Review of Urban Transit Systems in Alabama

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16.Abstract

The objective of this project was to perform a pilot review of selected urban transit systems currently operating in Alabama with guidance from the Transit Capacity and Quality of Service Manual. Using this document, transit quality of service levels can be obtained for six unique aspects of service.

A preliminary case study of the transit systems in Birmingham, Huntsville, and Tuscaloosa was performed to determine the level of service (LOS) offered in each community. The results of this study indicate that some of the measures are difficult to obtain without large expenditures and all the measure are passenger focused, neglecting the operator's constraints.

It was recommended that the existing methodology be expanded to include an aggregated transit LOS-based assessment method that takes under consideration a variety of important transit system performance measures simultaneously and produces an overall LOS grade for each transit route considered.

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Executive Summary

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It was recommended that the existing methodology be expanded to include an aggregated transit LOS-based assessment method that takes under consideration a variety of important transit system performance measures simultaneously and produces an overall LOS grade for each transit route considered.

Section 1
Introduction

Public transportation is an important component of an urban area transportation system. Understanding the operation of the transit system and the level of service (LOS) provided by the system is a key step in understanding the effectiveness of the system in meeting its goals. To aid transit agencies in an objective evaluation of their systems, the Transit Capacity and Quality of Service Manual, known as the TCQSM (TCRP, 1999), report was developed by the Transit Cooperative Research Program (TCRP) to provide a mechanism for transit operators to assign a level of service to their system. This TCQSM was intended to provide basic statistics that could be easily understood, in the same manner as the Highway Capacity Manual level of service measures for roadways and intersections.

As stated in the manual, bus capacity is a complex topic as it deals with the movement of both people and vehicles, depends on the size of the buses used and how often they operate, and reflects the interaction between passenger traffic concentrations and vehicle flow (TCRP, 1999). It also depends on the operating policy of the service provider, which normally specifies service frequencies and allowable passenger loadings. Ultimately, the capacities of bus routes, bus lanes, and bus terminals, are generally limited by (a) the ability of stops or loading areas to pick up and discharge passengers, (b) the number of vehicles operated, and (c) the distribution of pick-ups and deliveries along a route (TCRP, 1999). Although the calculation of capacity and quality of service for transit is a complicated process, the manual does provide a mechanism by which bus capacity and LOS can be determined for different facilities and operating strategies. It is through these mechanisms that this project was conducted.

Objective

The objective of this project was to perform a pilot review of selected urban transit systems currently operating in Alabama with guidance from the TCQSM. Emphasis was placed on quality of service considerations. Candidate transit agencies of Birmingham, Huntsville, and Tuscaloosa were reviewed as the pilot study locations. Based on the availability of data, and location of the systems, a collection of measures were used to address the level of service for various characteristics from the three systems. The results of the review are solely intended to provide a snap-shot of current transit operation levels and identify strengths and deficiencies, not to pass judgment on the effectiveness of the systems. As with the Travel Rate Indices relating to automobile travel in urban areas, it is one measure that can be used to determine their present LOS and provide guidance about means for improvement. In addition, it is intended that the results of this review will provide the agencies with valuable data on future research study efforts that can be beneficial to improving ridership levels and increasing the quality of service and user satisfaction.

The report contains four sections. The first section discusses the need for reviewing Alabama's transit systems and the objective of the study. The second section explains the methodology adopted and the practical tasks that were executed for the completion of the study. The third section displays the results. The fourth section draws conclusions from this study, and discusses areas for future improvements.

Section 2
Methodology

According to the TCQSM, 2nd Edition, there are six areas where transit systems can be evaluated: Service Frequency, Hours of Service, Transit Supportive Area, Reliability, Travel Time Difference, and Passenger Loading. For each area of interest, the TCQSM provides a measure of effectiveness (MOE) and a corresponding table to relate the MOE to a LOS. This section reviews the analysis and measure of effectiveness for each area.

Service Frequency

Service frequency focuses on the wait time between vehicles. This measure is intended to reflect the importance of schedules and attractiveness of the service to riders. The MOE is the amount of time between successive vehicles, or headway. Table 2-1 provides the LOS criteria for bus transit systems (TCRP, 1999).

Table 2-1: Service Frequency LOS (TCRP, 1999)

LOS	Headway (min)	Comments
A	<10	Passengers don't need schedules
B	10-14	Passengers consult schedules
C	15-20	Maximum time to wait if bus/train missed
D	21-30	Service unattractive to choice riders
E	31-60	One service available during hour
F	>60	Service unattractive to all riders

Hours of Service

Hours of service focuses on the availability of the buses during off-peak hours. This measure is intended to identify the ease with which riders can use the system for all types of transportation needs, not solely for commuters or those with flexible schedules. To qualify as providing service, a fixed route bus system must offer service at least once per hour. The measure of effectiveness is the total hours of operation during a typical 24-hour day that the buses are available. Table 2-2 provides the LOS for the bus transit system (TCRP, 1999).

