

**WARNER ROBINS AREA TRANSPORTATION STUDY (WRATS)**

**TRANSIT FEASIBILITY STUDY  
TRANSIT RIDERSHIP ESTIMATION  
09/10/12**

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## Introduction

The Metropolitan Planning Organization (MPO) for the Warner Robins Urbanized Area is the Warner Robins Area Transportation Study (WRATS). WRATS plans and coordinates transportation improvements for the Warner Robins metropolitan planning area consistent with federal surface transportation legislation.

The Warner Robins metropolitan planning area consists of all of Houston County and the northeastern portion of Peach County, Georgia. It includes the incorporated cities of Warner Robins, Byron, Centerville and Perry, as shown in Figure 1. The metropolitan planning area of Warner Robins consists of 417 square miles and approximately 149,000 people.

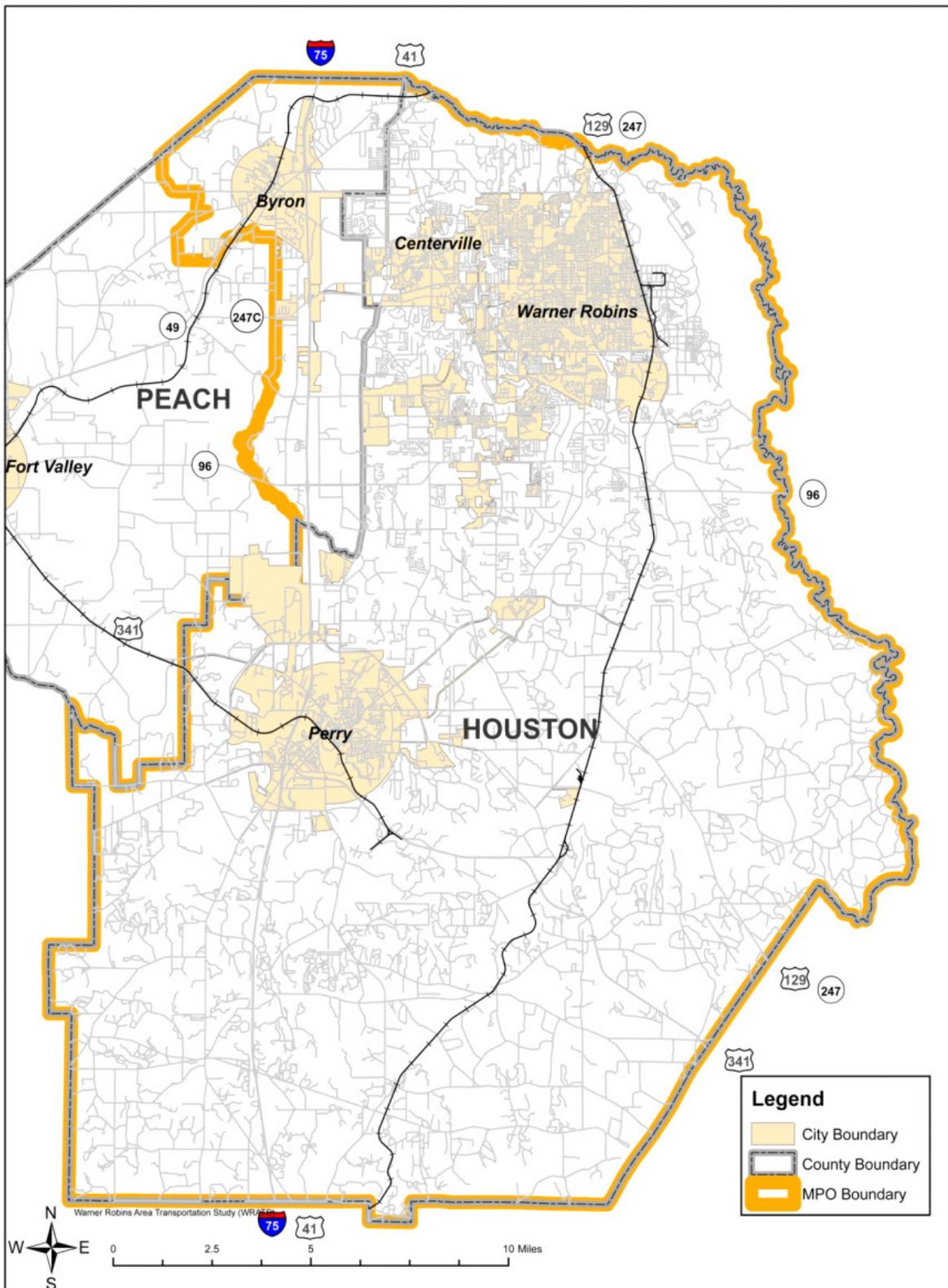
The Transit Feasibility Study (TFS) examines the need for transit services in the Warner Robins metropolitan planning area. As the area continues to grow and develop there is increasing interest in the potential for transit service. Recent success of the BiRD commuter bus service between Macon and Robins Air Force Base (RAFB) underscores the potential for similar service within the Warner Robins metropolitan area. In addition, numerous human service agencies and not for profits have stated that there is a need for transit service in Warner Robins among the populations that they serve. RAFB has been a strong supporter of transit and vanpool service, on base shuttle service, and commute alternatives as a means of reducing the number of vehicles entering and exiting the base and the amount of parking necessary on the base.

A transit feasibility study conducted by WRATS in 2003 recommended possible phased transit service options and assessed probable ridership and costs. However no action was taken as a result of the 2003 TFS, in part due to concern about who would pay for transit operations and operate the service, and in part due to concerns about the effectiveness of transit service in Warner Robins. A 2001 transit route feasibility study for service between Macon and RAFB resulted in the successful BiRD commuter service.

