across the megaregion. Interest in the project surged, and the team was prepared thanks to groundwork laid in prior years. In 2024, UMD coordinated with COG to provide the incenTrip source code, database, APIs, and a licensing agreement, enabling COG to quickly develop a new app using rehabilitated incenTrip assets: CommuterCash. Fully launched on March 3, 2025, CommuterCash debuted alongside the goDMV Commuter Competition, which gamified commuting among 40 employers using an adapted employer TDM module. Over the three-month campaign, CommuterCash logged more than 36,000 sustainable trips, nearly half the total trips recorded by incenTrip from November 2020 through December 2024. Metrics from the campaign are shown in Figure 11 on the following page.

PANDEMIC-ERA CHALLENGES AND STRATEGIC FORESIGHT

The ATCMTD project unfolded during a period when pandemic-related policies suppressed immediate demand for TDM solutions. However, project funders demonstrated foresight by maintaining technology development during years of nominal congestion. This decision proved wise: when RTO surged in early 2025, CommuterCash was ready to meet commuter needs, as evidenced by the success of the goDMV competition and subsequent growth.

OPERATIONAL SUSTAINABILITY AND INTEGRATION

Early data collection shows promising growth in CommuterCash usership throughout the Washington, DC megaregion. Development costs were absorbed by the ATCMTD grant, while ongoing operational costs have been integrated into COG's long-standing Commuter Connections program. This integration demonstrates that operational costs for CommuterCash are reasonable when incorporated into a larger commuter assistance framework, ensuring sustainability beyond the grant period.

BEHAVIORAL INSIGHTS AND INCENTIVE DESIGN

Despite successes, the project highlighted the difficulty of delivering personalized travel suggestions that significantly alter commute behavior. End-users favored simple, predictable ways to earn incentives over complex strategies. For example, participation in the Flextime Rewards program, designed to reduce congestion on select corridors, was minimal. Conversely, users responded positively to trip planning features that allowed them to earn points quickly. Future adaptations should explore more effective incentive structures that nudge commuters away from congested corridors without adding complexity.

