V. Jobs Access via Transit

This Smart Moves plan update was partially supported by a TIGER (Transportation Investments Generating Economic Recovery) grant from the U.S. Department of Transportation, awarded to MARC and its planning partners to study ways to increase the number of jobs in the region accessible by transit. This section defines what the plan means by jobs access, details current (baseline) jobs accessibility in the Kansas City region, and demonstrates how recommendations for fixed route changes will increase job access if implemented.

Definition of Jobs Access

This plan defines *jobs access via transit* as the ability of a worker to get to his or her place of employment using fixed route transit within a reasonable time frame. The plan measures the percentage of jobs accessible via transit to the average worker in the Kansas City region based on a 60-minute commute, which includes time to walk to the transit stop, wait for the transit vehicle, ride the vehicle, wait for any transfers, and walk to the final destination. The 2012 study by the Brookings Institution that called attention to Kansas City's low performance in job access by transit was based on a 90-minute commute time. In the Kansas City region, however, the average commute time is less than 23 minutes, one of the shortest in the United States. The Smart Moves planning team determined that 60 minutes, while still high compared to the regional average, would be a more reasonable commute time to measure transit accessibility.

The maps in this section show the number of jobs accessible to workers from where they live. These maps can be seen as measures of the economic opportunity provided by the transit system to residents in each location. Workers who live in a location that is shaded dark blue can reach a large number of job opportunities using transit, while those in light blue areas have fewer options.

Measuring Jobs Access

To model jobs access via transit, the Smart Moves planning team contracted with Conveyal, a company that created an analytical tool called Transport Analyst. This tool uses regional data to calculate, for every location, the number of jobs that can be reached via transit within a specified time by the average worker.

Methodology

Transport Analyst was used to compute the number of jobs that can be reached from every location in the Kansas City region with both the existing transit system and the system improvements proposed by *Smart Moves 3.0*. This analysis was performed for peak morning travel and late evening travel to get a picture of how well the transit system is serving those with traditional daytime commutes as well as those whose shifts begin in the early evening.

To compute accessibility to jobs, several data inputs were needed, starting with the locations of jobs within Kansas City region. These were obtained from the U.S. Census Bureau's Longitudinal Employer Household Dynamics Origin-Destination Employment Survey (LEHD LODES),[1] with further editing by MARC staff to correct data collection biases. Jobs data for the seven-county (Jackson, Johnson, Wyandotte, Leavenworth, Cass, Clay and Platte) KCATA service area was retrieved. These data inputs are unfortunately not segmented by shift time, so the team could not determine which jobs require which shifts. Therefore, in this analysis, job access was computed for all jobs regardless of the time of day under study.[2]

Average worker concept

The number of jobs that a worker can access on transit varies depending on where she or he lives. For instance, a downtown Kansas City, Missouri resident can access many more jobs via transit than a resident who lives in a neighborhood in suburban Lee's Summit. The model tallies up the number of jobs that each worker in the region can reach within a given commute time, depending on where they live and what transit is available, and then generates the average worker's number of accessible jobs.

Next, information about the existing and proposed public transit networks in the Kansas City region was added to the Transport Analyst model. For the existing network, the General Transit Feed Specification file from KCATA[3] was obtained. Transit information from May 2016 was used. New routes, as well as routes to be modified, were added to the model. A detailed list of all the transit services included in the Smart Moves model is available in Appendix A.

Finally, to compute the time needed to walk to and from transit stops, street network data was needed. Data was obtained from OpenStreetMap,[4] a worldwide, open-street network dataset.

Transport Analyst used these data sets to compute the job accessibility of the ***average regional worker*** in the region. The software works by computing the average travel time by transit from every location in the region to every job in the region during the chosen time window. For instance, in an analysis of the morning peak, the software computes the travel time from every location to every job if workers start their commutes at 6 a.m., 6:01, 6:02, 6:03, etc. It then averages those numbers to create an average travel time from each location to each job. If that average travel time is less than one hour, that job is considered reachable. For new routes that do not yet have exact schedules, but only frequencies, 1,100 random schedules with the specified frequency were created and tested in order to approximate any possible schedules that might be created in the future.[5]

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[1] U.S. Census Bureau, *LEHD LODES 2014.* https://lehd.ces.census.gov/data/#lodes

[2] While the jobs data used in the analyses do not include shift information, given the relatively low numbers of jobs accessible by transit both under baseline and plan conditions, it is safe to assume that the number of jobs generated by the model as being accessible actually exist at the given commute times.