The 2012 WRATS TFS will update the study conducted in 2003 to reassess the market for transit taking into account demographic and development changes since 2003, and collecting new information from the public and stakeholder agencies on their views about the need for transit service in the Warner Robins metropolitan area. The TFS will provide a Transit Master Plan that identifies costs and funding associated with any recommended transit service options and an Implementation Plan that addresses phasing, marketing and operations for any recommended transit services.

This document describes the methods used to estimate potential transit ridership in the Warner Robins Metropolitan Area for the transit service and transit routes identified in the draft transit service plan. The estimates build on prior work including the analysis of existing conditions, stakeholder interviews, peer review, on-line transit survey, and comments received from the project Steering Committee and public outreach.

Figure 1 - WRATS Study Area



## Transit Ridership Estimates

In order to estimate transit ridership for the transit services proposed for the Warner Robins Metropolitan Area several different methods were applied. These methods include estimates based on peer area statistics, estimates based on ridership capture rates for existing similar services in the case of proposed commuter routes that are similar to the BiRD transit service, and direct estimates in a simplified transit model based on estimated transit trip productions and attractions, at the Traffic Analysis Zone (TAZ) level, distributed as trips and assigned to the proposed transit routes.

### Estimates based on Peer Statistics

Transit ridership for the proposed line haul and demand response transit services proposed were estimated based on Passenger Trips per Vehicle Revenue Hour (PTVRH) of service from the 10 systems identified as Warner Robins peers from the Peer Assessment. In the absence of specific recent local experience with transit service, the peer group PTVRH is perhaps the best indicator of probable transit ridership in the Warner Robins Metropolitan Area. Figure 2 shows the PTVRH for the peer systems for 2010 from the National Transit Database (NTD). As can be seen in the table, the PTVRH for line haul transit for the peer group is an average of 14.5, but ranges from 4.0 to 27.2. For Demand Response Transit Service (DRT) the average PTVRH for the peer group is 1.8, with a smaller range of 1.3 to 2.7.

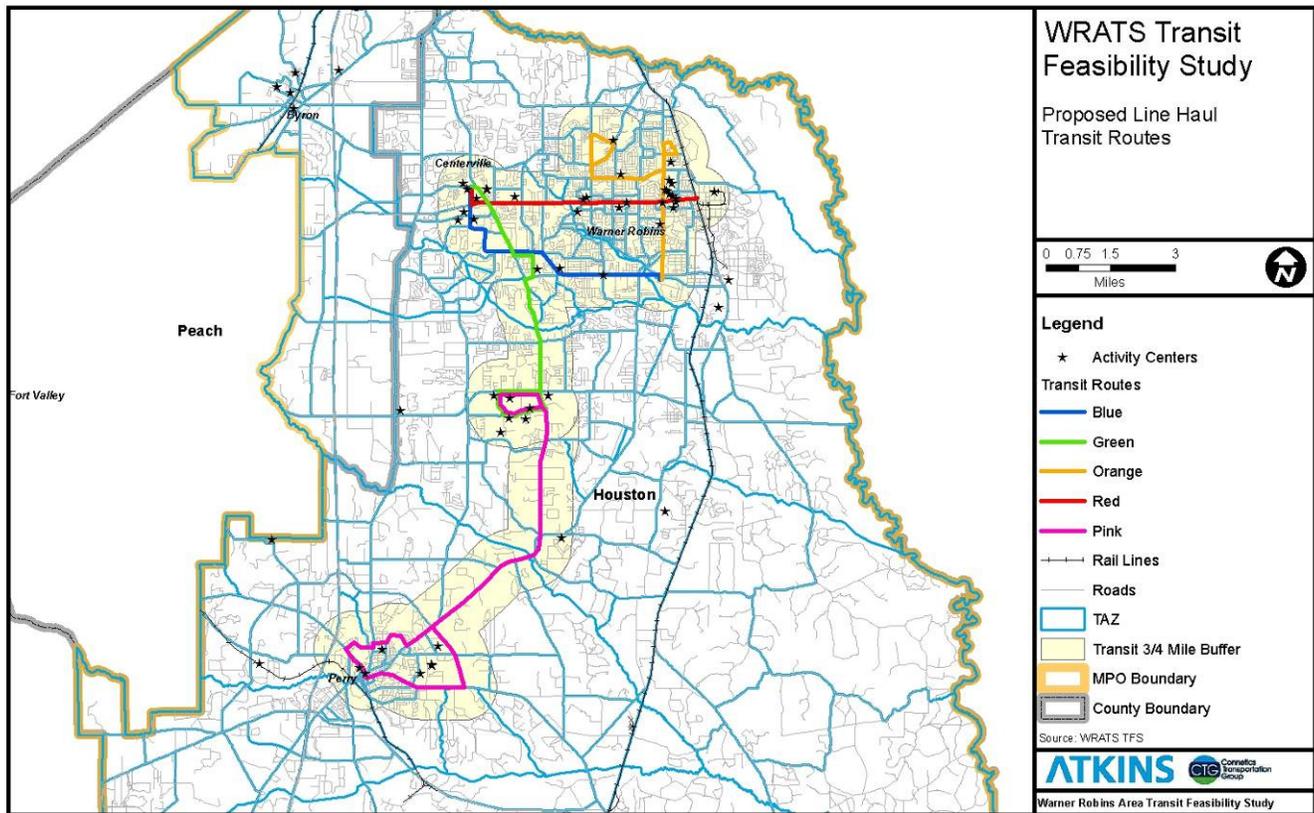
**Figure 2 – Peer Average Passengers per Vehicle Revenue Hour (PTVRH) of Service**

Transit System	Bus PTVRH	DRT PTVRH
SPARTA	24.3	
TSB		2.1
HAT	11.9	2.7
JCT	19.2	1.8
CUATS	4.0	1.6
ATS	27.2	2.0
MTA	10.1	1.3
CTS	11.3	1.4
Metra	17.7	1.6
The Ride	4.7	
<b>Average</b>	14.5	1.8
<b>High</b>	27.2	2.7
<b>Low</b>	4.0	1.3

Note: SPARTA and TSB provide service to the same area, and The Ride provides DRT service by having all “flex” routes in their system.

