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Agency: Wisconsin Department of Transportation
Award category: Information Communications Technology Innovations

Project title: Non-Driver ArcGIS Online Application
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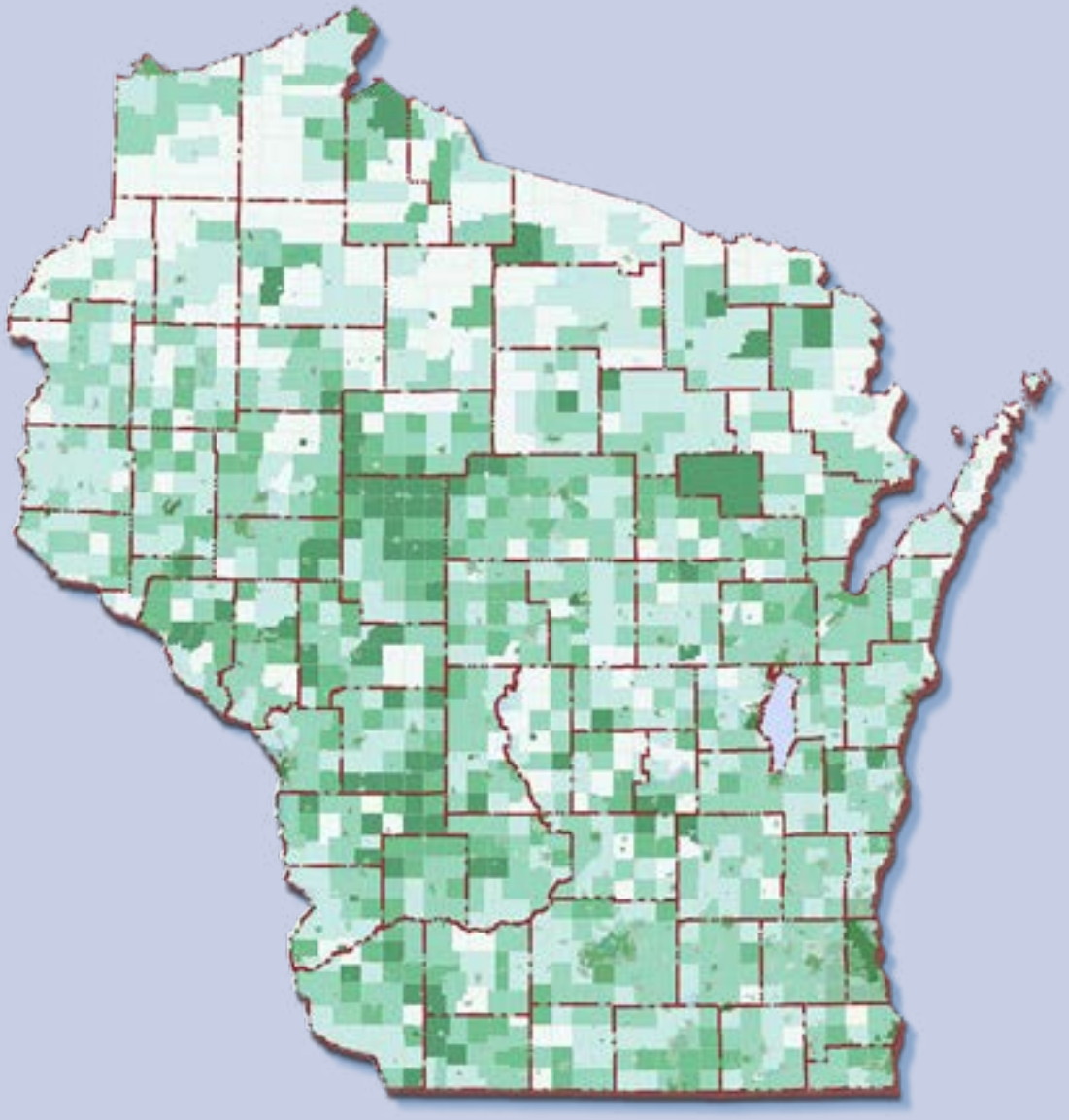
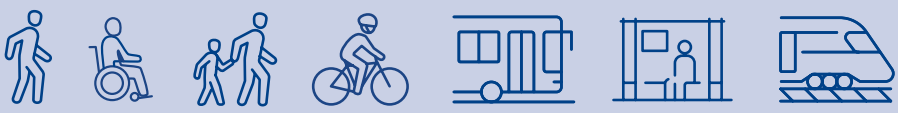
Wisconsin Department of Transportation

