

Transit Network Redesign

Title VI Service Equity Analysis

JARRETT WALKER + ASSOCIATES

Let's think about transit



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1. Purpose and Context

This memo describes the Service Equity Analysis performed in response to the Madison Metro Transit Network Redesign project. This analysis is prepared the following legal context:

- Title VI of the Civil Rights Act of 1964 prohibits recipients of Federal financial assistance (such as the City of Madison, including Metro Transit) from discriminating on the basis of “race, color, and national origin”.
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations incorporates requirements from Title VI and other federal laws to “prevent minority [...] and low-income communities from being subject to disproportionately high and adverse environmental effects”.
- The Federal Transit Administration (FTA) has established regulations to comply with Title VI and Environmental Justice requirements in circular FTA C 4702.1B – Title VI Requirements and Guidelines for Federal Transit Administration Recipients.
- In the case of a major service change like the Metro Transit Network Redesign, the FTA requires Metro Transit to undertake a Title VI Service Equity Analysis. This analysis is to establish that the proposed change does not pose a disproportionate impact to minority populations, or a disproportionate burden to low-income populations. Specifically, the Service Equity Analysis seeks to ensure that minority and low-income populations aren’t unfairly impacted by any service reductions, and that these groups do receive their fair share of service improvements.

Furthermore, in response to public concerns and debate prior to the adoption of the Metro Transit Network Redesign, this Service Equity Analysis has been expanded beyond the regulatory requirements of Title VI and includes discussions about the effects of service changes to specific disaggregated minority groups, people with Limited English Proficiency, seniors, and people with disabilities.

In this analysis, the words “minorities” and “people of color” are used interchangeably.

The existing Metro Transit network is in need of a redesign. The following reasons demonstrate this need:

- In 2020, Metro reduced service in response to the COVID-19 pandemic. Since then, ridership levels have returned, and Metro is preparing to raise service levels to meet demand. Many of the routes that were cut in 2020 no longer serve the community in the context of the existing post-pandemic transit network.
- Metro is planning to open its first bus rapid transit line in 2024 in the east-west corridor. This project will also have bus rapid transit branches serving the south and north sides as well as Middleton to the northwest. These routes are not existing routes and would be duplicative of the existing network. Because of the cascading effect of transit network changes needed to avoid duplication with bus rapid transit, nearly every route in the system needed investigation.
- Many transit riders and other members of the community have consistently complained about long travel times and infrequent service. These problems were especially impactful to people traveling outside peak periods and traveling to places other than downtown Madison.

2. Policy: Metro Transit’s Title VI Program

Metro Transit has developed a Title VI program that details how it applies Title VI regulations. The current version of this document is the Metro Transit Title VI Program, July 2017. The program includes procedures and for Metro Transit to follow regarding topics like discrimination complaints, public participation (including public participating in developing the major service change policy), communications, language assistance, minority participation in governing boards, service policies and standards, and fare and service equity.

For the purposes of this Service Equity Analysis, the following definitions in Metro Transit’s Title VI Program are key: Major Service Change, Adverse Effects, Disproportionate Impact, and Disproportionate Burden.

Major Service Change

The Metro Transit Network Redesign satisfies three of Metro Transit’s four criteria for a major service change requiring a Service Equity Analysis, including an analysis of adverse effects. Metro Transit’s Title VI policy establishes that “any service change that qualifies for a public hearing is ‘major’ and in need of analysis under Title VI.” This includes:

- The establishment of new bus routes
- An alternation on a route of more than 25% of its route miles
- The elimination of any bus service
- A 25% or greater change in the number of daily service hours provided

Adverse Effects

The Metro Transit Network Redesign imposes some adverse effects. Adverse effects are defined as a geographical or temporal reduction in service which includes, but is not limited to elimination of a route, rerouting of an existing route, and a decrease in frequency.

Any change to a transit network that rearranges, but does not functionally add service, will have adverse effects for some individuals and benefits to other individuals. The overarching goal in any change is to minimize these adverse effects and maximize the benefits, while targeting the benefits towards the people who most rely on the service. While individuals may see adverse impacts, certain populations – low-income people and people of color (minorities) – as a whole must not experience adverse effects at a greater rate than the population in the service area as a whole.

Disproportionate Impact on Minority Populations

This Service Equity Analysis must determine whether any adverse effects disproportionately impact minority populations. Metro Transit’s Title VI program does not establish a specific measure to quantify adverse effects.

To determine whether adverse effects disproportionately impact minorities, the Metro Transit Title VI program establishes the following criteria: “Should the burden of any major service change require a minority population / ridership (33% threshold) to bear adverse effects greater or less than 2% than those borne by the non-minority population / ridership, that impact will be considered a disparate impact.”

It is not clear from the program document what is intended by “33% threshold”. However, the following groups are identified as minority populations explicitly: Black/African American, American Indian/Alaska Native, Asian, Hawaiian Native/Pacific Islander, Other, Two or More Races, and Hispanic, Latino or Spanish Origin. These groups are based on racial and ethnic groups counted by the U.S. Census.

Disproportionate Burden on Low-Income Populations

Metro Transit’s Title VI program does not establish guidance on what constitutes a disproportionate burden for low-income populations. This Service Equity Analysis takes the position that the criteria for disproportionate burden on low-income populations should be similar to the criteria for disproportionate impact on minority populations.

Metro Transit’s Title VI program defines low-income populations as “households who are at or below 150% of the Department of Health and Human Services Poverty Guidelines.” As of 2022, the poverty thresholds by household size are as follows:

Household Size	2022 Income 150% of Federal Poverty Level
1	\$20,385
2	\$27,465
3	\$34,545
4	\$41,625
5	\$48,705
6	\$55,785
7	\$62,865
8	\$69,945
9 and above	Add \$7,080 for each additional person

Table defining low-income households

Metro Transit’s Title VI program does not directly state a threshold that defines the level of adverse effects that would pose a disproportionate burden on low-income populations, but the program is interpreted to use the same 2% threshold that is defined for minority populations.

3. Process: Equity in Planning the Network Redesign

The FTA circular 4702.1B does not require Service Equity Analyses to include a discussion of the planning process. However, this section is included as a demonstration of good faith, and consistent with the general principles of including equity at every step of planning.

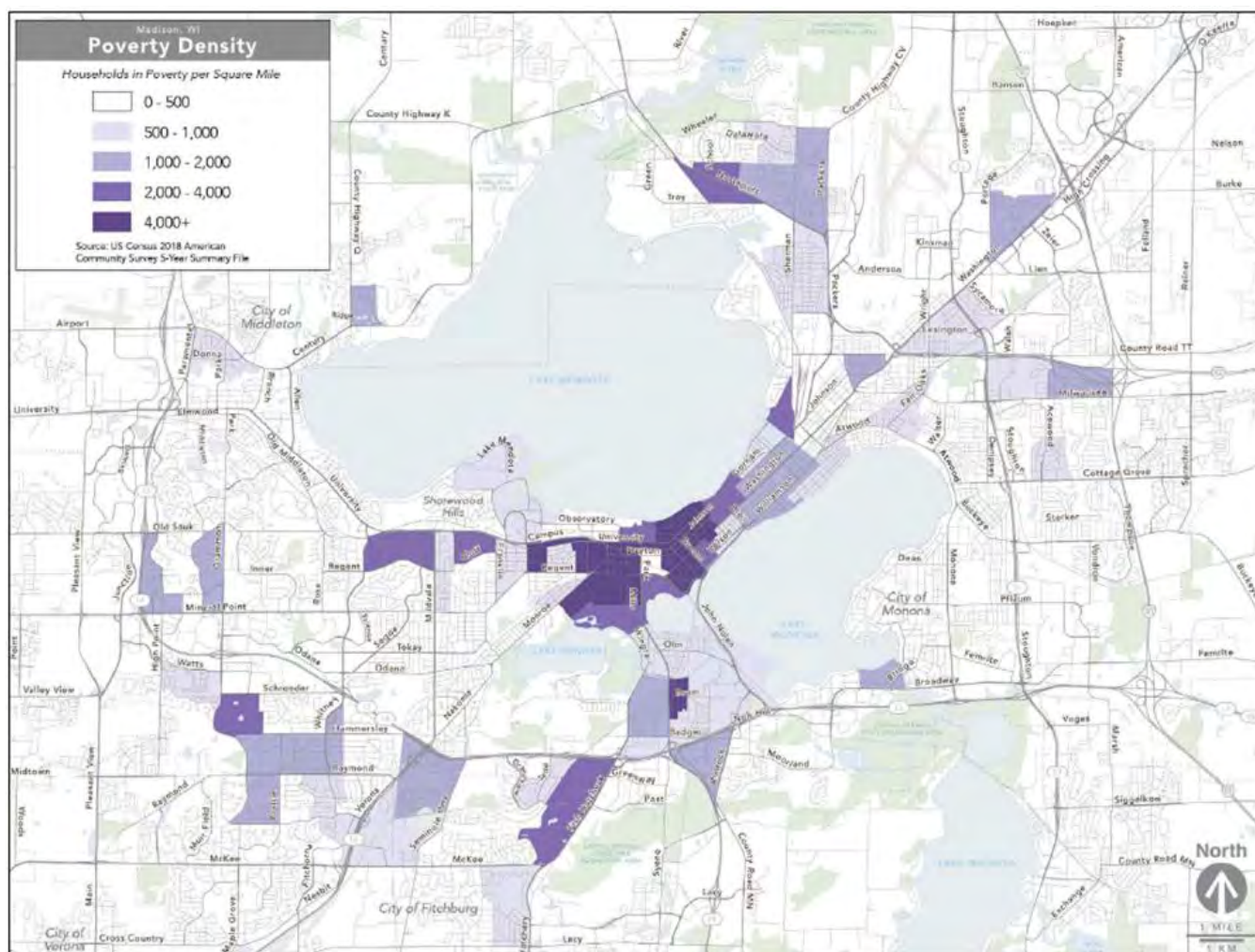
The Metro Transit Network Redesign has proceeded in four planning phases. Each of these phases included a process for gathering meaningful public input, resulting in changes to proposed service concepts. Input was sought through online and paper surveys, city-wide meetings, limited area meetings, and stakeholder meetings. During Phases 1-3, survey data was categorized according to respondent demographics, allowing the project team to clearly distinguish any meaningful differences in opinions that may have been based on race, income, age, and disability. During Phase 4 an emphasis was placed on limited area meetings to reach people directly and shape the specific amendments to the draft plan.

Each project phase also explicitly considered the impacts any conceptual network on minority and low-income populations, as well as other groups, through data analysis.