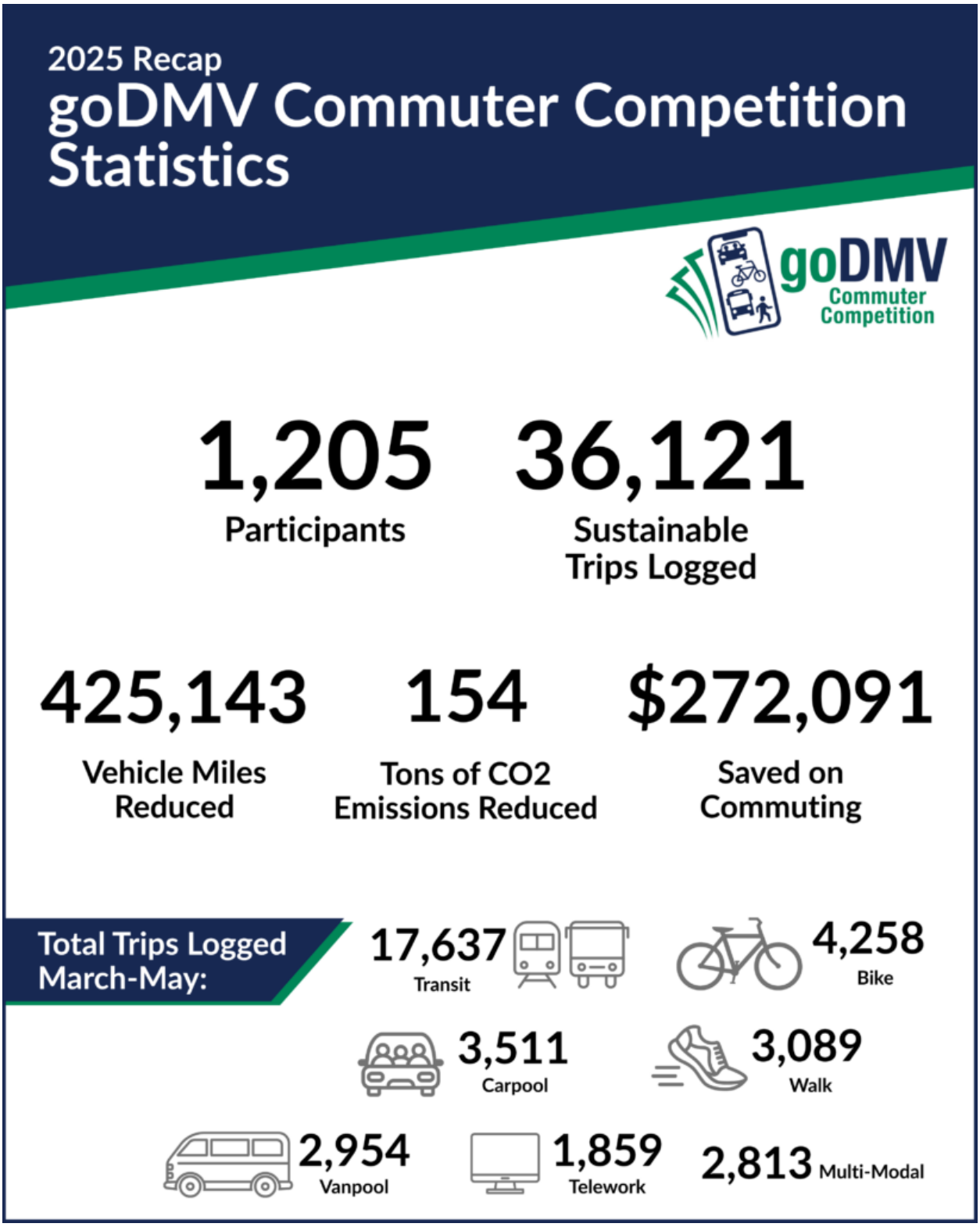

Figure 11: goDMV Infographic

EQUITY AND RURAL USERSHIP

Usership in rural areas was negligible, likely due to limited transit options and active transportation infrastructure. While adoption challenges persist, equitable access remains critical. Maintaining availability across the entire megaregion ensures rural communities are positioned to benefit as infrastructure investments expand. Future deployments should pair technology rollouts with targeted outreach and infrastructure planning to maximize impact in underserved areas.

TECHNOLOGY TRANSFER AND INTELLECTUAL PROPERTY

Sharing intellectual property among project partners proved challenging. For this project, UMD was tasked with research and evelopment, while COG was tasked with program implementation and operations. It took over a year for UMD to package and deliver assets necessary to launch CommuterCash. Without persistent coordination, these resources might not have been operationalized. Future projects should establish clear agreements on technology transfer and post-grant operations early in the process to avoid delays.

EVALUATION AND REAL-TIME FEEDBACK

As highlighted in the "Evaluation Results" section, one key lesson learned is the importance of integrating real-time evaluation mechanisms into technology deployments. For this project, the team relied on a retroactive analysis of a large dataset after implementation to assess VMT and VT reductions. While this approach provided valuable insights, it limited opportunities to make timely adjustments during the project. Future deployers can benefit significantly by collecting data upfront and throughout the deployment to better understand how the technology influences user behavior. For example, incorporating a brief microsurvey at the end of each trip could capture whether the congestion-reduction strategies deterred a drive-alone trip or shifted travel to off-peak times. Linking these responses to trip logs would enable evaluators to measure behavioral impact in real time and allow project teams to pivot or refine features as needed. This proactive approach would strengthen the evidence base for effectiveness and improve the adaptability of similar technologies.

LOOKING AHEAD

Overall, the ATCMTD program provided the project team a rare opportunity to build a quality product that will accomplish USDOT goals even after the ATCMTD project concludes. COG intends to operate CommuterCash as a core commute-based incentive program of the Commuter Connections TDM program. CommuterCash was ready to meet the abrupt need of commuters as RTO became widespread within the megaregion in early 2025 and will continue to meet the growing number of commuters seeking to find sustainable and efficient travel modes throughout the megaregion.