Non-Driver ArcGIS Online Application





WISCONSIN DEPARTMENT OF TRANSPORTATION

Wisconsin Department of Transportation Non-Driver ArcGIS Online Application

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Executive Summary

The Wisconsin Department of Transportation (WisDOT) holds improving the quality of life for Wisconsin's non-driving population as a significant priority. Non-driving populations include aging adults, students, low-income individuals, those with physical, sensory, mental or intellectual/developmental disabilities, and those who prefer not to drive, are unlicensed or have limited access to a vehicle. While it is known that non-drivers are located across the state, it is often questioned as to where and at what density. WisDOT has developed the Non-Driver ArcGIS Online Application (application) as a tool for local, regional and state stakeholders to assist in determining where the non-driving population resides in Wisconsin. The application produces estimates of non-drivers by county, city, village, town, U.S. Census block groups and tracts for stakeholders to be able to identify 'hotspots' of underserved and unserved Wisconsin non-drivers and facilitate multi-modal service improvements.

Idea

What problem or opportunity does the project address?

Non-driving populations can include aging adults, students, low-income individuals, those with physical, mental, or intellectual/developmental disabilities, and those who prefer not to drive. For non-drivers, activities like going to work, buying groceries, or going to a doctor can take enormous effort. Individuals with disabilities and adult student populations sometimes have difficulty engaging in their communities due to limited transportation options. Seniors often retain a vehicle registration but do not drive due to health conditions. This can be isolating and detrimental in a state with wide swathes of rural areas. The Wisconsin Department of Transportation developed the application as a tool for decision-makers and non-driver advocates to overlay available transit data to analyze locations on underserved/unserved non-drivers' needs.

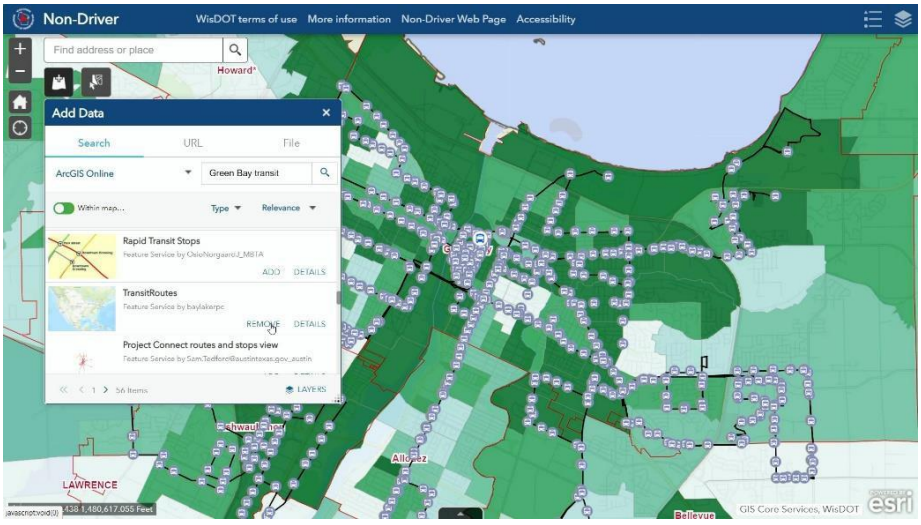

Figure 1: *The Non-Driver ArcGIS Online Application allows for users to upload data, such as transit routes, bus stops or service area boundaries, over the non-driver population estimates to identify "hot spots" of underserved and unserved Wisconsin non-drivers. Uploading data can be accomplished by using the application's Add Data feature.*

Why does it matter?

WisDOT estimates of the 5,806,975 people living in Wisconsin, 31% are non-drivers. With 97% of the state's land mass considered rural and with 30% of the population living in communities of under 10,000, it is known that non-drivers are located across the state. The application provides planners and decision-makers with where non-drivers are located within a given geographic area by county, city, village, town, U.S. Census Tract and U.S. Census Block Group levels. The data within the application produces a non-driver population estimate for each of the state's 72 counties and 1,851 cities, villages and towns, in addition to the estimates for the U.S. Census Tracts and Block Groups in the state.