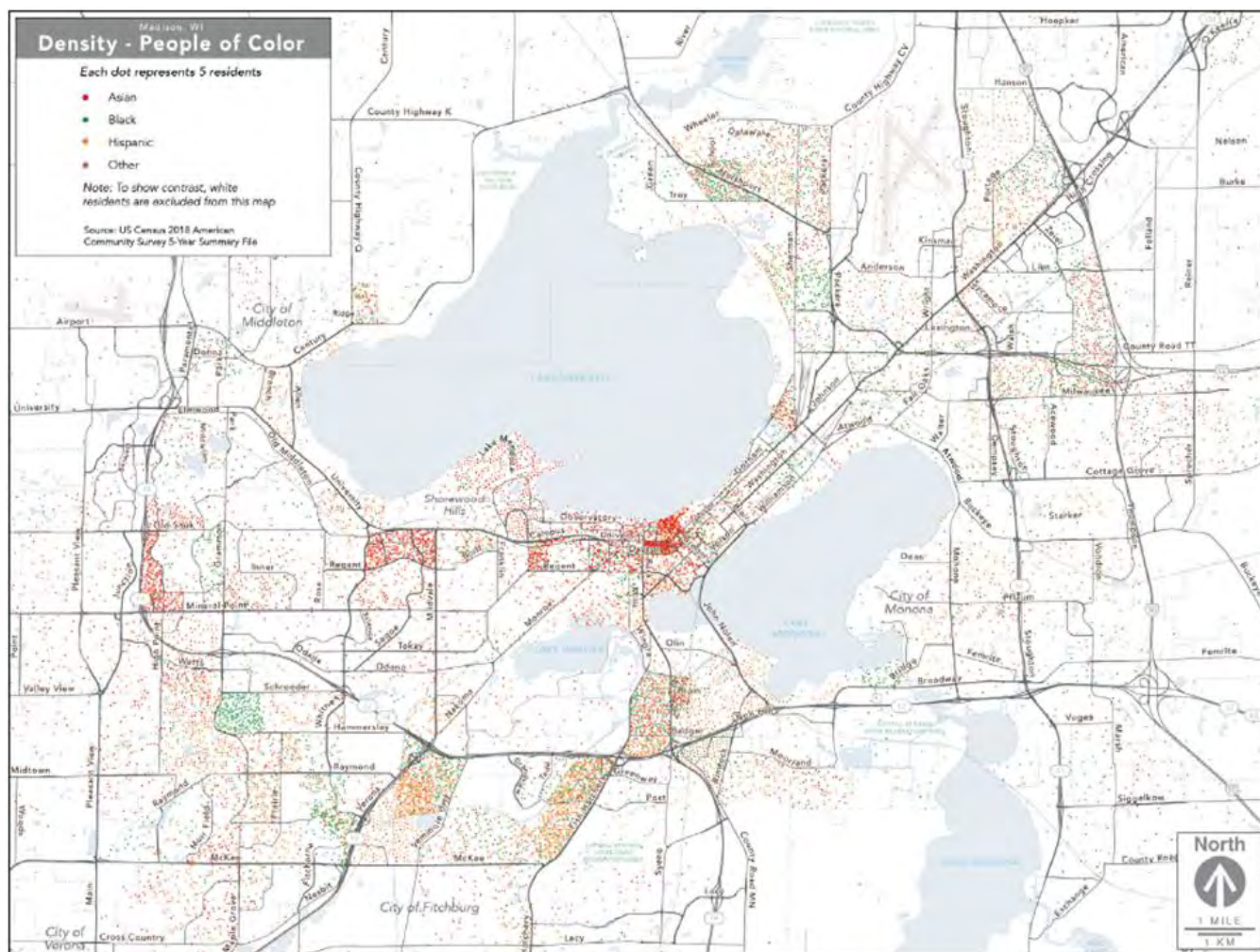
Phase 1: Existing Conditions and Choices (Spring 2021)

This phase presented the current market and need for transit service in Madison, examined the transportation services currently provided by Metro Transit, described the challenges of existing service for riders and the general public, and outlined the key choices to be made in deciding whether and how to make changes.

The Existing Conditions and Choices Report mapped out the density and approximate locations of key populations for transit need in Madison and environs, including households with zero vehicles, low-income people, racial and ethnic minorities, seniors, and youth. The report also discussed the distinction between the needs of students experiencing temporary poverty in central Madison, compared to the often generational poverty experienced by low-income populations in peripheral neighborhoods. Key examples of such maps are provided below.



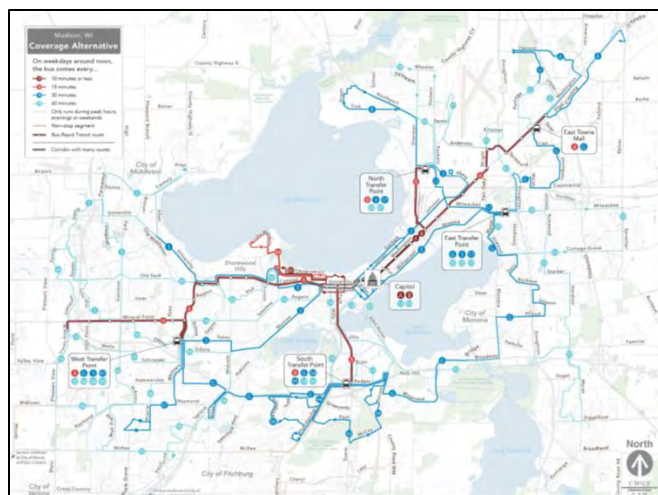
Map of density of people in poverty provided in the Existing Conditions and Choices Report



Map showing approximate distribution of racial and ethnic minorities, from the Existing Conditions and Choices Report

Phase 2: Alternatives (Fall 2021)

This phase developed two distinct alternatives for the future of bus service in Madison, based on a return to pre-pandemic service levels and the introduction of a separately planned East-West BRT corridor service. The Coverage alternative maintained mostly infrequent service outside of the planned BRT corridors. It utilized the existing transfer points and some efficiency gains to expand all-day service into some new areas. The Ridership alternative presented a complete redesign of service that would focus more on frequency and directness of bus routes, eliminating key elements of existing service like the transfer points, and slightly reducing the population within a 1/4-mile walk of a bus stop.



Coverage Alternative



Ridership Alternative

Figures demonstrating Coverage and Ridership alternatives

The Alternatives Report and Draft Network Plan expressed the effect of each proposed service concept on different populations, including:

- People's access to destinations – the change in numbers of jobs reachable within 45 minutes by transit – for the general population as well as people of color and people with low incomes.
- The number of people of color, low-income people, seniors, and youths would be located near service at different frequency levels. Examples of this analysis are shown in the tables below.

Proximity to Transit Service compared by Alternative			
The table below compares the number of people and jobs near all-day transit between the Existing Network and the two Alternatives.			
The Ridership Alternative would reduce the number of people near transit. The Coverage Alternative would maintain and slightly increase the number of people near transit service.			
	Existing Network	Ridership Alternative	Coverage Alternative
All Residents	79%	67%	81%
People of Color	79%	66%	81%
People with Low Incomes	91%	82%	91%
Senior Residents	73%	57%	73%
Youth	72%	57%	74%
Jobs	88%	76%	86%

Proximity to Frequent Transit Service compared by Alternative			
The Ridership Alternative would nearly quadruple the number of people near frequent transit (service every 15 minutes or better). The Coverage Alternative, would increase the number of people near frequent transit as well, but by a more modest amount.			
	Existing Network	Ridership Alternative	Coverage Alternative
All Residents	11%	43%	27%
People of Color	15%	41%	29%
People with Low Incomes	32%	66%	49%
Senior Residents	3%	29%	16%
Youth	4%	28%	15%
Jobs	17%	55%	47%

Tables comparing proximity impacts Ridership and Coverage Alternatives, by population group, from the Alternatives Report

During the Alternatives phase, these choices were presented to Madison’s Transportation Policy and Planning Board for direction on how to proceed with planning the new network. The board passed a resolution instructing the planning team to proceed with a “mostly Ridership” approach to the new system.

Phase 3: Draft Network Plan (Winter/early Spring 2022)

This phase was developed following public input and policy direction favoring the Ridership alternative. The Draft Plan was an adaptation of the Ridership alternative that added necessary coverage not provided in the Ridership alternative, and also refined the route geometry based on ongoing planning and analysis.

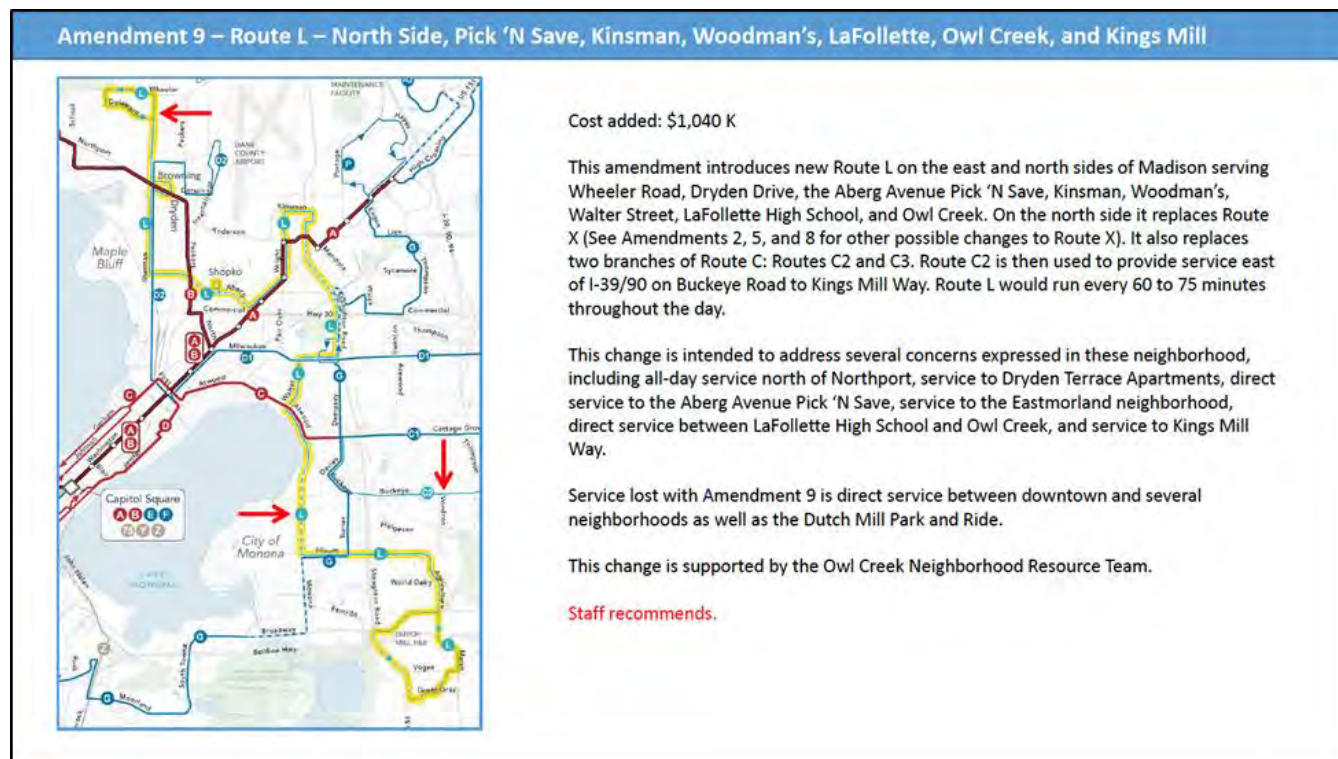
The draft plan contained much of the same analysis as the Alternatives phase. The planning team used maps and data to maintain, strengthen, and improve service in low-income neighborhoods such as along the Beltline corridor.