Figure 3 shows the Proposed Line Haul Transit Routes for the Warner Robins Metropolitan Area. There are 5 Line Haul Routes: Red, Blue, Green, Orange and Pink. The Pink Route has a “flex” service area within Perry, GA. The ¼ mile transit buffer is the area within which required complementary paratransit service would need to be provided either through dedicated DRT service or with “flex” routing.

**Figure 3 – Proposed Line Haul Transit Routes**



Using the proposed operating plan for the transit services proposed for the Warner Robins area with some judgment as to the PTVRH for specific transit routes yields the transit service ridership estimates for line haul transit listed in Figure 4. The estimated PTVRH for the individual transit routes is based on the population and employment density along the proposed route, the presence of activity centers, and populations likely to use transit services identified in the Existing Conditions Report analysis of 2006 -2010 5 Year ACS Block Group characteristics and 2010 TAZ level population and employment data.

The overall system PTVRH is approximately 18.0, slightly above the peer group average of 14.5 but within the range for the peer group. Average weekday passenger trips for the proposed system in Warner Robins are estimated to be 1,270, using this method. A reasonable bound of plus or minus 25% of this estimate gives a range of 950 to 1,590 weekday passenger trips per day for the line haul services proposed. The lower estimated PTVRH for the Pink Route is due to its proposed 120 minute headway and flex service area.

**Figure 4 – Line Haul Transit Ridership Estimates based on PTVRH**

Route	Name	Revenue Hours per Day	Passenger Trips per Vehicle Revenue Hour (PTVRH)	Average Weekday Passenger Trips (AWPT)
RED	Watson	14	24.3	340
BLUE	Russell	14	16.4	230
GREEN	Houston Lake	14	20.0	280
ORANGE	Davis	14	20.0	280
PINK	Perry	15	9.3	140
<b>SUM/AVERAGE</b>		71	18.0	1,270

Figure 5 shows the estimated DRT ridership per average weekday based on the proposed operating plan for DRT services in the Warner Robins area. The operating plan estimates that each of 3 peak DRT vehicles would be operated in revenue service 7 hours per day. This estimate of revenue hours is based on the average revenue hours per peak DRT vehicle for three most comparable peers in terms of meeting, but not exceeding, the minimum ADA paratransit requirements—Albany, Macon, and Columbus. Thus, the plan estimates a total of 21 hours of DRT service per day to provide required complementary paratransit services for those individuals within a ¼ mile buffer of the proposed transit routes who are unable to use fixed route transit service directly. It should be noted that the proposed Pink route between the Cohen Walker Drive area and Perry, GA has an element of flex service within Perry which would be able to respond to paratransit service requests.

The overall system PTVRH for DRT service equals 1.6 which is the same as the peer system average for the three specific peers discussed above. Estimated average weekday DRT passenger trips for the proposed system in Warner Robins is 33, using this method. A reasonable bound of plus or minus 25% of this estimate gives a range of 25 to 41 weekday passenger trips per day for the DRT services proposed.

**Figure 5 – Demand Response Transit Ridership Estimates based on PTVRH**

Route	Revenue Hours per Day	Passenger Trips per Vehicle Revenue Hour (PTVRH)	Average Weekday Passenger Trips (AWPT)
All	21	1.6	33

### Estimates based on Capture Rates

In the case of the proposed commuter routes to Robins Air Force Base (RAFB) estimates for ridership can be derived based on the existing BiRD service between Bibb County and RAFB. Since the proposed Brown and Purple Routes operate express service to the base and serve primarily workers at the base, presumably their ridership rates should be similar. Figure 6 shows the average weekday transit riders to RAFB for the months of May, June and July of 2012. Figure 7 shows the number of RAFB Employees by County for Bibb, Houston and Peach counties for Fiscal Year 2009. These numbers were provided by RAFB. Houston County has the largest

number of resident RAFB employees of any county, with over 60% of all RAFB employees residing in Houston County. County level employee data for RAFB is the smallest geographic scale available at which the data is both available and complete.

**Figure 6 – BiRD Ridership to RAFB from Bibb County**

Month	Ridership	Service Days	Riders/day
May	904	23	39
June	912	21	43
July	900	22	41
<b>Average</b>	905	22	41