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Application users, such as local and regional planners, can use the information by comparing non-driver spatial data with existing or planned transit services mapping data, to allow for data-driven decision making and evidence-based policy decisions in Wisconsin communities. A transportation system inclusive of multimodal options available to the whole community improves the quality of life for everyone.

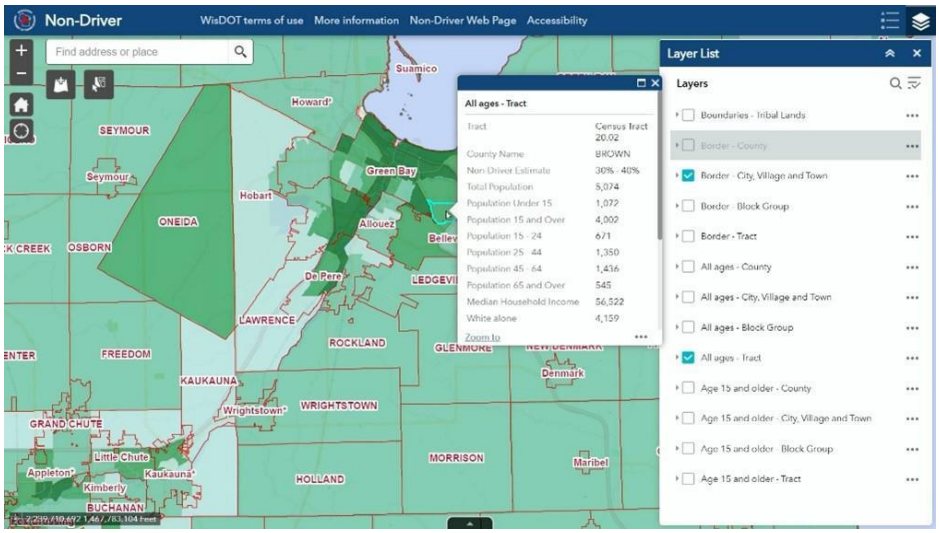

Figure 2: *The Non-Driver ArcGIS Online Application provides non-driver estimations as well as total population and demographic data from the U.S. Census Bureau. By selecting a geographic area (county; city, village or town; U.S. Census Block Group or Tract) a pop-up box will appear displaying the non-driver estimate, total population and demographic data for the selected area.*

The cost to develop the Non-Driver ArcGIS Online Application was approximately $110,000 and over 1,000 hours of staff time. The application increases the opportunities for improving the quality of life of non-drivers. A direct benefit of the application is providing local, regional, and state planners with estimations of where non-drivers are located within a given geographic area.

What makes it different?

Non-drivers comprise a significant percentage of Wisconsin's population, and many face challenges getting where they need to go. In an effort to improve transportation mobility, safety and access for non-drivers in Wisconsin, the department developed the Non-Driver ArcGIS Online Application for use by decision-makers. The application combines datasets from the U.S. Census Bureau and WisDOT's Division of Motor Vehicles to calculate the estimated non-driver populations at the county; city, village, town; U.S. Census Tract and U.S. Census Block Group levels. *A unique methodology is used to process the datasets to identify the non-driver.* Non-drivers are individuals who 1.) do not hold a driver license or 2.) do hold a driver license but cannot be reliably matched to a vehicle. The use of Business Intelligence to 'read' large DMV data files, approximately 19.5 million data records, that define the non-driver combined with ArcGIS to plot the data and overlays is an innovative technology approach to assist in multi-modal needs planning.

What makes it universal?

Improving transportation mobility and access for non-drivers is an effort that can be taken on by all states at any level of government. The Non-Driver ArcGIS Online Application creates an increased understanding of where non-drivers are located that informs regional planning and local/state government decision making. The tool allows for decision-makers to identify "hot spots" of underserved and unserved non-drivers. The application can be replicated by a local or state government as long as the entity has access to U.S. Census data and state driver and vehicle registration datasets.

Business Intelligence for combining datasets in accordance with specific rules and GIS for mapping data points and overlays of multiple sets of data are increasingly common software tools used by planners and IT specialists.

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Non-drivers are often an untapped part of a community or region's workforce due to inconsistent or unreliable transportation services. The application allows employers and municipal planners to consider access to transportation for its employees and provide for new multimodal services with a community. Greater opportunity to participate in the existing and future workforce can lead to increased benefit to the local and regional economies.

Implementation

What was the roadmap?