In Phases 2 and 3, access and proximity analyses were based on populations within the City of Madison. For this Service Equity Analysis comparing existing service to the Transit Network Redesign plan, analyses were based on the entire Metro Transit service area.

Phase 4: Final Plan (late Spring 2022)

The plan adoption process integrated large amounts of feedback received on the draft plan. The adoption process by the City of Madison Common Council involved including 17 of many possible amendments to the plan based on community feedback. The final adopted plan also increased the total planned service investment by the City of Madison by about \$1 million per year over 2019 levels.

Many of the proposed amendments adopted as part of the final plan were explicitly introduced to respond to equity concerns. Examples of this include Amendment 4, which added Route O, and Amendment 9, which added Route L. Route L was designed to connect low-income and minority areas on the north side and in Owl Creek directly to a variety of key destinations, including two discount grocery stores (Pick ‘N Save on Aberg Avenue and Woodman’s on Milwaukee Street), Madison College, and La Follette High School.

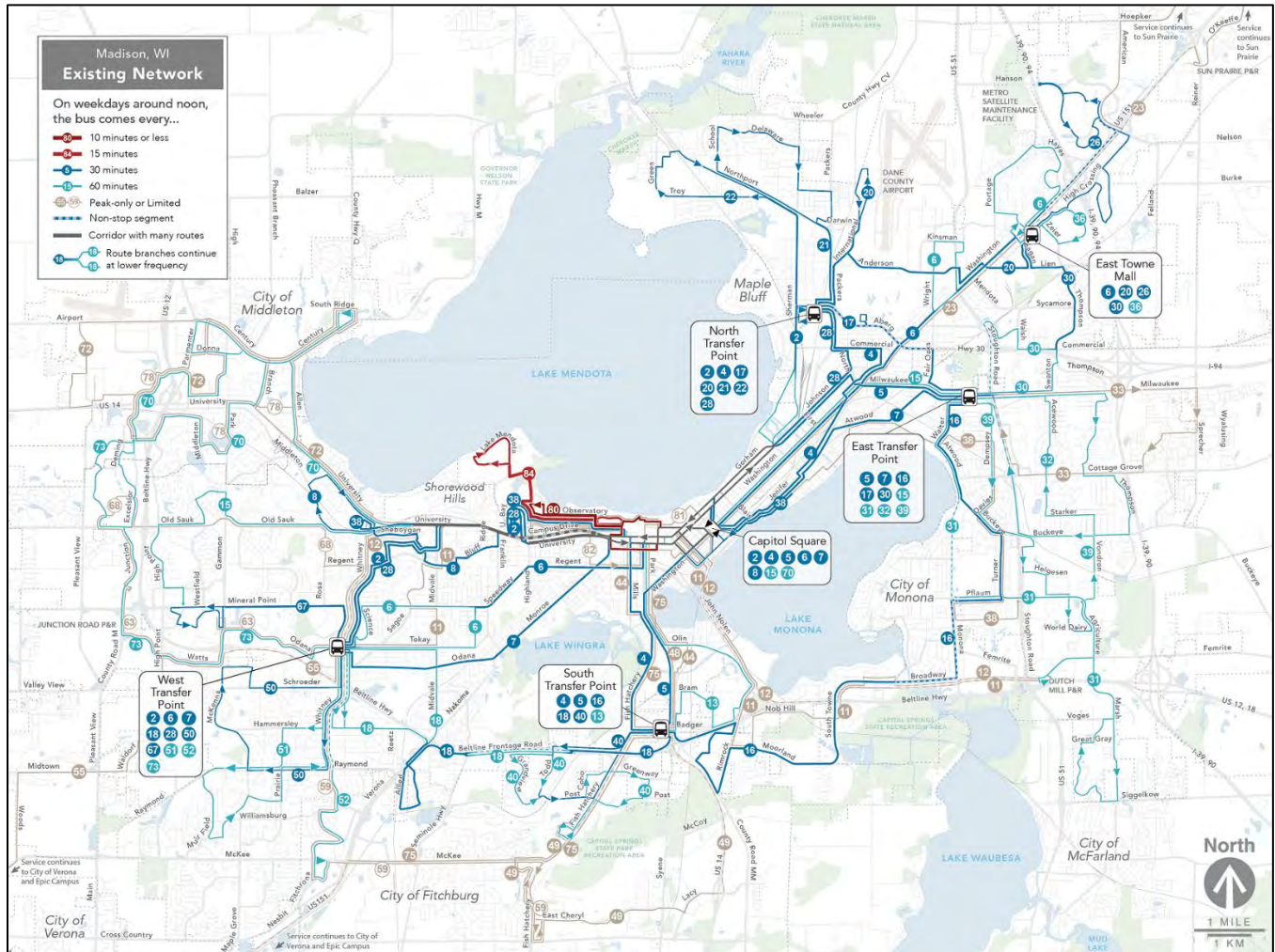


Map and description of one of the proposed amendments from Draft Plan to Final Plan, showing the introduction of proposed Route L

Following adoption of the plan, the project schedule calls for plan refinements in 2022 and 2023, with implementation in summer 2023.

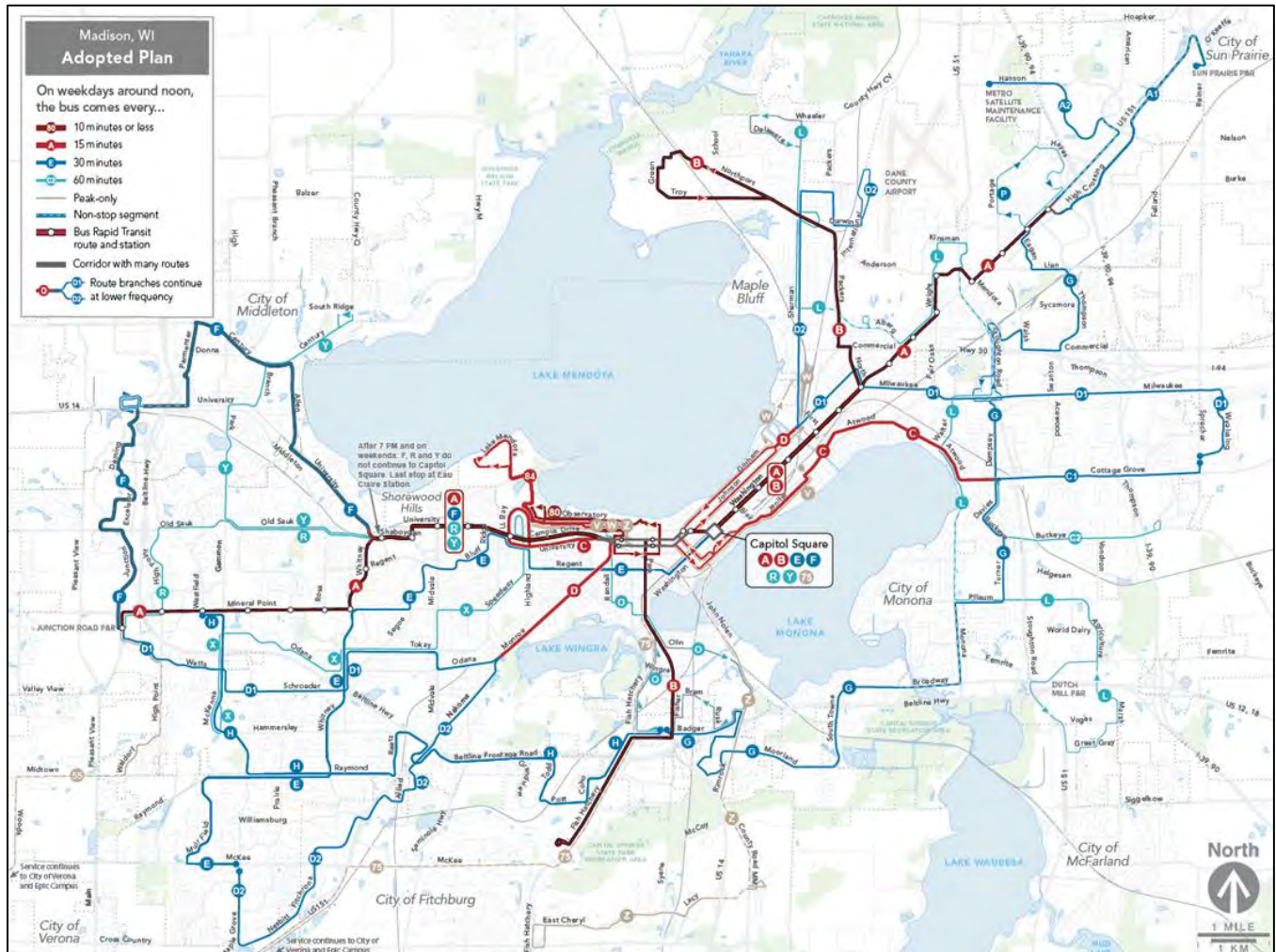
4. Existing and Proposed Service Maps

The figure below shows the existing transit system as it existed in 2022. Routes are shown individually, and colors represent the weekday mid-day frequency. This network is focused on providing timed transfers at the four transfer points. The transfer point system makes it possible to travel by transit to and from almost anywhere in the service area, but requires long waits due to low frequencies, multiple transfers, and includes many one-way loop routes in outlying areas.



Existing Metro Transit network as of 2022

The figure below shows the final plan map following the Transit Network Redesign. Similarly, routes are shown individually, and colors represent the weekday mid-day frequency. This network is focused on attracting higher ridership by providing more frequent service and direct travel. As a result, most trips by transit take less time, but some people will have to walk farther to reach a bus stop.