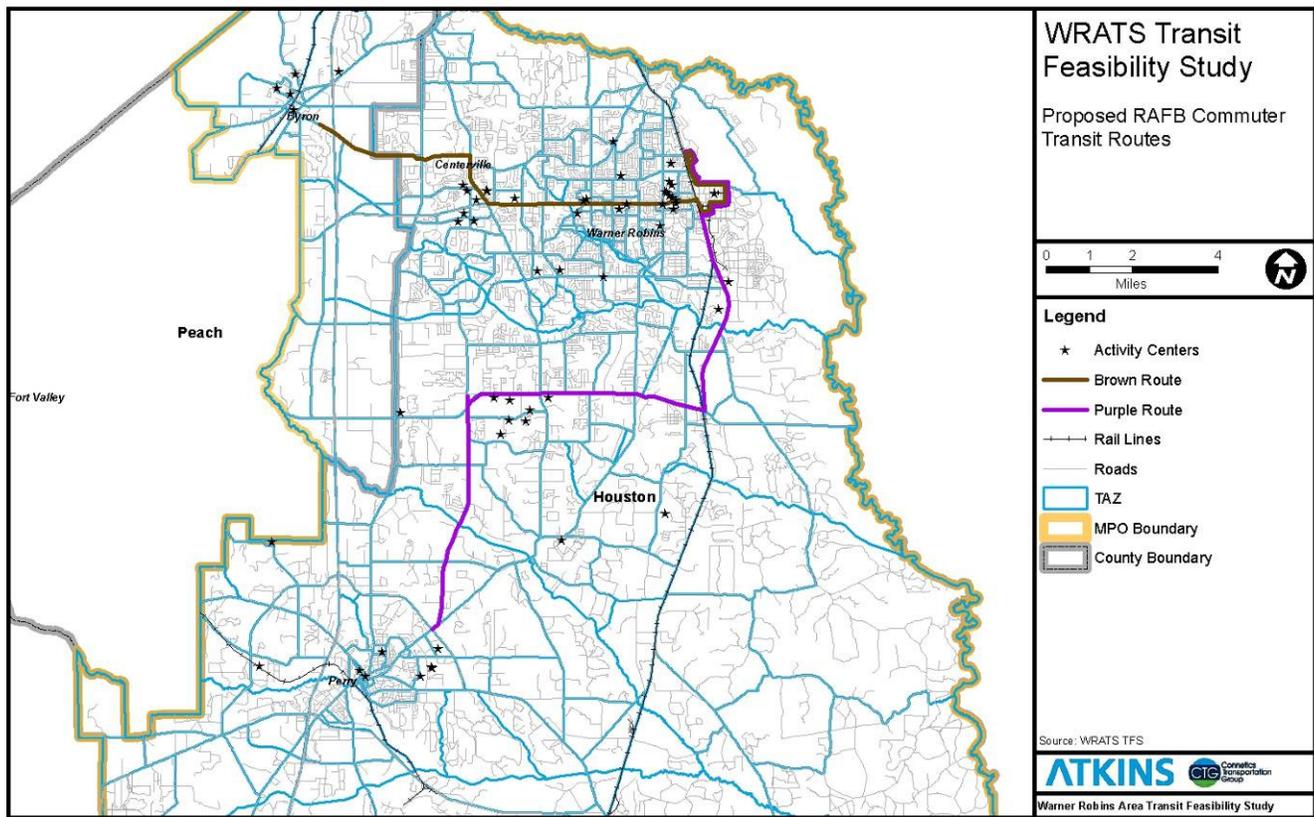
The Table in Figure 7 includes a factor indicating the proportion of RAFB employees likely to be included in the potential transit ridership market. For Bibb County this was assumed to be 1.0, or 100%, because of the distance to commute from the base which is generally longer than from Houston or Peach County. For Houston County the factor is assumed to be .5, or 50%, due to the close proximity of much of the county to the base which makes it less likely that proposed commuter bus services will be attractive to RAFB employees. For Peach County the factor is assumed to be .8, or 80%, because much of Peach County is not readily accessible to the stops for the proposed commuter services. Applying the factor to the number of RAFB employees by county yields the estimated potential transit market number of employees by county. The capture rate in Table 7 is derived from the number of RAFB employees riding the BiRD service from Bibb County i.e. 41 riders per day from a potential market of 2,773 = 1.48%. Using the capture rate of 1.48% from the BiRD route applied to the potential market of RAFB employees from Peach and Houston counties gives estimates of riders per day of 98 from Houston County and 21 from Peach County. Multiplying the estimated riders/day by 2 – which presumes all riders make round trips by transit – yields estimated boardings per day which total 238 for the Houston and Peach County markets. Using the same reasonable bound of plus or minus 25%, as used for the Line Haul and Demand Responsive Transit services, yields a range of 180 to 299 boardings, or AWPT, per day.

**Figure 7 – RAFB FY 2009 Employees by County**

County	Employees	Factor	Potential Market	Capture Rate	Estimated Riders/day	Estimated Boardings/day
Bibb	2,773	1.0	2,773	1.48%	41	82
Houston	13,253	0.5	6,627	1.48%	98	196
Peach	1,811	0.8	1,449	1.48%	21	42

The estimated ridership and boardings per day from Figure 7 were distributed to the Brown and Purple Routes based on the locations served by the routes and assumptions about the proportion of ridership likely to use either route based on proximity and ease of access. Figure 8 shows the Brown and Purple RAFB Commuter Routes. Figure 9 shows the distribution of ridership to the Brown and Purple Routes. The Brown Route is assumed to capture all of the ridership from Peach County and 40% of the ridership from Houston County. The Purple Route is assumed to capture 60% of the ridership in Houston County.

**Figure 8 – Proposed RAFB Commuter Transit Routes**



**Figure 9 – Estimated Commuter Bus Ridership**

Route	Name	Average Weekday Passenger Trips (AWPT)
Brown	Byron RAFB Commuter	121
Purple	Perry RAFB Commuter	118
<b>SUM</b>		<b>239</b>

### Transit Ridership based on Direct Estimation

In order to be able to display and examine transit ridership on a route level, a simplified mode choice and assignment model was developed in ARCGIS and CUBE. The simplified model generated estimated 2010 transit trip productions and attractions at the Traffic Analysis Zone (TAZ) level based on accessibility of the TAZ to transit and the amount of population and employment within the TAZ.