[3] Kansas City Area Transportation Authority, *Google Transit Data Feed*, http://www.kcata.org/transit_data/access_gtdf

[4] OpenStreetMap Foundation, http://www.openstreetmap.org/

[5] For a more thorough description of the methodology used, see Conway, Matthew Wigginton, Andrew Byrd, and Marco van der Linden. "Evidence-Based Transit and Land Use Sketch Planning Using Interactive Accessibility Methods on Combined Schedule and Headway-Based Networks." *Transportation Research Record* 2653 (2017). doi:10.3141/2653-06.

The analysis takes into account the time spent waiting, as well as the time spent riding the transit vehicle and walking to or from the stop, as it computes many different travel times over a given window. The resulting travel time is sensitive to changes in service frequency. Increasing the frequency on a line will decrease the time people spend waiting, and will therefore result in an accessibility boost. Many people have schedules that are not well correlated with the transit schedule. The specific time they need to arrive at or leave work may or may not align well with the transit schedule, possibly causing a long wait. This methodology captures long waits and incorporates them into the computation of accessibility.

Model Results

The universe of workers was defined as those who live and work within the Census-defined urbanized area. This model does not include those workers or jobs on the rural or distant exurban areas of the region, in order to more accurately depict the realistic ability of transit to deliver workers to jobs within a reasonable commute time.

Baseline

Under baseline (existing) conditions, the model shows the average Kansas City area worker can access 5 percent of the region's jobs via transit during the morning commute and 3 percent during the late evening commute within 60 minutes. With a 90 minute commute time, these figures jump to 16 percent and 7 percent, respectively. Table X shows jobs access figures for 30, 45, and 75 minute commutes.

Table X: Jobs Accessibility via Transit

Kansas City Region Jobs Accessibility via Transit (Baseline)

	Commute Time (minutes)									
	30		*45*		*60*		*75*		*90*	
Morning Peak, 6-9 a.m.	7,038	1%	22,192	2%	45,852	5%	88,666	10%	148,633	16%
Evening, 8-11 p.m.	5,455	1%	15,086	2%	26,067	3%	40,908	5%	59,507	7%

Source: Conveyal, 2017.

Smart Moves 3.0 Improvements

The Smart Moves plan for fixed-route improvements is projected to result in the average worker being able to access 28 percent more jobs by transit within 60 minutes during the morning peak hour (6-9 a.m.), and 94 percent more in the late evening (8-11 p.m.) compared with baseline conditions during the mid-term (5-10 years). Short-term (0-5 years) recommendations result in increases of 18 percent in the morning peak and 70 percent in the late evening. At full plan buildout, fixed route recommendations increase the number of jobs accessible to the average worker by transit by 47 percent in the morning peak and 122 percent in the late evening. See Table X for the percentage of jobs the average worker can access under the Smart Moves plan in the short-, mid-, and long-terms for a range of commute times.