Adopted final plan map of the Transit Network Redesign

5. Quantitative Analysis

FTA Circular 4702.1B requires transit agencies to perform an analysis of the adverse effects of major service changes on minority and low-income populations. This analysis is to be based on the agency program's threshold for disproportionate impact and disproportionate burden. This Service Equity Analysis includes analysis done according to two methods:

Method 1: People-trips (Service Quantity)

The people-trips method focuses on changes in the amount of service provided near people. The goal of this method is to determine whether the number of annual bus trips near minority and low-income populations would change more than the amount of service near non-minority and non-low-income populations.

Method 2: Transit Access to Destinations (Service Quality)

The access analysis method focuses on changes in the usefulness of service to different populations. This method seeks to establish how many destinations people can reach in a defined amount of time (typically 45 minutes), using transit and walking. The goal is to how minority and low-income populations are affected compared to other groups.

Both the people-trips and access methods were applied to compare service provided in the existing condition (as of 2022) to service that would be offered at the time the Transit Network Redesign is implemented (mid 2023).

Method 1: People-trips (Service Quantity)

This method uses the following procedure to calculate service quantity:

- For each Census block group, the population (U.S. Census 2020 American Community Survey 5-year data) is taken for each demographic group, which is assumed to be evenly distributed within the block group.
- For each bus route that serves the Census block group, the number of times that bus route runs annually is calculated. Any bus trip that has a bus stop within 1/4 mile of the Census block group is considered to serve that block group.
- The population of the block group multiplied by the number of times a bus trip serves that block group is calculated as people-trips.
- The people-trips for all block groups are then summed and expressed as total service area people-trips.
- This calculation is done for both the existing and planned networks, and for various demographic groups.

The total number of people-trips is therefore a measure of both service quantity and the number of people who located near the service. The table below shows the system-level aggregate change in people-trips based on all proposed service changes in the Transit Network Redesign plan.

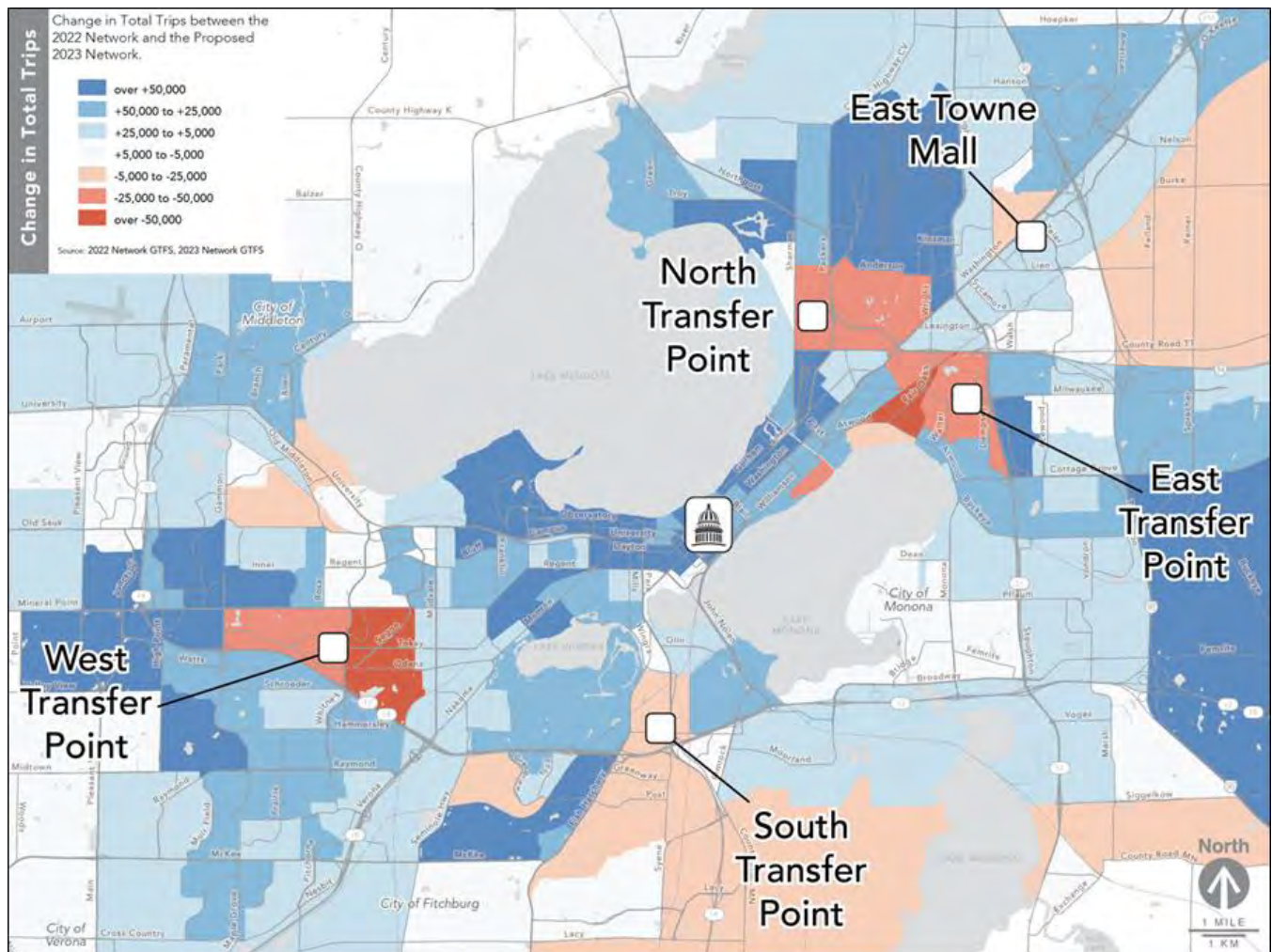
People-trips within 1/4-mile of Metro Transit Service					
	All Residents	Non-Low-Income	Low-Income	Non-Minority	Minority
Existing Network	12,865,043,690	6,939,442,829	5,925,600,861	9,601,846,300	3,263,197,390
Transit Network Redesign	16,309,595,980	9,176,994,770	7,132,601,210	12,065,254,935	4,244,341,045
Difference	+ 3,444,552,290	+ 2,237,551,941	+ 1,207,000,349	+ 2,463,408,635	+ 981,143,655
	+ 27 %	+ 32 %	+ 20 %	+ 26 %	+ 30 %

Table comparing the total quantity of service near people in the existing network and Transit Network Redesign network

The results in this table show that:

- Low-income populations experience a smaller service increase (+20%) than non-low-income populations (+32%).
- Minority populations experience a larger service increase (+30%) than non-minority populations (+26%).

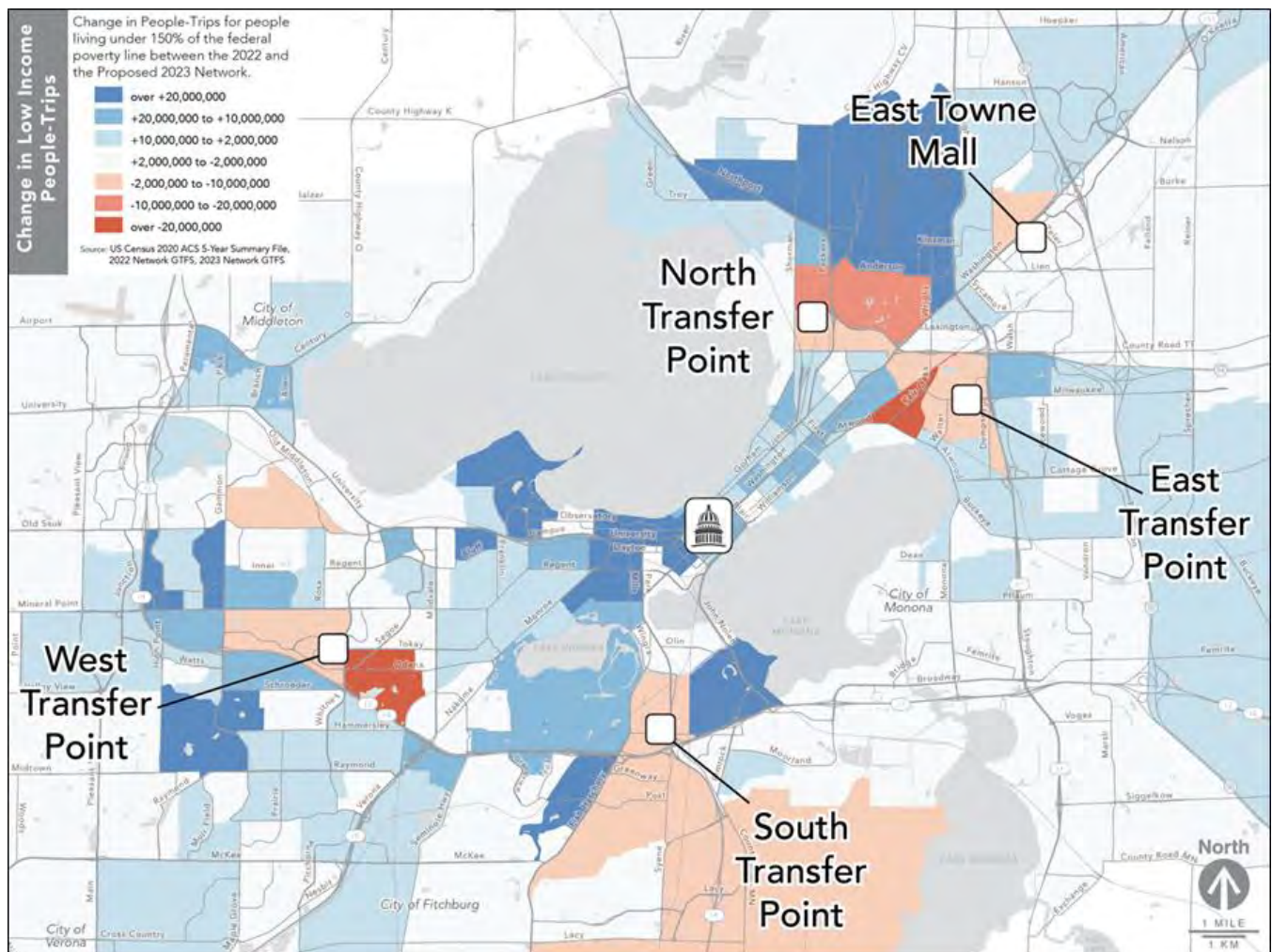
Although all groups experiences a benefit, it is possible that low-income residents benefit less from the Transit Network Redesign than other groups. However, this is not sufficient for a finding of “disproportionate burden” on low-income populations because service quantity (people-trips) would increase almost everywhere in the Metro Transit service area, as shown in the figure below. The main exception is the vicinity of the existing transfer points because the Transit Network Redesign would eliminate the Transfer Point system, focusing instead on providing direct routes from peripheral neighborhoods to and through central Madison. The only people who benefit from the many routes at the transfer points are the very few people who live immediately near them, which most people in the adjacent Census block groups do not.