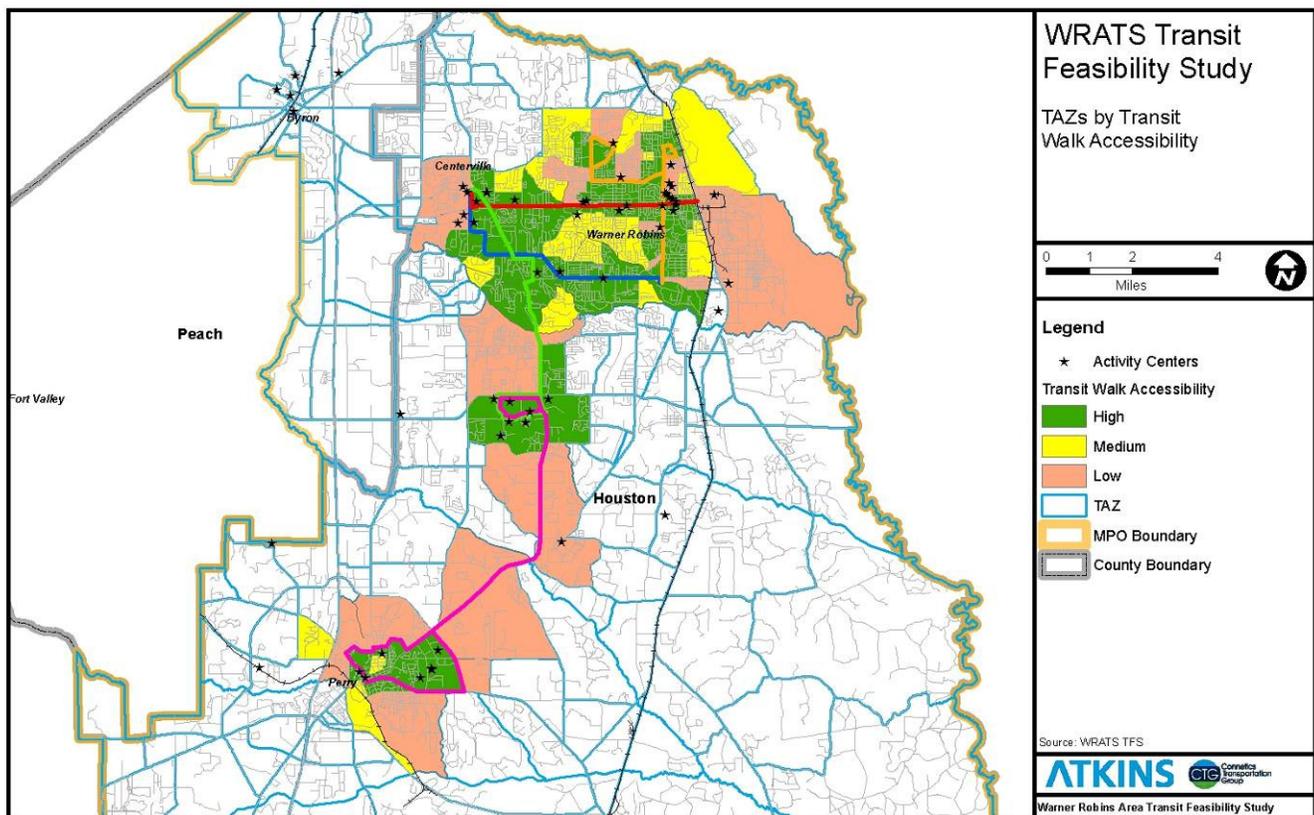
Transit trip productions were estimated based on TAZ population and adjusted based on a qualitative assessment of walk access to transit, with those TAZs that had the best walk access getting a higher proportion of transit trip productions. Transit trip productions were increased in those TAZs that have a high proportion ( $\geq 20\%$ ) of zero auto households.

Transit trip attractions were estimated based on TAZ total employment, retail employment and service employment. Retail and service employment locations tend to produce more transit attractions. Transit trip attractions were increased for those TAZs that had access to multiple transit routes. Transit attractions were also increased for those TAZs that contain regional activity centers identified as part of the existing conditions report.

Estimated transit trip productions and attractions were converted into trips in the CUBE travel demand model maintained by WRATS and GDOT by accounting for the relative scale of TAZ productions and attractions for each TAZ, and the distance between TAZs. Trips were then assigned to the proposed Line Haul transit routes as coded onto the travel demand model network. The estimated transit trip productions and attractions were scaled until the resultant daily transit trips on the assigned transit routes roughly matched the total average weekday transit ridership estimates based on passenger trip per vehicle revenue hour (PTVRH). Although these are “rough” estimates they enable depiction of ridership on each route as influenced by the characteristics of the transit routes and the adjacent TAZs.

Figure 10 shows the TAZs that were determined to be accessible to transit by the level of walk accessibility. These TAZs are generally all or partially within the ¼ mile transit buffer for line haul transit routes shown in Figure 3. In total 146 TAZs of the Warner Robins Metropolitan Area’s 329 TAZs are walk accessible to the proposed line haul transit routes. It was assumed that only TAZs that have walk accessibility would generate transit trips.

**Figure 10 – Transit Accessible Traffic Analysis Zones (TAZs) by Level of Walk Accessibility**



The level of walk accessibility for each TAZ was based on a subjective assessment of the proportion of the TAZ that had direct access to transit. A few TAZs that are within ¼ miles of a transit route were omitted because very little of the developed area within the TAZ is walk accessible to a proposed transit route.

Figure 11 shows estimated daily transit trip production by TAZ. Total TAZ trip productions were estimated by multiplying the 2010 TAZ population by 4; roughly the same as 10 trip productions per household per day. Total TAZ trip productions were then factored by an estimated transit trip rate varied by the walk accessibility of the TAZ, with those TAZs having the best walk access getting a larger transit trip rate than those with lesser walk access. Finally, in those TAZs within census block groups that have a 2010 household zero-auto ownership percentage of 20% or more, transit trip productions were increased.