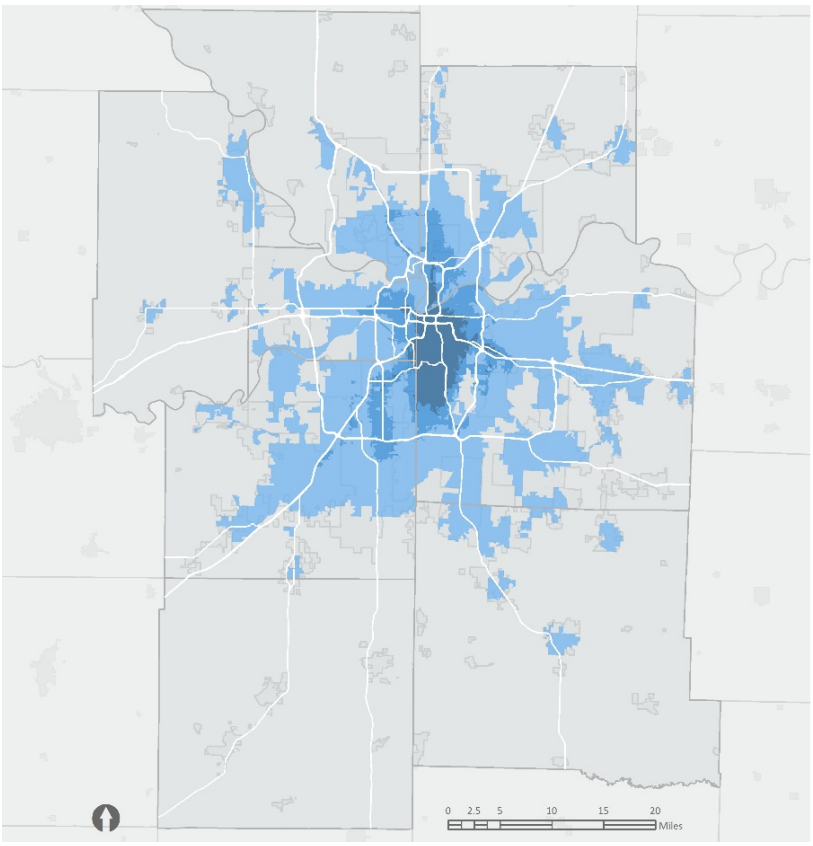
Figure 13: Jobs Accessibility after Smart Moves Implementation

Kansas City Region Jobs Accessibility via Transit (Model Results Under Smart Moves 3.0)

	Commute Time (minutes)									
	30		*45*		*60*		*75*		*90*	
Morning Peak, 6-9AM										
Short-term (0-5 years)	7,558	1%	24,895	3%	54,297	6%	102,468	11%	165,733	18%
Mid-term (5-10 years)	7,730	1%	26,302	3%	58,717	7%	111,045	12%	182,281	20%
Long-term (10-20 years)	8,001	1%	28,442	3%	67,256	7%	131,921	15%	222,194	25%
Evening, 8-11PM										
Short-term (0-5 years)	6,922	1%	21,603	2%	44,305	5%	80,217	9%	126,761	14%
Mid-term (5-10 years)	7,070	1%	23,212	3%	50,475	6%	93,588	10%	151,247	17%
Long-term (10-20 years)	7,342	1%	25,034	3%	57,838	6%	111,216	12%	183,537	20%

Source: Conveyal, 2017.

The following maps show baseline accessibility by transit in the morning peak and late evening as well as accessibility at buildout of the Smart Moves fixed route transit system. People who live in areas that are shaded dark blue are able to access many more jobs via transit than those who live in areas shaded lighter blue.