Map showing where transit service (annual trips) would increase (blue) and decrease (red)

As shown in the figure above, low-income people live throughout Madison, but are especially concentrated in central Madison (esp. around the University of Wisconsin campus), and in peripheral neighborhoods scattered on the North, Northeast, South and Southwest sides of Madison. There is a wide band of mostly middle- and high-income neighborhoods in between these different low-income areas. It is impossible to increase service to outlying low-income areas without increasing service in non low-income areas along the way.

As a result, most low-income people live in areas that would experience service increases, but many areas that would experience service increases do not have large low-income populations. The figure below shows the change in low-income people-trips due to the Transit Network Redesign.



The people-trips method is a common way for transit agencies to determine whether the impacts of a proposed service change are distributed fairly. However, it has shortcomings:

- Service quantity does not always reflect usefulness. Transit service is useful because it allows people to reach the places they need to go. A bus may come by a location often, but not go anywhere useful.
- Effects are only measurable as an average for entire populations. Although minority and low-income populations may on average experience higher levels of service due to the Transit Network Redesign, some people will experience service reductions.
- Many trips are double counted. For example, in the existing network, many trips start and end at the transfer points and the bus traveling through this area is counted twice – first as it approaches the transfer point, and again after it starts a new trip leaving the transfer point. The proposed service combines these shorter routes into fewer longer routes, causing the bus to only be counted once as it passes through the neighborhood, even though it provides the same amount of service without the delay of going through the transfer point. This phenomenon is shown in the figure below.

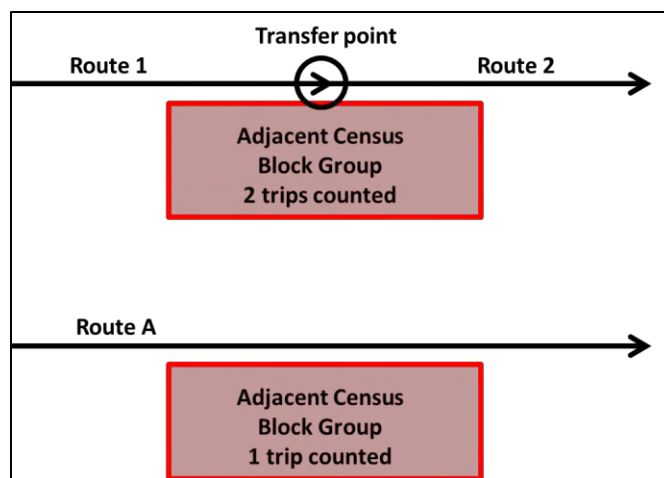


Figure demonstration how trips are double counted in the existing network with the transfer points (above), but not in the Transit Network Redesign network (below)

This memo addresses these limitations by applying a second analysis method, based on transit access to destinations.

Method 2: Transit Access to Destinations (Service quality)

Access analysis is based on the notion that transit's usefulness to individuals is related to the number of destinations a person can reach in a reasonable amount of time.

Using data from the U.S. Census' most recent (2019) Longitudinal Employment-Household Dynamics jobs location dataset, we can estimate how many destinations are in the areas accessible in both existing service and under the redesign. Although people travel for many different reasons, not only to go to work, employment data is readily available, and common destinations like health care facilities and grocery stores are usually also places where people work. The travel time shown includes walk time to and from bus stops, an average wait time and transfer times based on the headway, and time riding on the bus itself using projected bus speeds.

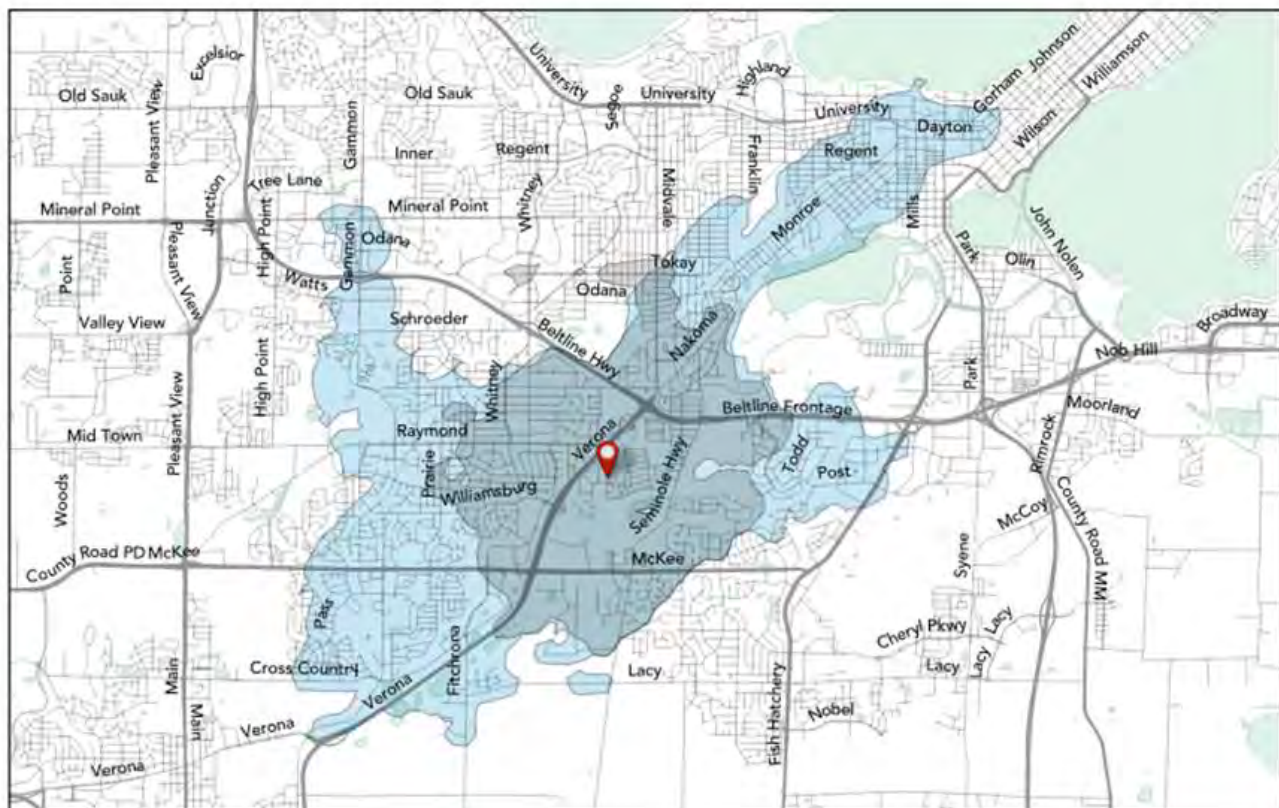
The graphic in the figure below shows an example of how the Transit Network Redesign would change a person's access to places using Metro Transit, if that person were located at the intersection of Allied Drive and Lovell Lane, on a weekday in the mid-day.

How far can I travel in **45 minutes** from

Allied at Lovell

on weekdays at noon using:

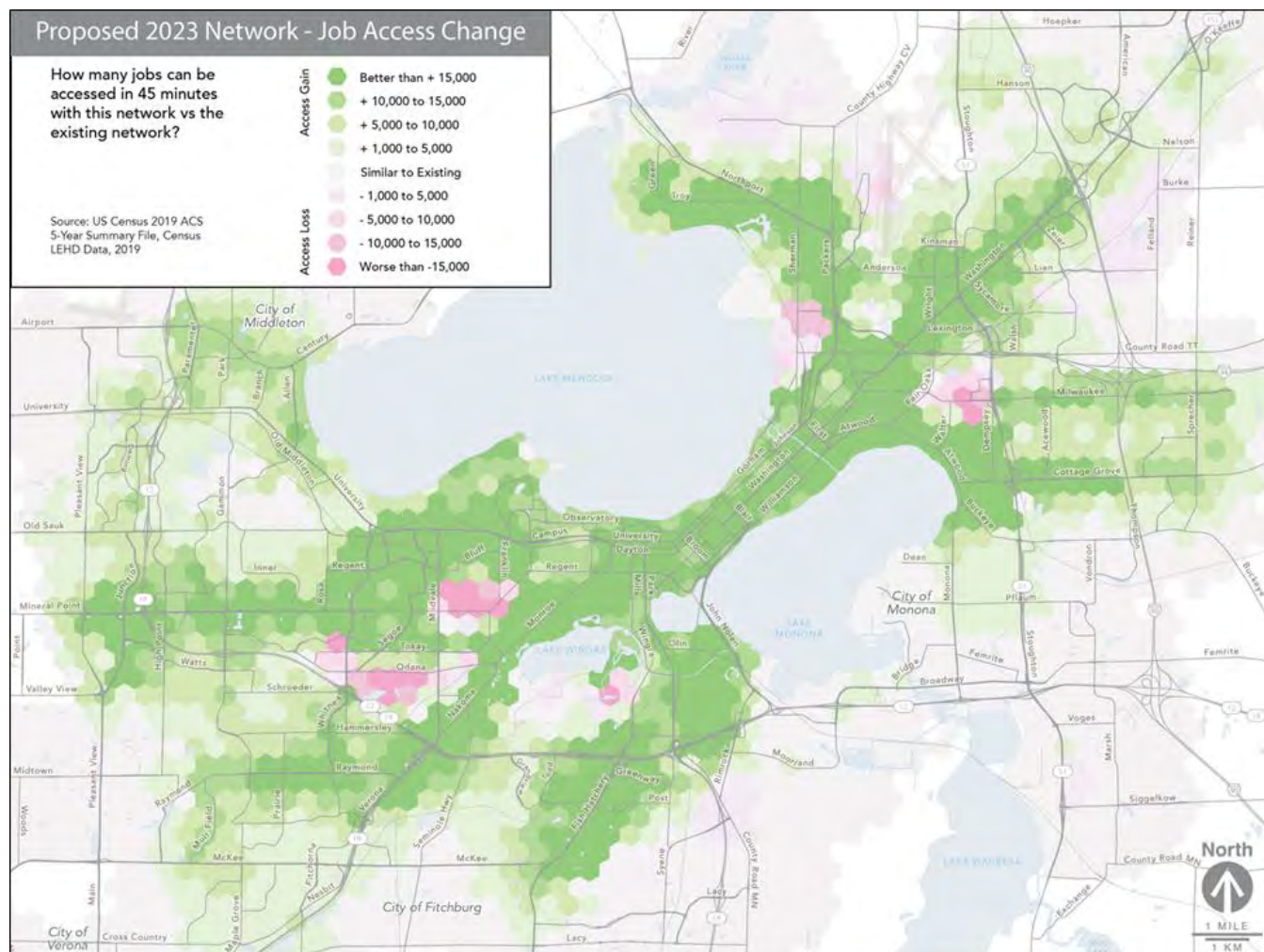
the Redesigned 2023 Network?