**Figure 11 – Estimated Daily Transit Trip Productions by TAZ**

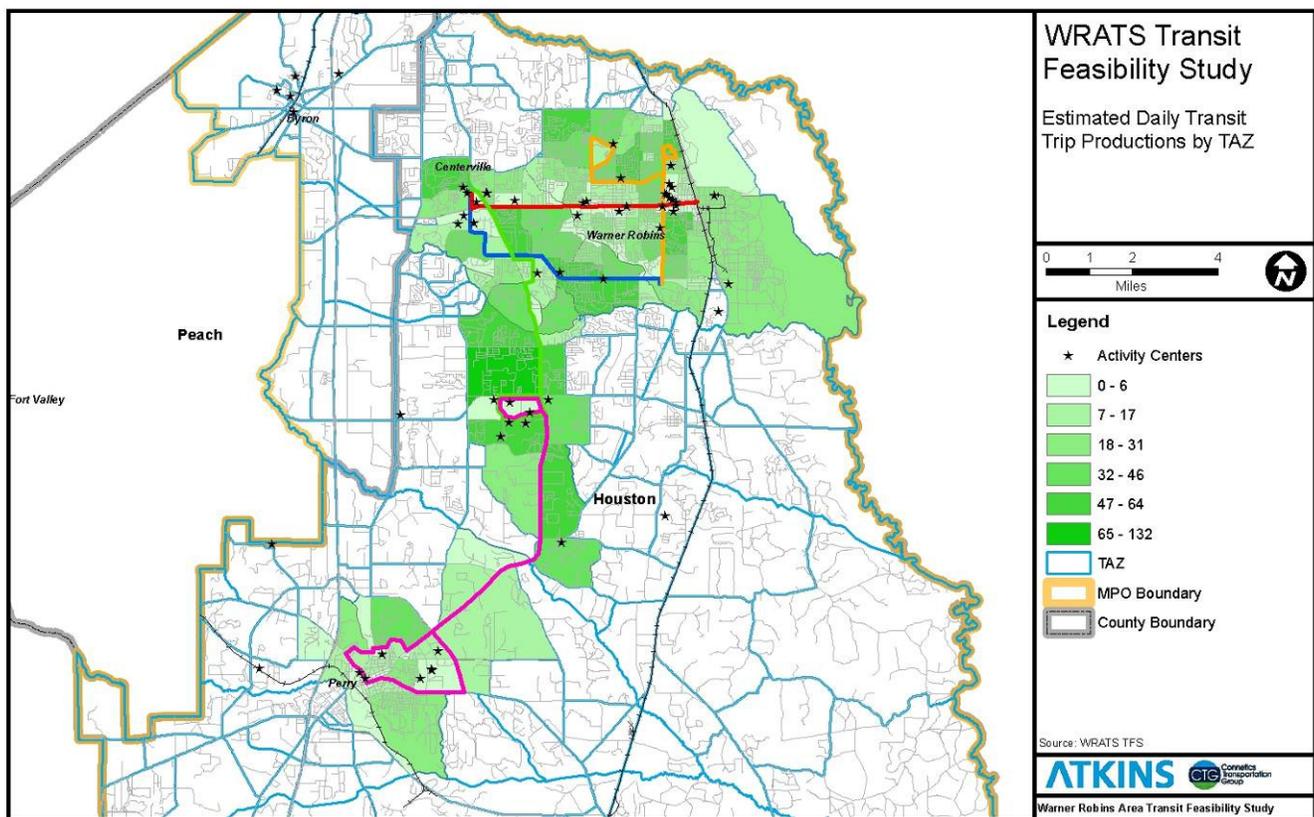


Figure 12 shows the Transit Service Level by TAZ. Transit service levels were assigned to TAZs with transit walk accessibility based on the number of transit routes serving the TAZ. In general those TAZs that have the most transit service should have a higher rate of attraction of transit trips.