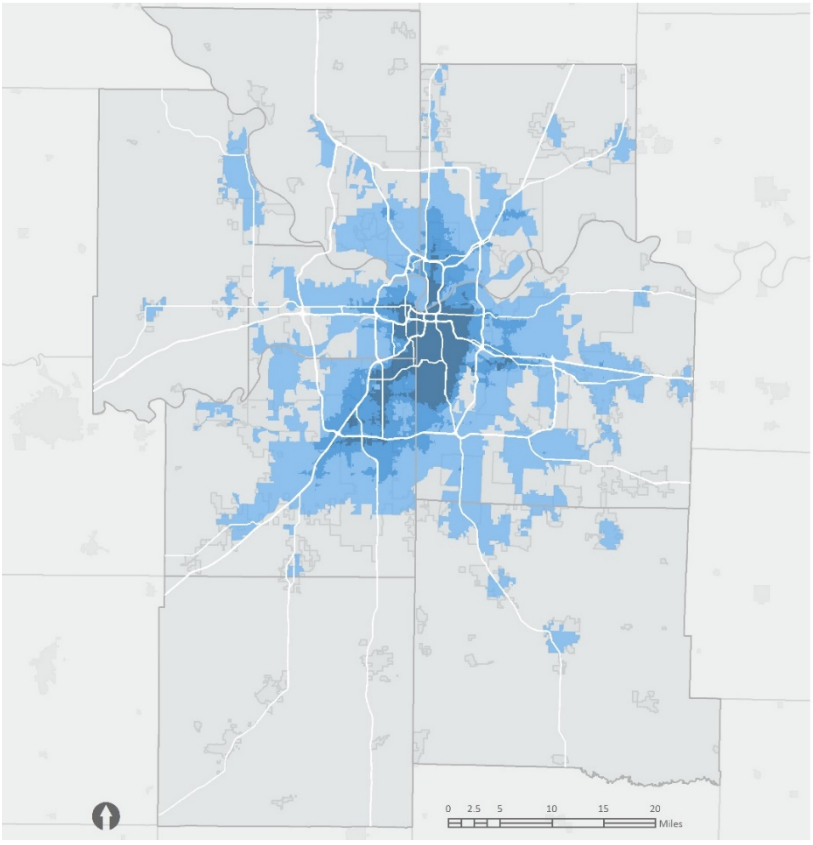


Jobs Access by Transit at Baseline

60-Minute Morning Commute 6:00 to 9:00 a.m.

High
Medium
Low

KANSAS MISSOURI MARC

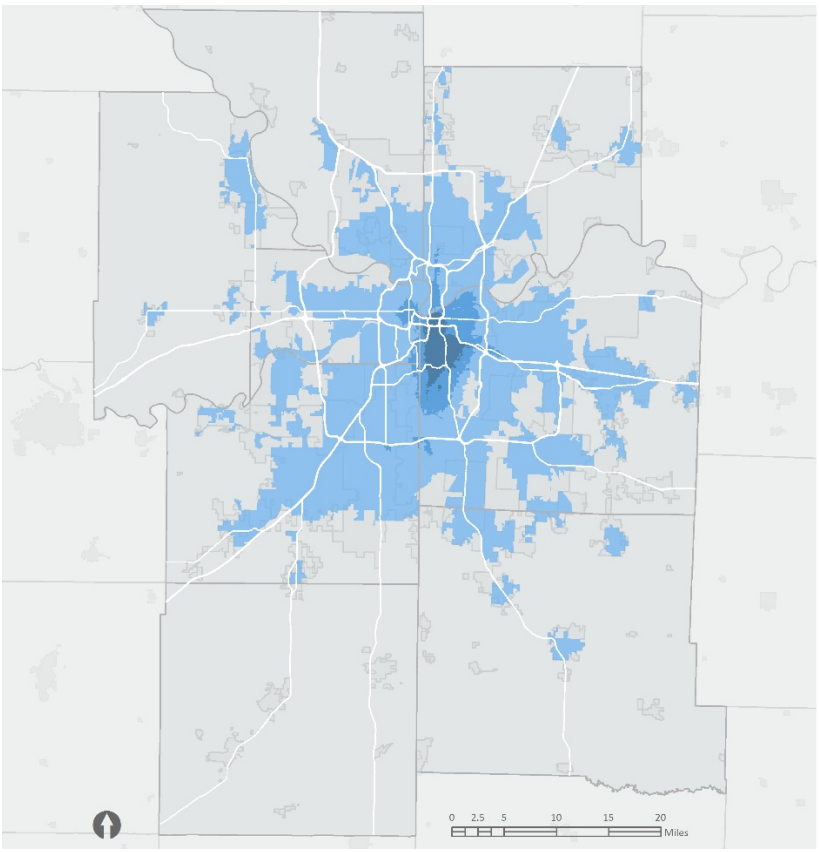


Jobs Access by Transit at Plan Buildout

60-Minute Morning Commute 6:00 to 9:00 a.m.