Map showing how far someone could travel, by walking and transit, in 45 minutes, when starting at Allied Drive and Lovell Lane

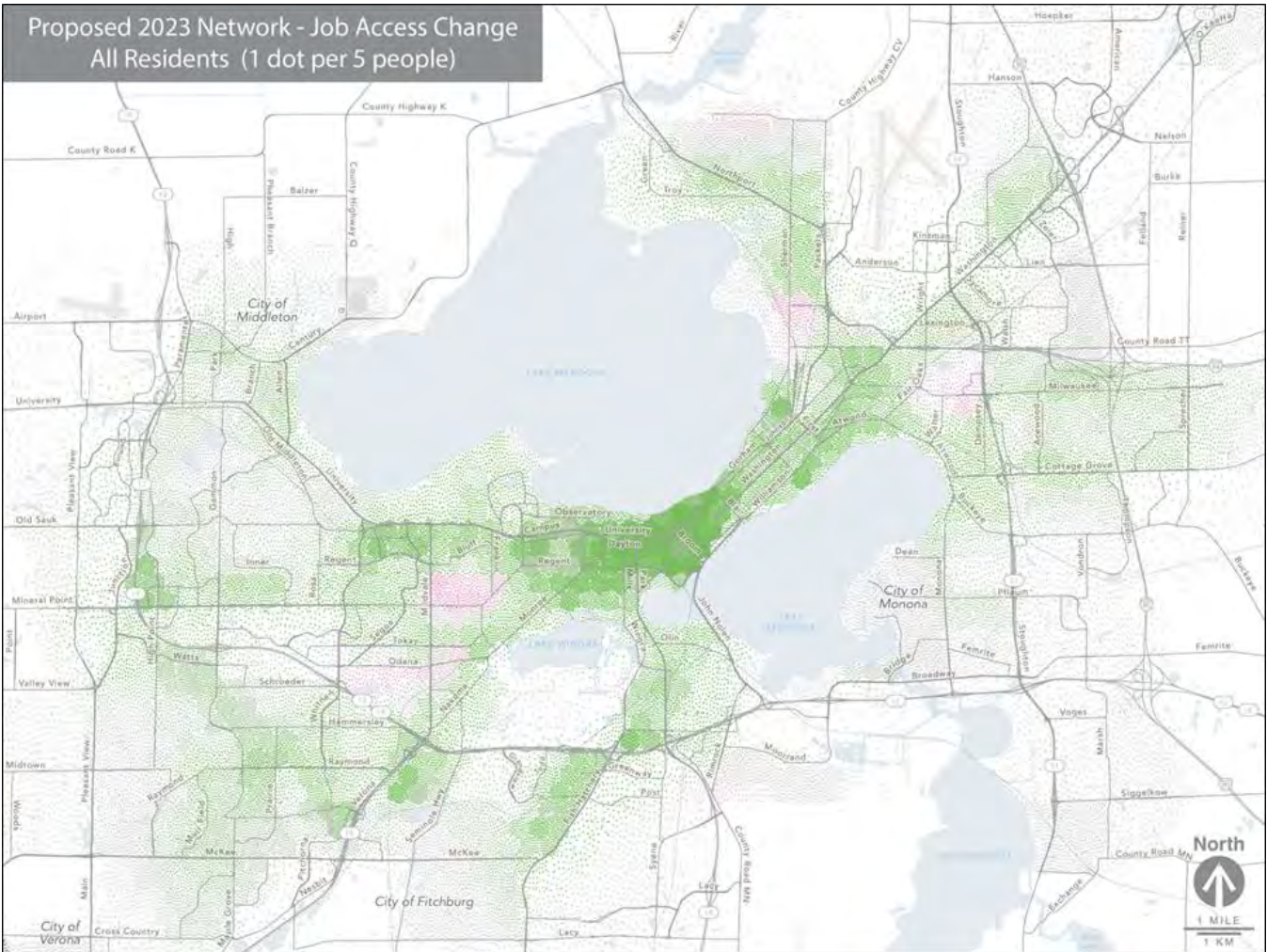
As shown in the figure above, the redesigned transit network would allow someone in this location to access many more places (the light blue areas) in the same amount of time. In this particular example, a person located at Allied Drive and Lovell Lane could reach approximately 6,000 jobs within 45 minutes using existing transit service, compared to approximately 41,000 jobs within 45 minutes with the Transit Network Redesign network.

This same analysis has been repeated for each location on a grid within the Metro Transit service area to understand how the population will be affected as a whole, as shown in the map below.



Map showing places where access to destinations within 45 minutes by transit would increase (in green), decrease (in pink), or stay about the same (in grey)

The map in figure below shows the result of this analysis weighted by population, where one dot represents five residents. Population locations are based on data at the Census block group level in the U.S. Census 2019 American Community Survey (ACS) 5-year data.



Access Change for Minorities and Non-Minorities

The tables below compare access change outcomes for minority and non-minority populations in the Metro Transit service area.

	Approx. Population	Median access to Jobs within 45 minutes, door-to-door, using transit			
		Existing Network	Network Redesign	Change	
All Residents	352,000	10,400	20,200	+9,800	+94%
Non-Minority White non-Hispanic	261,000	10,100	19,200	+9,100	+90%
Minority All people of color	91,000	11,000	23,600	+12,600	+115%

Table comparing the change in the median access to jobs for minorities and non-minorities

	Percentage Experiencing:	
	Decreased Access (-1,000 jobs or worse within 45 minutes)	Significantly Increased Access (+10,000 jobs or better within 45 minutes)
All Residents	3%	47%
Non-Minority White non-Hispanic	3%	45%
Minority All people of color	2%	50%

Table comparing the percentage of minorities and non-minorities experiencing decreased access vs. significantly increased access to jobs by transit within 45 minutes

Based on these results:

- Minority residents are more likely (50%) than non-minority residents (45%) to experience a significant increase in access to jobs by transit due to the Transit Network Redesign.
- Minority residents are less likely to experience an adverse effect (decreased access) than non-minority residents. This suggests the absence of a disproportionate burden on minority populations.
- The median person of color would experience about a 115% increase in access to jobs by transit within 45 minutes, compared to a 90% increase for White non-Hispanic residents.

Access Change for Specific Racial and Ethnic Groups

The tables below include all the racial and ethnic groups listed in Metro Transit's Title VI program, listed in order of population. In addition, the White non-Hispanic population is provided as the non-minority comparison population.

	Approx. Population	Median access to Jobs within 45 minutes, door-to-door, using transit			
		Existing Network	Network Redesign	Change	
White non-Hispanic	261,000	10,100	19,200	+9,100	+90%
Asian non-Hispanic	27,000	16,200	31,000	+14,800	+91%
Hispanic	27,000	10,000	22,000	+12,000	+120%
Black non-Hispanic	24,000	9,800	19,200	+9,400	+96%
Two or More Races non-Hispanic	10,000	8,500	18,200	+9,700	+114%
Native American/Alaska Native * non-Hispanic	1,500 *	9,800	18,300	+8,500	+87%
Other * non-Hispanic	< 1,000 *	7,500	14,700	+7,200	+96%
Native Hawaiian/Pacific Islander * non-Hispanic	< 200 *	4,100	4,900	+800	+20%
* Populations are considered too small for a reliable analysis.					

Table comparing the change in the median access to jobs by racial and ethnic group

	Percentage Experiencing:	
	Decreased Access (-1,000 jobs or worse within 45 minutes)	Significantly Increased Access (+10,000 jobs or better within 45 minutes)
White non-Hispanic	3%	45%
Asian non-Hispanic	2%	56%
Hispanic	2%	52%
Black non-Hispanic	2%	45%
Two or More Races non-Hispanic	3%	45%
Native American* non-Hispanic	3%	55%
Other* non-Hispanic	5%	41%
Native Hawaiian/Pacific Islander* non-Hispanic	0%	33%
* Populations are considered too small for a reliable analysis.		

Table comparing the percentage of each racial and ethnic group experiencing decreased access vs. significantly increased access to jobs by transit within 45 minutes

Based on these results:

- Members of minority populations are equally or more likely to experience increased access to jobs by transit due to the network redesign as members of the non-minority (White non-Hispanic) population.
- No racial or ethnic minority group in the Metro Transit service would experience an adverse effect (decreased access) at a rate more than 2% higher than the White population. There is no disproportionate impact on minority populations according to the threshold in Metro Transit's Title VI program. All but the "Other" group (whose population is so small that the analysis is likely to be unreliable) would experience adverse effects at a lower rate than the White population.
- The median member of all but the three smallest groups would experience a similar or greater improvement in access to jobs by transit than the median White resident.
- The analysis for the three smallest minority groups (Native American, Other, and Pacific Islander) is considered unreliable because their overall populations are so small that the margin of error is likely higher than the reported population in most Census block groups.

Access Change by Income Groups

The tables below compare access change outcomes for low-income vs. non low-income populations in the Metro Transit service area.

	Approx. Population	Median Access to Jobs within 45 minutes, door-to-door, using transit			
		Existing Network	Network Redesign	Change	
All Residents	352,000	10,400	20,200	+9,800	+94%
Non-Low Income	270,000	8,400	15,700	+7,300	+87%
Low-Income	71,000	34,900	67,200	+32,200	+92%

Table comparing the change in the median access to jobs by income group

	Percentage Experiencing:	
	Decreased Access (-1,000 jobs or worse within 45 minutes)	Significantly Increased Access (+10,000 jobs or better within 45 minutes)
All Residents	3%	47%
Non-Low-Income	3%	40%
Low-Income	2%	67%

Table comparing the percentage of each income group experiencing decreased access vs. significantly increased access to jobs by transit within 45 minutes

Based on these results:

- Low-income residents are more likely (67%) than non-low-income residents (40%) to experience a significant increase in access to jobs by transit due to the Transit Network Redesign.
- Low-income residents are less likely to experience an adverse effect (decreased access) than non-low-income residents. This suggests the absence of a disproportionate burden on low-income populations.
- The median low-income and non-low-income person would both experience about a 90% increase in access to jobs by transit within 45 minutes. The absolute increase would be much higher for the median low-income resident (+32,200), compared to the median non low-income resident (+7,300).