Figure 12 – Transit Service Level by TAZ

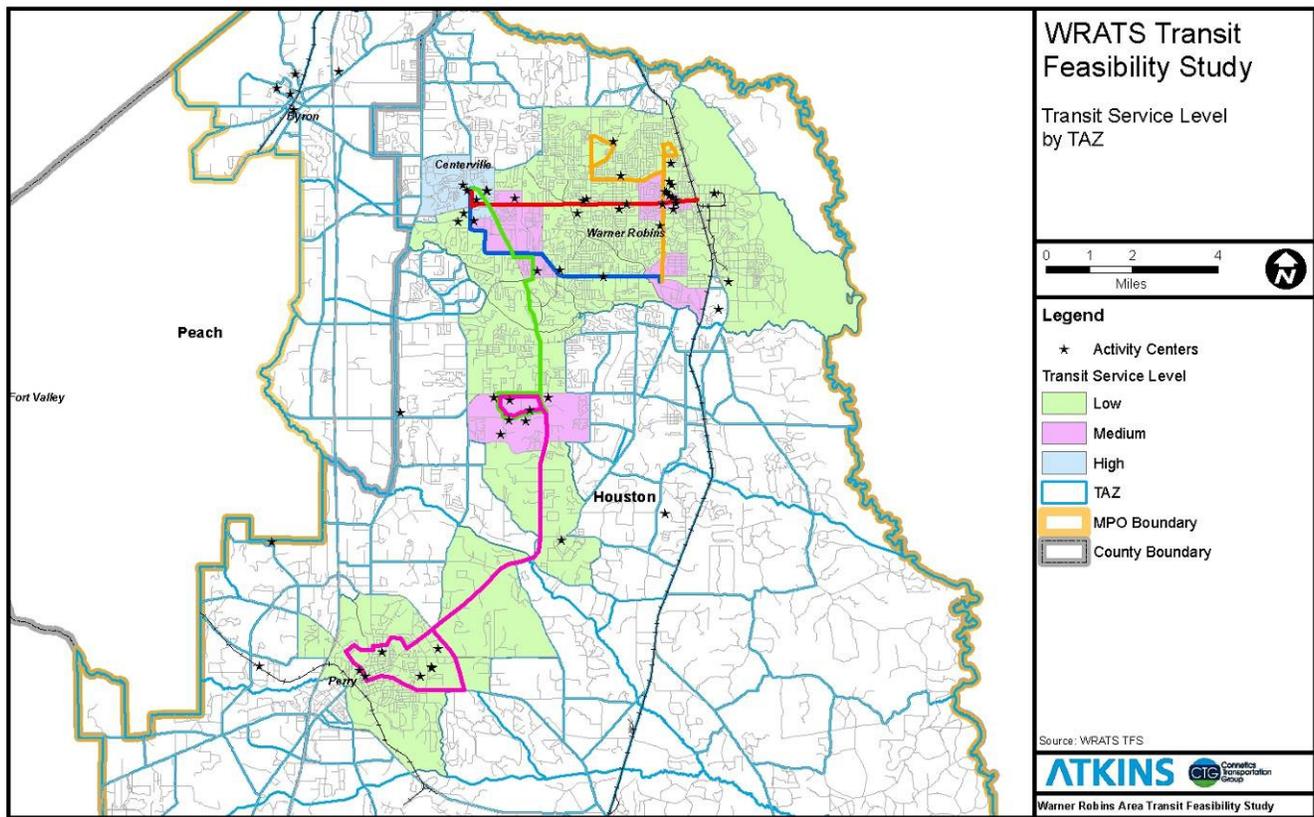
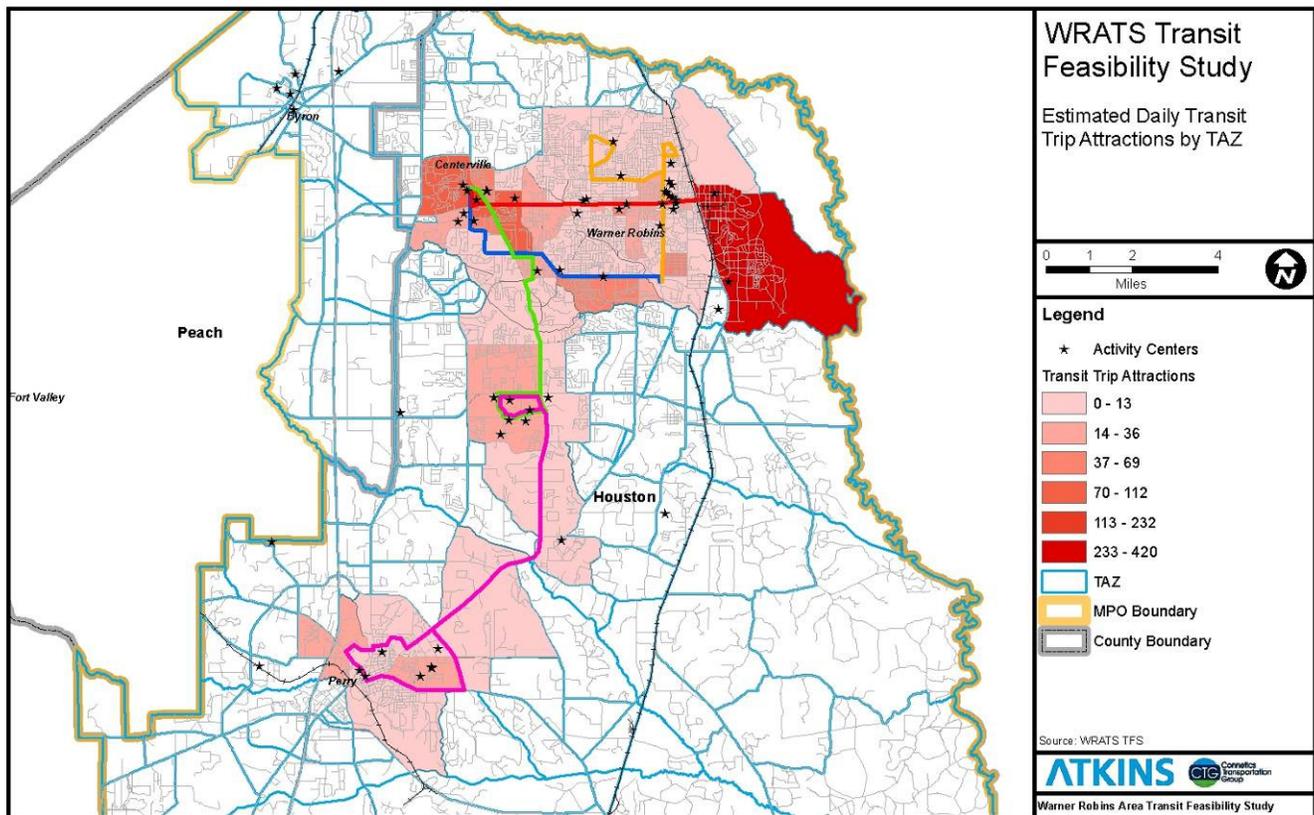


Figure 13 shows daily estimated transit trip attractions by TAZ. Transit trip attractions are based on the 2010 employment within the TAZ. Those TAZs that have the most employment have the highest potential for transit trip attraction.

Total trip attractions were estimated by multiplying the TAZ total employment by 4 and then adding additional trip attractions for those TAZs with retail or service employment, because retail and service employment reflect land uses that tend to produce more trips than other areas. Transit trip attractions were estimated by factoring the total trip attractions by the transit service level of the TAZ, with those TAZs that have the highest transit service levels getting a larger transit trip rate than those TAZs with lower service levels. Transit trip attractions were increased for those TAZs containing a regional activity center. Finally, transit trip attractions for the TAZs containing RAFB were reduced to account for the proposed Brown and Purple commuter routes that will provide direct service to the base for employees, a higher level of service for those employees than the proposed line haul transit routes would provide.