Increasing accessibility and mobility options for non-drivers is a significant equity-related priority of WisDOT. The department recognizes that for some non-drivers, daily tasks such as going to the grocery store, work or travelling for appointments can be difficult and time consuming. The Non-Driver ArcGIS Online application provides local, regional and state planners with a resource to improve non-drivers' quality of life by providing estimates of where non-drivers are located. From the information technology perspective, the application was developed an expedited project. Expedited projects are ones where the project scope is well-defined, understood and agreed upon by all stakeholders. By working with external partners, such as WiNDAC, and internal business units, WisDOT understood the positive impact the application can for non-drivers.

The Wisconsin Department of Transportation has a Project Management Office within the Bureau of Information Technology Services that maintains an IT Project Life Cycle which carries any project from identifying the project purpose to planning and developing to ongoing project maintenance process development. WisDOT staff from across the department developed and used a variety of quality control processes to validate the methodology to create the non-driver population estimates. Business area staff ensure the data within the application is easily accessible and consumable by end users.

Successful implementation of the Non-Driver ArcGIS Online application can be shown by the usage of the application. Between May 2022 – May 2023, the application has been used on average 5.45 times per day. The department continues to update the application's data regularly to provide current non-driver population estimates. Additionally, the department will continue to work with WiNDAC and other stakeholders to enhance the application's features.

Who was involved?

The Wisconsin Department of Transportation formed the Wisconsin Non-Driver Advisory Committee (WiNDAC) in spring 2020 as an advisory forum to discuss transportation mobility, safety, and access for Wisconsin's non-driving populations. The committee is comprised of state and local government, FHWA, legislators, academia, advocacy groups, mobility service providers and stakeholder transportation associations. The committee identified the need for improved non- driver planning resources. This need led WisDOT to develop the Non-Driver ArcGIS Online Application. The department sought feedback from WiNDAC prior to, during, and following the deployment of the Non-Driver ArcGIS Online Application. Committee members provided feedback during the demonstration—an example of feedback being incorporated into the application was the inclusion of Wisconsin DMV service center locations throughout the state.

The application's development efforts required staff from across the Wisconsin Department of Transportation. The Division of Motor Vehicles' data stewards provided the necessary driver and vehicle data sets needed to calculate the non-driving population estimates. The department's Business Intelligence team processed approximately 6.5 million driver and 13 million vehicle data points in less than 45 minutes through a set of filters and methodology processes to identify the drivers in Wisconsin. This information was then combined with the U.S. Census Bureau population data to calculate and define Wisconsin non-drivers. Following this process, WisDOT's GIS Unit geocoded the non-driver data into the Non-Driver ArcGIS Online Application to provide the non-driver population estimates.

WiNDAC members were notified in early 2022 that the application was complete and publicly available via the WisDOT website. A news release was issued, and application demonstrations are provided upon request.

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How did you do it?

The Non-Driver ArcGIS Online Application utilizes the Esri ArcGIS Online platform as an increasingly popular technology to allow users the ability to add their own data to the application, consume complex U.S. Census and WisDOT Division of Motor Vehicles datasets and discover and download the datasets for analysis. Significant technical accomplishments include processing huge volumes of data (~6.5 million driver records and ~13 million vehicle records) in less than 45 minutes and identifying process improvements for the consumption of driver and vehicle data.

Numerous data inconsistencies and anomalies were corrected to ensure data was accurate and in the correct format to be consumed by ArcGIS. Alongside the application, WisDOT published documentation about data margin of error, which is inherent to the process of geocoding millions of datapoints and using U.S. Census data. The documentation allows users of the application to make informed decisions about whether the data meets the needs of their individual use case. The data and non-driving population estimates in the application are displayed at the aggregate level to prevent disclosure of personally identifiable information. The application is posted on the website and is accessible to anyone with an internet connection.