Table 2-2: Hours of Service (TCRP, 1999)

LOS	Hours per Day	Comments
A	19-24	Night or owl service provided
B	17-18	Late evening service provided
C	14-16	Early evening service provided
D	12-13	Daytime service provided
E	4-11	Peak hour service/limited midday service
F	0-3	Very limited or no service

Transit Supportive Areas

The transit supportive area focuses on the locations where transit riders are assumed to reside and their desired destinations. The measure examines whether or not the transit system is traveling along appropriate routes. The definition provided in the TCQSM for transit supportive area is one where the housing density is at least three units per gross acre (7.5 units per gross hectare) or where the employment density is at least four jobs per gross acre (10 jobs per gross hectare). The area is considered to have adequate transit coverage if the supportive area is less than 0.25 miles from the bus service, provided there are adequate pedestrian connections to the transit sites from the surrounding area. The supportive area in question is measured as either all-or-nothing depending on the location of the transit service. The measure of effectiveness is the percent of transit supportive area that is served by the transit system. Table 2-3 provides the level of service criteria for the bus transit system (TCRP, 1999).

Table 2-3: Transit Supportive Area (TSA) LOS (TCRP, 1999)

LOS	% TSA	Comments
A	90.0-100%	Virtually all major origins & destinations served
B	80.0-89.9%	Most major origins & destinations served
C	70.0-79.9%	About ¾ of higher-density areas served
D	60.0-69.9%	About two-thirds of higher-density areas served
E	50.0-59.9%	At least ½ of the higher-density areas served
F	<50.0%	Less than ½ of higher-density areas served

Reliability

Reliability focuses on the on-time performance of the transit system. This measure is related to the traveler's perception of whether the bus would be late and they would have to spend more time than necessary waiting for their trip to begin. A transit vehicle was considered on-time if the vehicle arrived within five minutes of the published arrival time. If a vehicle arrived early and did not wait until the published pick-up time, the vehicle was deemed late as an individual would need to wait for the next vehicle. The MOE is the percent of transit vehicles that are on time. Table 2-4 provides the level of service criteria for the bus transit system (TCRP, 1999).

Table 2-4: Reliability (TCRP, 1999)

LOS	On-Time Percentage	Comments
A	95.0-100.0%	1 late transit vehicle every 2 weeks (no transfer)
B	90.0-94.9%	1 late transit vehicle every week (no transfer)
C	85.0-89.9%	3 late transit vehicles every 2 weeks (no transfer)
D	80.0-84.9%	2 late transit vehicles every week (no transfer)
E	75.0-79.9%	1 late transit vehicle every day (with a transfer)
F	<75.0%	1 late transit vehicle at least daily (with a transfer)

Travel Time Difference

Travel time difference focuses on the extra travel time incurred using the transit system versus driving a personal vehicle. Ideally, the traveler would not experience a significant difference in travel time. The measure of effectiveness is the travel time difference between driving a personal vehicle and using the transit vehicle. Table 2-5 provides the LOS criteria for the bus transit system (TCRP, 1999).

Table 2-5: Travel Time Difference LOS ((TCRP, 1999)

LOS	Travel Time Difference (min)	Comments
A	≤0	Faster by transit than by automobile
B	1-15	About as fast by transit as by automobile
C	16-30	Tolerable for choice riders
D	31-45	Round-trip at least an hour longer by transit
E	46-60	Tedious for all riders; may be best possible in small cities
F	>60	Unacceptable to most riders

Passenger Loadings

Passenger loadings focus on the amount of area a passenger is afforded while on the vehicle. This measure is similar to LOS calculations for sidewalks and elevators, where personal space encroachment is viewed as undesirable. The measure of effectiveness is the number of passengers per seat (for vehicle designed to have seated traveler) or floor area per passenger (for vehicles designed to have most people standing). Table 2-6 provides the LOS criteria for the bus transit system (TCRP, 1999).

Table 2-6: Passenger Loading LOS (TCRP, 1999)

LOS	Load Factor (p/seat)	Standing Passenger Area (ft2/p) (m2/p)		Comments
A	0.00-0.50	>10.8†	>1.00†	No passenger need sit next to another
B	0.51-0.75	8.2-10.8†	0.76-1.00†	Passengers can choose where to sit
C	0.76-1.00	5.5-8.1†	0.51-0.75†	All passengers can sit
D	1.01-1.25*	3.9-5.4	0.36-0.50	Comfortable standee load for design
E	1.26-1.50*	2.2-3.8	0.20-0.35	Maximum schedule load
F	>1.50*	<2.2	<0.20	Crush load

*Approximate value for comparison, for vehicles designed to have most passengers seated. LOS is based on area.
†Used for vehicles designed to have most passengers standing.