**Figure 13 – Estimated Daily Transit Trip Attractions by TAZ**

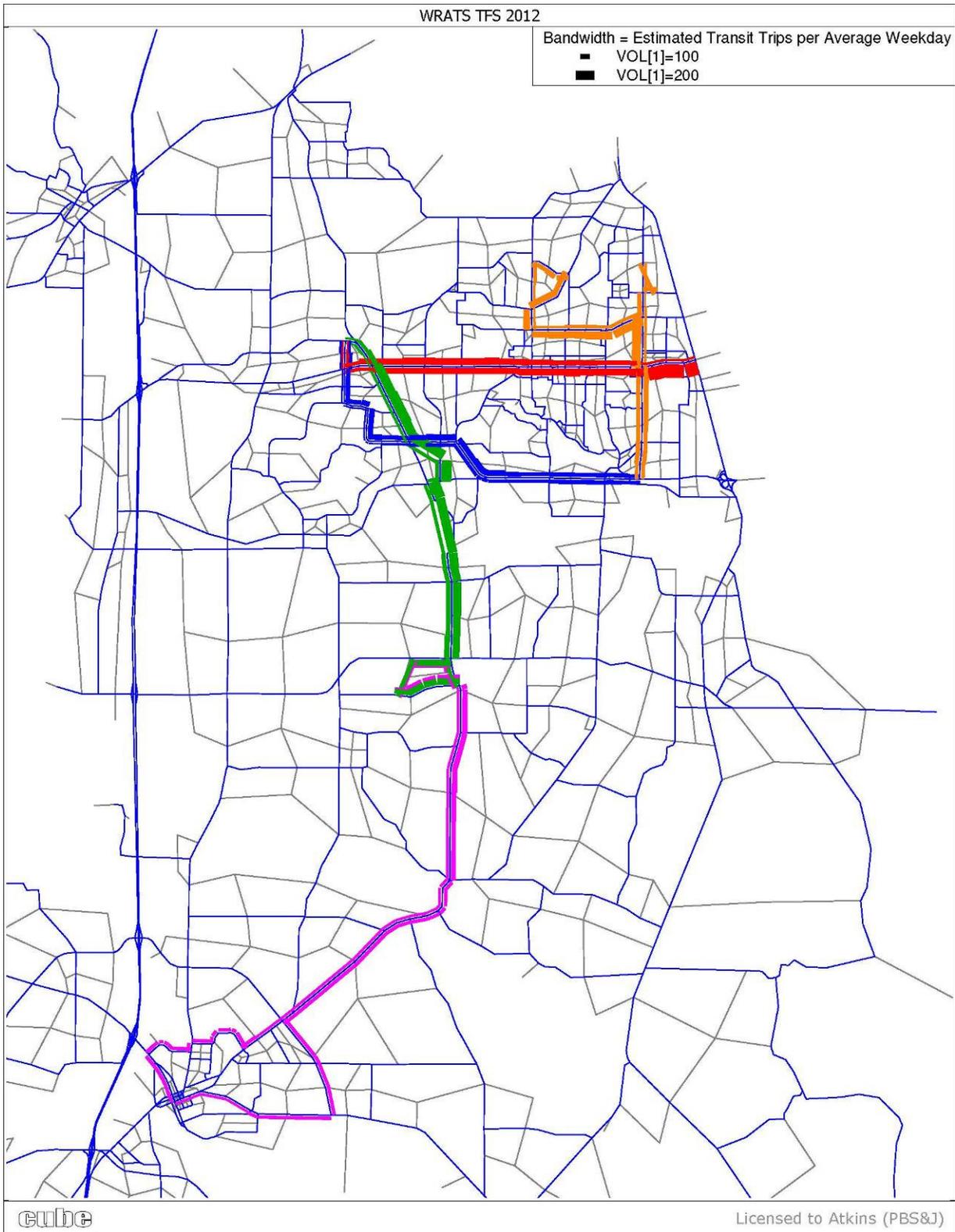


After TAZ transit trip productions and attractions were estimated they were distributed as trips within the CUBE travel demand model maintained by WRATS and GDOT. The distribution process matches TAZ transit trip productions to TAZ transit trip attractions based on the relative scale of each TAZs productions and attractions and the relative distance between TAZs.

Transit trips between TAZs can then be assigned to the proposed line haul transit routes as coded onto a network within the model in order to visualize what transit ridership on the routes would be relative to the characteristics of the transit routes and the TAZs that each transit route serves. Figure 14 shows the proposed transit routes with the assigned trips and the relative ridership, or line loads, on different segments of each transit route. Transit trips were scaled to roughly match the estimates for the proposed system of line haul transit routes based on the peer group passenger trips per vehicle revenue hour (PTVRH) estimates, however the loadings on each route may differ from the individual route level PTVRH based estimate.

The band widths of the transit routes shown in Figure 14 show the relative daily ridership volumes for each of the proposed line haul transit routes by segment. As can be seen the Red and Green routes show the highest daily ridership, while the Pink route shows the lowest ridership volumes. System volumes tend to be the highest along Watson Boulevard and between Watson Boulevard and the Cohen Walker area.

Figure 14 – Network Assigned Daily Transit Trips by Route for the Proposed Line Haul System



## Conclusions from the Estimation of Transit Ridership

Transit ridership on the proposed transit services for the Warner Robins Metropolitan Area is likely to be consistent with the average ridership experienced by the peer transit systems. The ridership estimates documented in this report represent reasonable estimates based on rational estimation procedures but actual ridership may differ significantly for each service based on operating characteristics of the specific service provided and factors that either have not been considered directly in preparing these estimates, or for which information was either unavailable or at a level of aggregation that cannot account for localized conditions that influence transit ridership i.e. individual transit stop accessibility, sidewalk coverage, traffic conditions, fares and fare subsidies, perceived safety, scheduling, service interlining, and so on.