High
Medium
Low

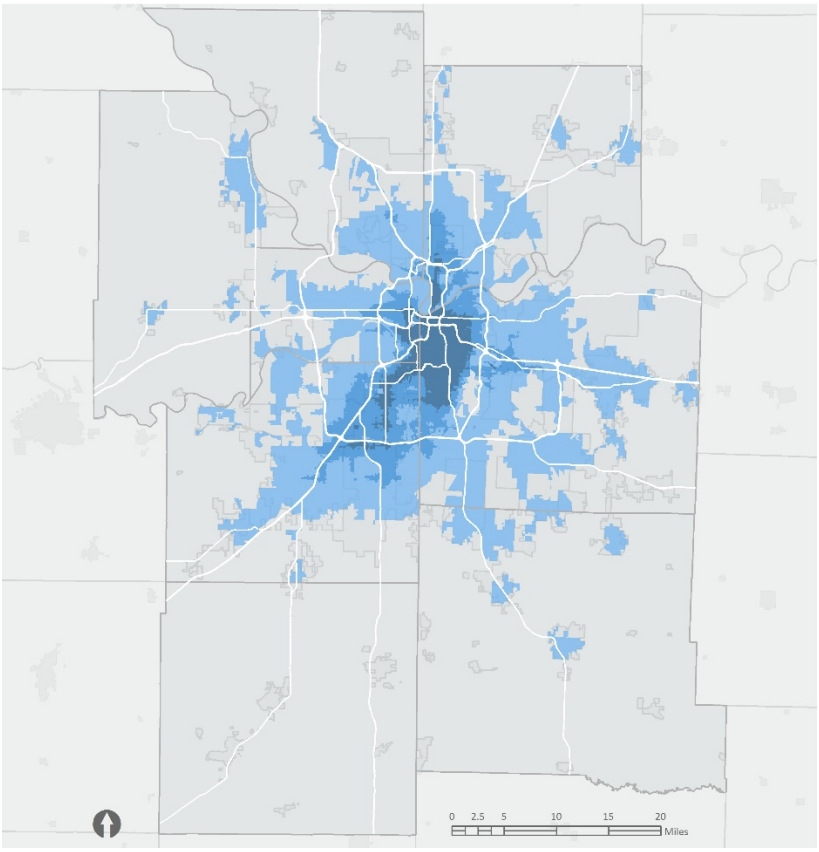
KANSAS MISSOURI MARC



Jobs Access by Transit at Baseline

60-Minute
Late Evening Commute
8:00 to 11:00 p.m.

High
Medium
Low



Jobs Access by Transit at Plan Buildout

60-Minute
Late Evening Commute
8:00 to 11:00 p.m.

High
Medium
Low

County-by-County Analysis

The team also used Transport Analyst to model jobs accessibility by county. Cass, Clay, and Jackson counties in Missouri and Johnson, Platte, and Wyandotte counties in Kansas were examined because these are the counties that either have transit access currently or are envisioned to gain it under Smart Moves 3.0.

Just as the regional analysis generated the jobs accessibility for the average regional worker, this methodology generates the jobs accessibility for the average worker who lives in a given county. For example, the model shows that the average worker who lives in Jackson County can currently access about 71,700 jobs by transit or about eight (8) percent of the region's jobs.

For the most part, the model results show gains for workers who live in the analyzed counties. Since Jackson and Wyandotte counties include the bulk of the urban core where transit access (and ridership) is already the highest, the workers who reside in these counties have access to the highest percentages of jobs currently and at plan build out. Under Smart Moves, workers who live in Johnson County experience the most gains—Johnson County workers go from being able to only access three (3) percent of the region's jobs currently to eight (8) percent under plan buildout. Additionally, it should be noted that while Johnson County workers gain access to more jobs in the region as a whole, workers from across the region also gain better access to the emerging job centers in Johnson County. This is important especially in terms of connecting workers without access to a personal vehicle who live in the urban core and elsewhere with job opportunities in Johnson County.