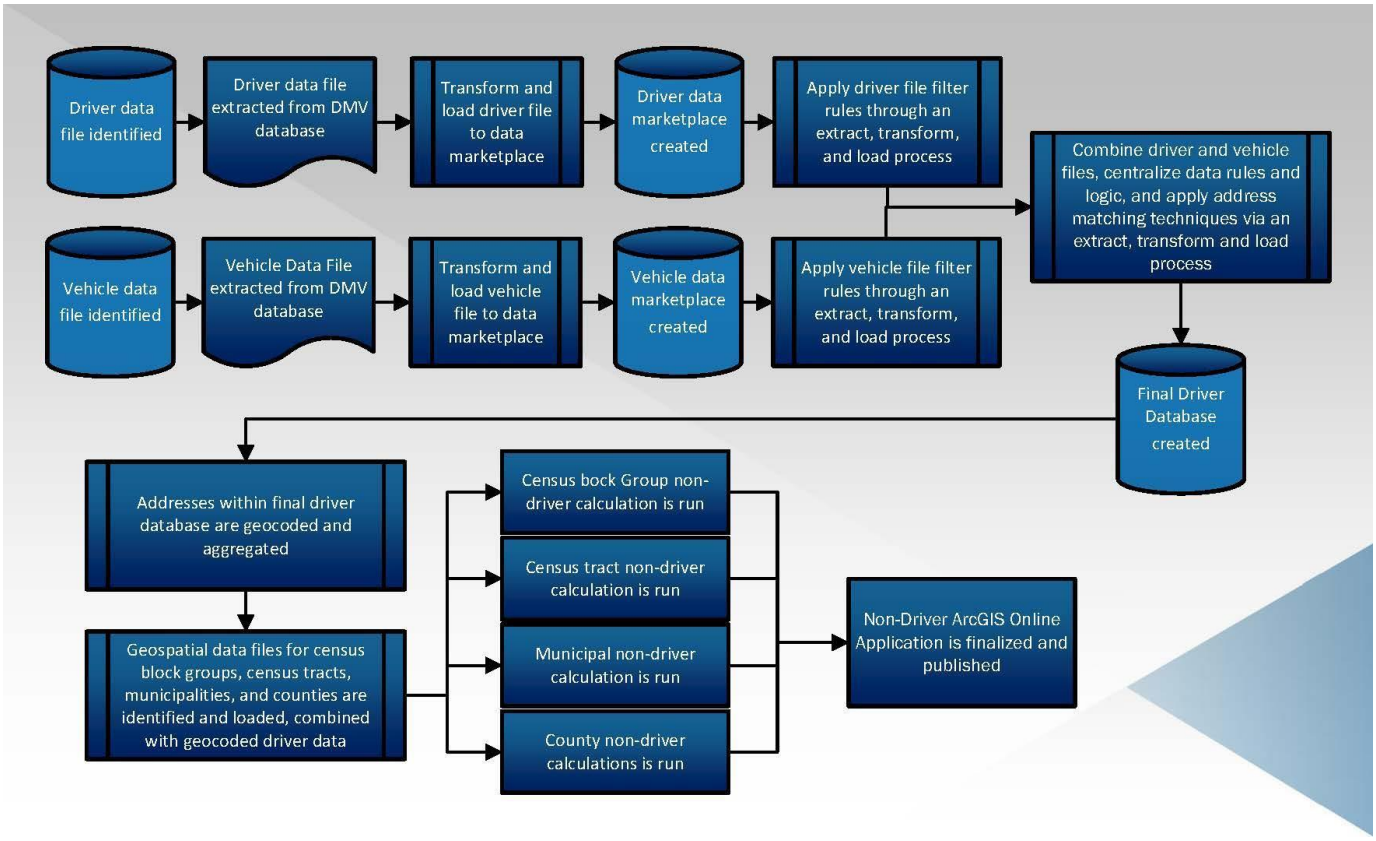

Figure 3: *The above figure illustrates the technical steps required to complete the Non-Driver ArcGIS Online Application.*

As referenced previously, WisDOT dedicated over 1,000 hours of staff time to develop the Non-Driver ArcGIS Online Application, at an overall cost of approximately $110,000. The application utilizes U.S. Census Bureau's Attribute Data and Geographic Data; the Wisconsin State Legislature's Wisconsin City, Villages and Towns geometry data; and WisDOT's Division of Motor Vehicles' driver dataset and vehicle registration dataset.

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Impact

What did the project make better?

The Non-Driver ArcGIS Online Application can be used at the state or local level by transit providers, local government, regional planners and state level government. The data within the application produces an estimate for each of the state's 72 counties and 1,851 cities, villages and towns. Application users can use the information by comparing non-driver spatial data with existing or planned transit services mapping data, to allow for data-driven decision making and evidence-based policy decisions in Wisconsin communities.