Access Change for People with Limited English Proficiency

The tables below compare access change outcomes for people with limited English proficiency compared to all residents.

	Approx. Population	Access to Jobs within 45 minutes, door-to-door, using transit			
		Existing Network	Network Redesign	Change	
All Residents	352,000	10,400	20,200	+9,800	+94%
Limited English Proficiency	14,000	11,200	20,400	+9,200	+87%

Table comparing the change in the median access to jobs by English proficiency

	Percentage Experiencing:	
	Decreased Access (-1,000 jobs or worse within 45 minutes)	Significantly Increased Access (+10,000 jobs or better within 45 minutes)
All Residents	3%	47%
Limited English Proficiency	3%	47%

Table comparing people with low English proficiency vs. all residents experiencing decreased access to jobs by transit and significantly increased access

Based on these results:

- LEP residents are equally likely to experience either a decrease (3%) or a significant increase (47%) in access to jobs by transit within 45 minutes, compared to members of the general population.
- The median LEP resident may experience a slightly lower increase in job access by transit than the median member of the general population. However, the difference is small enough in both absolute terms (+9,200 vs. +9,800) and percentage terms (+87% vs. +94%) that it may be within the margin of error for this analysis.

Access Change for Seniors (ages 65 and over)

The tables below compare access change outcomes for seniors (residents ages 65 and over) with the general population of the Metro Transit service area.

	Approx. Population	Access to Jobs within 45 minutes, door-to-door, using transit			
		Existing Network	Redesigned Network	Change	
All Residents	352,000	10,400	20,200	+9,800	+94%
Seniors (65+)	43,000	8,100	14,700	+6,600	+81%

Table comparing change in the median access to jobs for seniors vs. all residents

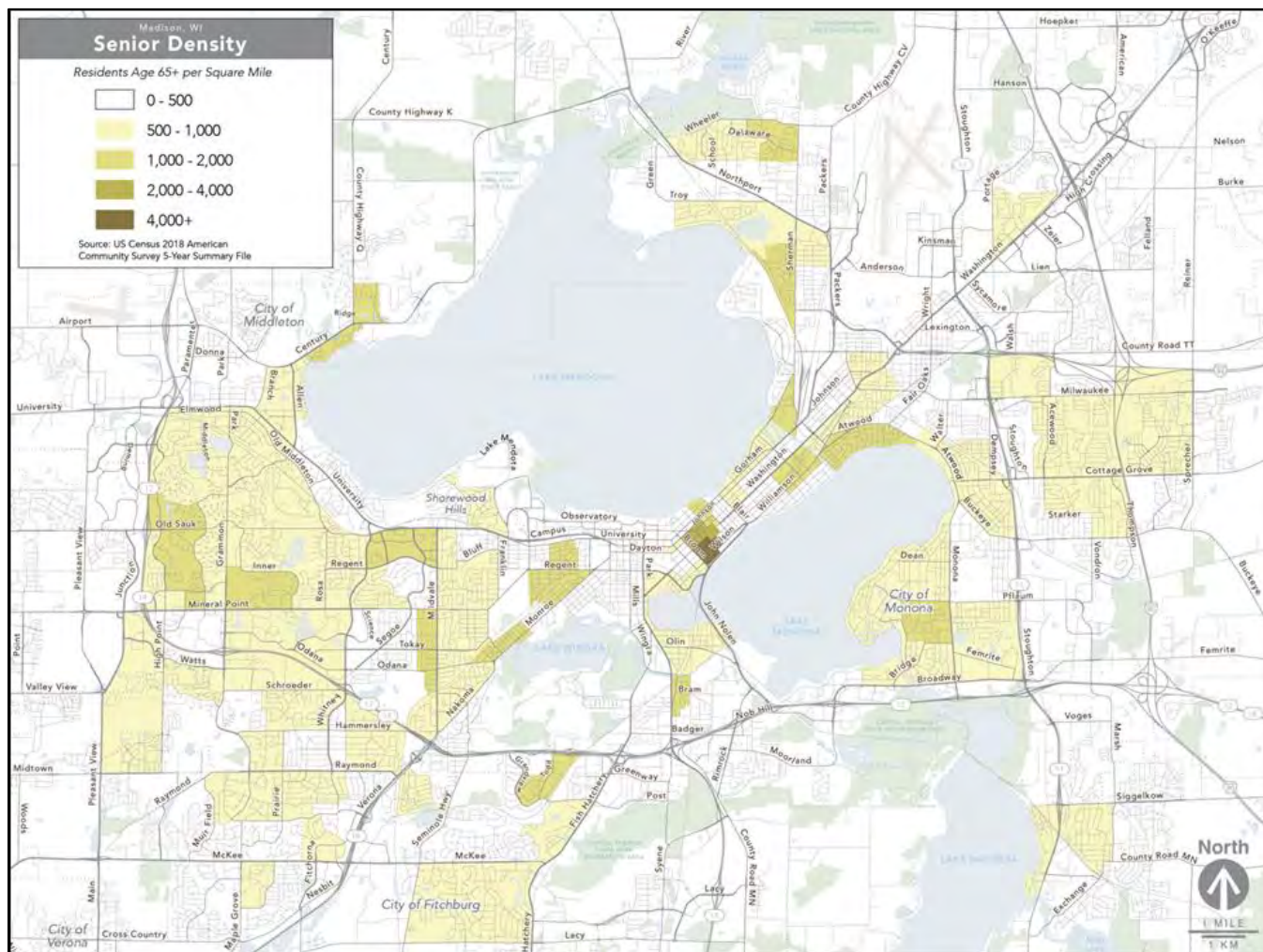
	Percentage Experiencing:	
	Decreased Access (-1,000 jobs or worse within 45 minutes)	Significantly Increased Access (+10,000 jobs or better within 45 minutes)
All Residents	3%	47%
Seniors (65+)	4%	36%

Table comparing seniors vs. all residents experiencing decreased access to jobs by transit and significantly increased access

Based on these results:

- Seniors are less likely to experience an increase in access to jobs by transit within 45 minutes than members of the general population (36% for seniors vs. 47% for all residents). This is because:
 - Compared to the overall population, seniors are more likely to live in lower density areas (see the senior density map below) and own single-family homes.

- As a result, seniors are more likely to live far from arterial streets where it makes sense to concentrate frequent transit service in a redesigned network focused more on ridership goals and less on coverage goals.
- Seniors are slightly more likely (4%) to experience a decrease in access to jobs by transit within 45 minutes than members of the general population (3%). However, the difference is less than Metro Transit’s 2% threshold for a disparate Impact. Neither federal Title VI regulations nor Metro Transit’s Title VI program explicitly protect seniors from disparate impacts.



Map of density of seniors ages 65 and over in the Metro Transit service area

Access Change for People with Disabilities

The tables below compare access change outcomes for people with disabilities with the general population of the Metro Transit service area.

	Approx. Population	Access to Jobs within 45 minutes, door-to-door, using transit			
		Existing Network	Network Redesign	Change	
All Residents measured at the Block Group Level	352,000	10,400	20,200	+9,800	+94%
People with Disabilities measured at the Census Tract level	29,000	9,000	16,800	+7,800	+87%

Table comparing change in the median access to jobs for seniors compared with all residents

	Percentage experiencing:	
	Decreased Access (-1,000 jobs or worse within 45 minutes)	Significantly Increased Access (+10,000 jobs or better within 45 minutes)
All Residents measured at the Block Group Level	3%	47%
People with Disabilities measured at the Census Tract level	4%	41%

Table comparing people with disabilities vs. all residents experiencing decreased access to jobs by transit and significantly increased access

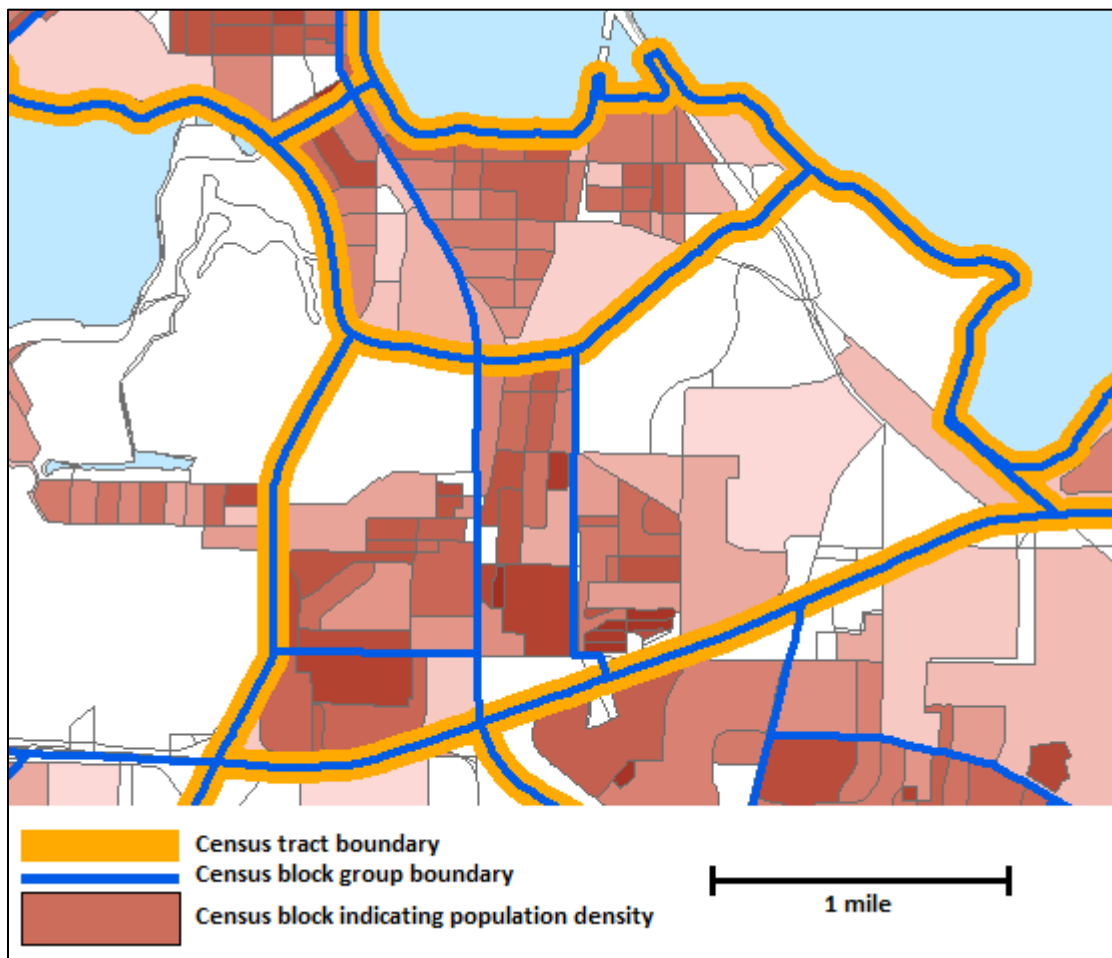
Based on these results:

- People with disabilities may be less likely (41%) to experience a significant increase in access to jobs by transit within 45 minutes compared with all residents (47%).
- People with disabilities may be slightly more likely (4%) to experience a decrease in access to jobs by transit within 45 minutes than members of the general population (3%). However, the difference is less than Metro Transit's 2% threshold for a disparate impact. Neither federal Title VI regulations nor Metro Transit's Title VI program explicitly protect seniors from disparate impacts.