Kansas City Region Jobs Accessibility via Transit by County
(Baseline and Smart Moves 3.0 model results for 60 minute commute time)

	Morning Peak		Late Evening	
	# of Jobs Accessible	% of Total Jobs	# of Jobs Accessible	% of Total Jobs
Cass County, MO				
Baseline	0	-	0	-
Short-term (0-5 years)	2,654	< 1%	2,193	< 1%
Mid-term (5-10 years)	2,656	< 1%	2,193	< 1%
Long-term (10-20 years)	2,682	< 1%	2,196	< 1%
Clay County, MO				
Baseline	33,899	4%	8,379	1%
Short-term (0-5 years)	36,379	4%	26,006	3%
Mid-term (5-10 years)	41,610	5%	32,316	4%
Long-term (10-20 years)	50,605	6%	38,513	4%
Jackson County, MO				
Baseline	71,738	8%	47,834	5%
Short-term (0-5 years)	77,733	9%	65,545	7%
Mid-term (5-10 years)	78,898	9%	70,395	8%
Long-term (10-20 years)	86,031	10%	75,160	8%
Johnson County, KS				
Baseline	29,056	3%	13,306	1%
Short-term (0-5 years)	46,411	5%	41,254	5%

Mid-term (5-10 years)	52,470	6%	45,463	5%
Long-term (10-20 years)	68,259	8%	60,347	7%
Platte County, MO				
Baseline	22,729	3%	9,537	1%
Short-term (0-5 years)	20,232	2%	10,053	1%
Mid-term (5-10 years)	23,128	3%	11,935	1%
Long-term (10-20 years)	19,217	2%	16,661	2%
Wyandotte County, KS				
Baseline	55,212	6%	27,360	3%
Short-term (0-5 years)	63,191	7%	38,337	4%
Mid-term (5-10 years)	79,384	9%	64,290	7%
Long-term (10-20 years)	81,154	9%	65,400	7%

Note: Cass County results are modest because this plan recommends the addition of one route into Cass County (the Grandview/Belton Express), which currently does not have any transit service. Platte County results go up and down between the baseline, short, mid-, and long-terms, though service is improved over the course of Smart Moves 3.0 implementation. The dip between baseline and the short-term is explained by the fact that the portion of the North Oak route that goes to Zona Rosa was replaced with a route from Zona Rosa to Liberty on Barry Road, requiring a transfer to the high job density downtown. This does not change travel times that much, but it pushes some of the highest density blocks in the region from a travel time slightly below 60 minutes to slightly above. Although it's a little bit to get to downtown, it's a more connective network (i.e. better east-west connectivity). The dip between mid- and long-terms is explained by the fact that in the long-term, local service from downtown to KCI is replaced with express service. Under Smart Moves, access to the jobs located on Ambassador and that are currently served by the KCI route are envisioned to be provided by mobility services such as van pool, car pool and employee shuttles.

Environmental Justice Analysis

Finally, the team used Transport Analyst to model access to jobs by transit for workers who live in environmental justice areas. Environmental Justice (EJ) is the concept that people of color and low-income populations are often disproportionately impacted by environmental conditions as well as being less likely to benefit from investments that affect quality of life. Investments in transit would fall into the latter category. In order to monitor the impact of a variety of actions on EJ communities, MARC has designated where EJ communities are located throughout the region. This was done by using demographic data from the U.S. Census Bureau/ American Community Survey (ACS) Five-Year Estimates. Benchmarks for both people of color and low-income populations were established in accordance with Federal Transit Administration (FTA) and Federal Highway Administration (FHWA) policy guidance on environmental justice. MARC defines EJ areas as census tracts where:

1. The proportion of minority populations in the tract is greater than the minority proportion of the overall MPO area (27.7%).

2. More than 20 percent of households are in poverty (based off the U.S. Census Bureau's poverty thresholds).

Census tracts meeting one or both of these criteria are referred to as EJ areas or tracts.

In addition to EJ areas, the team also modeled access to jobs by transit for workers who live in racially/ethnically concentrated areas of poverty (R/ECAP). R/ECAP areas are census tracts where more than half the population is non-White and 40 percent or more of the population is in poverty or where the poverty rate is greater than three times the average poverty rate in the area.