Non-drivers are often an untapped part of a community or region's workforce due to inconsistent or unreliable transportation services. With proper transportation options non-drivers can pursue or accept employment that would otherwise be inaccessible to them. The GIS tool allows employers to consider access to transportation for its employees and provide for new multimodal services with a community. Greater opportunity to participate in the workforce can lead to increased benefit to the local and regional economies.

How do you know?

Wisconsin Department of Transportation staff have presented the Non-Driver ArcGIS Online Application at various forums to develop awareness of the tool and solicit feedback. Salient presentations include the meeting of the Wisconsin Non-Driver Advisory Committee, the 2021 Southeast Wisconsin Transportation Symposium at the University of Wisconsin-Milwaukee, the Wisconsin Transit Riders Alliance annual meeting, and the 2022 Wisconsin Public Transportation Association Fall 2022 Conference. The application has been shared widely with the application's target audience, including state and local government, academia, advocacy groups, mobility service providers, and stakeholder transportation associations. The application has been viewed about 3500 times since its release in January 2022. The application was cost-efficient to produce, while creating significant value to stakeholders.

"While WisDOT's Non-Driver ArcGIS will not create more transportation options, it plays a critical role in transportation planning. The tool shows where Wisconsin's non-drivers live—rural, suburban, and urban—and who they are by demographic groups. When other mapping layers are added, such as current transportation services and pedestrian/bicycle infrastructure, a comprehensive picture is created indicating where there may be significant gaps in services and infrastructure that leave non-drivers with few to no options.

Transportation planners can use this real-time information for critical decisions about system and infrastructure design and to spark ideas for filling these gaps. Regional planners can utilize this information as additional criteria when considering where to place a new hospital, clinic, or shopping area.

Since the foundation of the mapping tool is built using Department of Motor Vehicles and census data and other layers can be added by the user, this tool could be replicated in other states across the country to enhance their toolboxes for creating greater transportation equity for non-drivers."

Denise Jess, Executive Director
Council of the Blind and Visually Impaired, and
Co-Chair of Wisconsin Non-Driver Advisory Committee

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"This tool brings new prominence, ease-of-use, and access to U.S. Census Bureau and Wisconsin Department of Motor Vehicles data regarding non-drivers in the State of Wisconsin. Presenting this information in a public-friendly geographic format allows residents, transportation planners, and transportation providers to quickly understand where unmet needs for transportation are greatest within the State.

Within the Wisconsin context, there has long been a perception that non-drivers are mostly concentrated in the State's urban areas. The presentation of this information in an interactive and geographic format makes clear that the 31 percent of the State's population that does not drive is distributed across the State, and that high concentrations of non-drivers exist in some urban areas, but also in many rural areas in the western and north central parts of the State. Addressing this incorrect perception with data enables residents, planners, and decision-makers to think critically about what services are being provided to ensure that all residents, across the State, can fully participate in the State's economy and achieve a high quality-of-life. As discussions over transportation programs and services in the State continue, this tool helps to inform decision makers about where needs are highest and where programs may need to be developed or strengthened to meet those needs. I would expect that many states across the country are struggling with similar challenges, particularly given the national trend in aging that is both increasing demand for transportation services for seniors and increasing the pressure on employers and governments to ensure that every working age adult is able to access jobs."

Kevin Muhs, City of Milwaukee, and
Former Executive Director of Southeastern Wisconsin Regional Planning Commission

What now?

According to UW-Madison's Applied Population Laboratory, Wisconsin's population is projected to continue trending older over the next twenty years, especially in rural counties. Given this, and other demographic changes in the state, it is particularly important to maintain high quality, frequently updated data in the application. WisDOT plans to update the application on a regular basis, upon the availability of new U.S. Census data. Updates to the data within the application are crucial to ensure that end users of the application are viewing the most up-to-date and accurate data of non-driving populations.

In addition to refreshing the data, WisDOT is committed to creating new functionality within the application in order to expand the application's impact and serve the needs of more users. In May 2022, four months after the initial go-live date of the application, WisDOT released a new DMV service center geospatial data layer. The layer allows planners to be able to overlay non-driver data with DMV service center locations and transit service data to identify latent transportation need related to accessing DMV services. Additionally, WisDOT is developing a template for application users to upload address-based location data to the application.

WisDOT intends for the Non-Driver ArcGIS Online Application to be a lasting and accurate source of data provided to planners and advocates in the state, as we improve transportation for non-drivers.