However, these results should be interpreted with caution, for the following reasons:

- "People with Disabilities" is a broad category that includes people who experience a wide variety of physical and mental impairments. It is not clear from the data available whether people with disabilities who experience mobility challenges experience less benefit (or more adverse effect) from the Transit Network Redesign compared with people with disabilities with mild to no mobility challenges. Furthermore, the access analysis methodology assumes that it is possible to walk a long distance to service. The impacts of longer walks vary widely according to the type and severity of disability that a person may experience.
- No paratransit service area will be lost. All areas currently within the paratransit boundary will be maintained, and some new areas will be eligible for paratransit. While paratransit does not offer the spontaneous freedom of fixed-route transit, it is likely that:
 - People currently using paratransit will remain eligible for paratransit.
 - Some individuals who currently use fixed-route for routine trips who can no longer access fixed-route with the proposed system will be able to use paratransit.
 - Some people with disabilities in the Madison area who are currently outside the paratransit boundary will be newly eligible to use paratransit.
- The Census provides data on people with disabilities only at the larger Census tract level. It is less clear exactly where people with disabilities live within the Census tract, and it is less appropriate to assume that people are uniformly

distributed within Census tracts compared to the smaller Census block group. This geography is demonstrated in the figure below.



The figure above demonstrates the challenges with analysis at the Census tract level. While Census blocks (about equivalent to a city block) are small and can be assumed to be mostly uniform in population density, Census block groups (made up of several Census blocks) are larger but reasonable conclusions can still be made about them, and Census tracts (made up of several Census block groups) are noticeably non-homogenous.

6. Qualitative Analysis

In addition to the quantitative analysis, this qualitative analysis attempts to describe the how low-income people and people of color are affected by the Transit Network Redesign, and also how negative effects have been mitigated.

The planning process

Through the development of the Coverage and Ridership Alternative maps, Metro designed the networks to connect neighborhoods with an emphasis on connecting low-income and other marginalized neighborhoods. Examples of this included maintaining and enhancing cross-town service such as Routes G and H, effectively replacing existing Routes 16 and 18 in east and south Madison, and providing new all-day service to low-income housing east of I-39/90/94.

A shift from peak-oriented service to all-day service

Prior to 2020, Metro's network was heavily oriented to peak periods with over twice as many buses in service during weekday peak periods compared to mid day, with even fewer buses in service on evenings and weekends. However, low-income people who are more likely to rely on transit are also more likely to need service throughout the day. The Transit Network Redesign redistributes service more equitably throughout the day with improved off-peak service.

A shift away from transfer points

Many of Madison's low-income neighborhoods and neighborhoods of color lie in areas beyond the transfer points. Because of this, these residents are likely to need to transfer to travel nearly anywhere in the system, increasing their travel times, and increasing the risk of a missed connection. Combining and lengthening routes, and eliminating the transfer points, yields significant benefits for these riders.

The amendment process

The transition from draft plan to final plan was used as a tool to ensure transportation equity could be intentionally incorporated into the plan. Of the amendments drafted, several changes were made through direct input and advocacy from the public to create or modify routes to meet the needs of the community. Highlighted changes are the addition of Routes L and O, and the modification of Route G in south Madison.

More consistent and usable routes

Madison's route structure prior to 2020 was extremely complicated. There were many routes that only ran during certain times of the day, or only ran on certain days of the week. Many routes had two or more "vias", where a route with the same number would split into many different variants. This has led to confusion, failed trips, and missed connections. These problems disproportionately affected low-income people and neighborhoods of color that are more likely to be in peripheral Madison where the routes more likely to split and be replaced with different routes on weekends. The problems also disproportionately affected people with low English proficiency and people who do not have access to technology to help them plan trips. The proposed network is far simpler and easier to use for all riders.

Shifting the focus to frequency and directness over coverage

Through the planning process, it was somewhat common to associate the Coverage model with an increase in equity. This would imply that low-income people and people of color do not value their time as much as other riders. In contrast, staff have heard mostly complaints about travel time, transfers, and indirection from low-income riders. Therefore, addressing these problems while maintaining adequate coverage will help the service be more useful for the neighborhoods that need it.

Freezing the paratransit boundary

The Transit Network Redesign plan technically would remove a small number of people from the required 3/4-mile buffer from fixed-route service where they would automatically be in the paratransit boundary. Metro Transit made the decision to revise its policy and keep those areas in its eligible paratransit boundary, while also extending its paratransit boundary to cover areas that will be served by fixed-route service.

A survey on people with disabilities

A key concern by members of the community was how people with disabilities would be served with the new system. Metro conducted a survey for people with disabilities. Of the 50 people who responded, who said that they have a disability and use fixed-route service, the following conclusions were drawn.

- Walking further and crossing streets, particularly in winter and for wheelchair users, was a key concern.
- The affordability of using paratransit, and the capacity of Metro to provide sufficient paratransit, was a concern.
- Additional benches, shelters, and other amenities would improve the experience.
- There is a desire to have bus stops as close to their homes and destinations as possible.
- Usability for blind people and people with neurological disorders is important.
- Several specific concerns have been directly addressed by the amendment process in the final plan.

Planning for places and destinations that are unlikely to be represented in data

The planning team mapped out many known destinations that are likely to need transit service. These areas include full-service budget-minded grocery stores, public housing, and similar resources. For example, the Pick 'N Save grocery store on Madison's north side was identified as a needed destination because of the limited availability of grocery stores in the area, and Route O on the south side was designed to serve a food pantry on Fish Hatchery Road.

Considering persistent poverty with student poverty

This Service Equity Analysis considers all people equally when considering poverty. Although that practice is standard and appropriate, there is a concentration of poverty in the central Madison area where most people in poverty are students, while most people experiencing persistent and generational poverty are living in peripheral areas along the Beltline corridor and on Madison north and south sides. While these two groups are equally likely to rely on transit, they have different needs and demographics. Both groups, in general, will benefit from the Transit Network Redesign with more service and better access to jobs and other destinations. People living downtown will see better coordinated and less duplicative service where there is a long wait for a bus, and then several buses all show up at once going in the same direction. People living in peripheral neighborhoods will see fewer transfers, more frequent off-peak service, and in general a more consistent and usable transit system.

7. Summary of Key Findings

Metro Transit has carried out a Title VI Service Equity Analysis, based on the requirements of federal civil rights law and regulations. This analysis finds that:

- The redesigned network will provide more useful service to large numbers of people, and less useful service to relatively few individuals.
 - 47% of Metro Transit service area residents will experience a significant increase in the number of destinations they can access (+10,000 jobs or better) by transit within 45 minutes.
 - 3% of service area residents will experience a reduction in the number of places they could access by transit (-1,000 jobs or worse) within 45 minutes.
- There is no evidence of a disproportionate impact on minority populations. People of color will benefit at similar or higher rates as White non-Hispanic people.
 - The amount of service within 1/4-mile of minority populations (people-trips) will increase by 30%, compared to a 26% increase for non-minority populations.
 - 56% of Asian residents, 52% of Hispanic residents, and 45% of Black residents will experience a significant increase in access to destinations (+10,000 jobs or better) by transit within 45 minutes, compared to 45% of White non-Hispanic residents.
 - 2% of Asian, 2% of Hispanic, and 2% of Black residents will experience a reduction in access to destinations (-1,000 jobs or worse) by transit within 45 minutes, compared to about 3% for White non-Hispanic residents.
- There is no evidence of disproportionate burden on low-income populations. Low-income residents will experience a smaller increase in service quantity (people-trips) than the average resident, but they will be far more likely to experience more useful service (improved destination access).
 - The amount of service near low-income populations will increase by 20%, compared to a 32% increase for non low-income populations. This is primarily because service near the transfer points is duplicative and double counted by the methodology.
 - Nonetheless, low-income residents are far more likely to benefit from increased frequency and directness of service in the redesigned network. 67% of low-income residents would experience a significant increase in access to destinations (+10,000 jobs or better), compared to 40% of non-low-income residents.
 - Conversely, only 2% of low-income residents will experience a reduction in access to destinations (-1,000 jobs or worse) by transit within 45 minutes, compared to about 3% of non-low-income residents.

Furthermore, in response to local concerns expressed during the redesign process, this service equity analysis has also included an evaluation of the impacts of the Transit Network Redesign on people with limited English proficiency, seniors, and people with disabilities.

Compared to the general population:

- Limited English proficiency populations will benefit at similar rates to the population as a whole. 47% of residents with limited English proficiency will experience a significant increase in the number of destinations they can access (+10,000 jobs or better) by transit within 45 minutes. 3% of residents with limited English proficiency will experience a reduction (-1,000 jobs or worse).
- Although seniors will benefit from the Transit Network Redesign, in general they are less likely to benefit compared with the population as a whole. 36% of seniors will experience a significant increase in the number of destinations they can access (+10,000 jobs or better) by transit within 45 minutes. 4% of seniors will experience a reduction (-1,000 jobs or worse).

- This is mostly because seniors in Madison, and throughout the U.S., are more likely to live in low-density areas and single-family homes than the general population. As a result, they are less likely to live near main streets where more frequent service is planned.
- Nonetheless, many more seniors will have access to more useful service than they do today. It is possible that a more coverage-based redesign would have even more positive outcomes for senior residents, but this would likely come at the expense of fewer gains for low-income and minority populations.
- People with disabilities may benefit less on average from the network redesign, but this finding is less definitive due to limitations in available data. Census data on where people with disabilities live is much less precise than data on other populations.
 - Based on available data, it appears that 41% of residents with disabilities will experience a significant increase in the number of destinations they can access (+10,000 jobs or better) by transit within 45 minutes, while 4% of residents with disabilities will experience a significant reduction (-1,000 jobs or worse).
 - The planning team utilized specific knowledge, data, and public input to address as many known gaps in coverage for people with disabilities as practical. For example apartments and other facilities where people with disabilities are likely to live or visit were more likely to be served than other areas.