Modeling results show that EJ and R/ECAP populations both currently and under Smart Moves have access to more jobs via transit as compared to the regional population as a whole (see Table X). While the percent change in jobs accessibility is higher in the region as a whole from baseline to buildout (47% in the morning and 122% in the late evening) versus in EJ (31% in the morning and 97% in the late evening) and R/ECAP areas (15% in the morning and 56% in the late evening), this is because the region has less transit service compared to EJ and R/ECAP areas. This is largely because the areas where most EJ and R/ECAP populations are concentrated—the urban core and inner-ring suburbs—are denser than the region as a whole, and therefore support higher levels of transit service.

Kansas City Regional Jobs Accessibility by Transit for EJ and R/ECAP Populations Compared to the Regional as a Whole (60 minute commute)

	Morning Peak		Late Evening	
	# of Jobs Accessible	% of Total Jobs	# of Jobs Accessible	% of Total Jobs
Baseline				
Region as a whole	45,852	5%	26,067	3%
EJ Areas	74,020	8%	42,866	5%
R/ECAP Areas	167,211	19%	110,316	12%
Modeling:				
Short-term (0-5 years)				
Region as a whole	54,297	6%	44,305	5%
EJ Areas	83,822	9%	66,514	7%
R/ECAP Areas	178,816	20%	145,283	16%
Mid-term (5-10 years)				
Region as a whole	58,717	7%	50,475	6%
EJ Areas	89,203	10%	77,682	9%
R/ECAP Areas	188,907	21%	170,014	19%
Long-term (10-20 years)				
Region as a whole	67,256	7%	57,838	6%
EJ Areas	96,848	11%	84,288	9%
R/ECAP Areas	192,818	21%	172,175	19%

This does not mean, however, that EJ and R/ECAP areas are not in need of transit service improvements. Given that low-income populations are often employed in the retail and restaurant sectors, as caretakers and custodians, or in other positions that are not traditionally 9-5, the increases in jobs accessibility in the late evening and weekend are especially meaningful for EJ and R/ECAP workers.

Measuring Employment Coverage of Transit and Mobility Services

In addition to modeling jobs access via transit, the coverage of the region's transit system can also be measured in relation to where jobs are located. This methodology demonstrates the ability of the transit system to connect to jobs, assuming workers live near transit that can deliver them to work in a reasonable amount of time. In a sense, it shows the number of jobs workers could access if they chose to live near transit.

Methodology

First, coverage of the current transit system was measured by creating quarter-mile buffers around all transit stops and then measuring the number of jobs within those buffers. Next, it was assumed that new routes would have transit stops located every quarter mile, although further route planning will be required to determine exactly where they will be located along each route. Finally, jobs located within half a mile of planned mobility hubs were measured, with the rationale that transportation options available at mobility hubs will provide a larger reach.

Results

Table X shows results for jobs coverage for both the current transit system as well as the future system under this plan, in addition to the jobs coverage offered by planned mobility hubs.

Figure 14: Geographic Proximity of Jobs to Transit System

Geographic Proximity of Jobs to Transit System

	# of Jobs	*%*
Total Employment (Urbanized Area)	901,257	100%
Employment within 1/4-mile of existing stops	469,337	52%
Employment within 1/4-mile of proposed stops	525,469	58%
Employment within 1/2-mile of mobility hubs	230,865	26%

Source: 2010 Census Urbanized Area. MARC-edited LEHD 2014 employment data. Route, stop, and mobility hub data from KCATA and Consultant Team.

Of the over 900,000 jobs in the urbanized area, 52 percent are currently located within a quarter-mile of a transit stop. Adding the routes proposed in this plan, would result in 58 percent of existing jobs within a quarter-mile of transit and 26 percent of jobs within a half-mile of planned mobility hubs. Given that this plan makes recommendations that seek to attract more employers to areas around transit, these percentages will hopefully be even higher. These results indicate that increased density of development (residential and commercial) around transit stops and mobility hubs, a recommendation included in this plan, will offer workers more opportunities to locate close to transit and have access to more jobs.