This project intended to examine these six measure using three Alabama transit systems as case study locations. However, as will be seen in the next chapter, the availability of data and the time required to collect sufficient data limited the application to selected MOEs for the different systems.

Section 3
Case Study Results

The case study analysis conducted as part of this research focused on the transit systems in Birmingham, Huntsville, and Tuscaloosa. The areas of measurement and levels of service outlined in the methodology were followed to the extent possible. Not all analyses were performed based on difficulty in obtaining some of the desired information and budget limitations of the project. The main characteristics of each transit systems are presented next, followed by a discussion on the results from the case study analyses.

Birmingham Transit System

The Birmingham Jefferson County Transit Authority refers to its large transit system as MAX. MAX operates 109 buses, including 10 CNG vintage trolleys, and 22 paratransit vehicles. MAX buses meet ADA requirements and are wheelchair accessible. Max serves the metropolitan cities of Birmingham, Bessemer (Limited stops in Midfield, Brighton, and Lipscomb) Fairfield, Homewood, Hoover, Mountain Brook, Tarrant, and Vestavia Hills. MAX service enhancement program consists of bike racks on buses, new bus route signage with clearly identified bus stops' new bus shelters, and a new system map and schedule book. The Authority's enhancements include advanced onboard bus technology that will inform riders about system wide routes and schedules and offer local weather and news reports. There will be an upgrade of the MAX CNG operations facilities, security system and maintenance shop. (http://www.bjcta.org, April 2007)

Huntsville Transit System

The Public Transportation Division of Huntsville, Alabama commonly refers to its transit system as the Huntsville Shuttle. The Huntsville Shuttle operates thirteen fixed routes covering more than 175 miles of city streets each hour of service. Though this system covers many miles with thirteen routes, it is still be categorized as a medium system. One of these routes is the Tourist Trolley Loop, which hits all major attractions throughout Huntsville. The goal of the Public Transportation Division is to provide adequate and efficient community transportation services for the general public, senior citizens, physically challenged citizens, commuters, and individuals with limited transportation alternatives. (http://www.ci.huntsville.al.us/PublicTran, April 2007)

Tuscaloosa Transit System

The Tuscaloosa Transit Authority system is the public transit system for the City of Tuscaloosa. Tuscaloosa's first street car line was a trolley system put into place in

1882. "Trolleys" were brought back in 1999. At first they were used in the downtown area and for the University of Alabama home football games. Now the system has been expanded and Trolleys run on four fixed routes. With only four fixed routes this system is considered small. The Trolley system currently operates only in the city of Tuscaloosa. The move to Trolley Illusion buses came out of a 1998 study that showed that the City needed smaller, more economical buses. The look blends well with the historic nature of the town. (http://www.uatrolley.org/door, April 2007)

Case Study Results

The first two measures for evaluating the quality of service offered by transit systems are hours of service in a day and headway between vehicles. For the transit systems studied in this project, route information was gathered from published timetables available on the Internet (http://www.bjcta.org , April 2007, http://www.ci.huntsville.al.us/PublicTran, April 2007, http://www.uatrolley.org/door, April 2007). This information made it possible to determine, for each route, the amount of time each day the vehicles were available for riders, and the headway between vehicles. The hours of service for the transit system was based on the difference between beginning operating time and ending operating time and the headway was measured by calculating the amount of time between successive vehicle passes. After gathering the necessary data from web sites, the LOS was determined for each of the three systems using the TCQSM 2nd Edition. LOS values are shown in Tables 3-1, 3-2, and 3-3 for the Birmingham, Huntsville, and Tuscaloosa transit systems, respectively.

Reviewing the results from the three transit systems, with respect to hours of service, the Birmingham transit system provided routes with the longest possible riding hours, while also offering a few limited routes throughout the day for specialized travel. As a result, 21 routes were found to operate in LOS of B or C, seven routes in LOS of D or E, and the remaining eight in LOS F. All transit routes in Huntsville and Tuscaloosa received LOS grades of D or E due to not offering early morning or late night hours. Focusing on headway, the majority of the routes (61%), had headways between 31 and 60 minutes which resulted in a LOS of E. Two routes in Birmingham received LOS values of B, and another 6 routes had LOS of D.

Table 3-1: Birmingham Hours of Service and Transit Frequency LOS

Route	Hours of Service	LOS	Headway (Min)	LOS
Blue Line- North/South	13	D	15	B
Red Line- East/West	8	E	30	D
Green Line- South Side loop	11	E	15	B
South Bessemer	16	C	30	D
Jefferson/ Wennoah	16	C	50	E
Ensley / Wylam	16	C	50	E
Pratt/ Ensley	16	C	30	D
Sixth Avenue South	16	C	30	D
Highland	14	C	60	E
Idlewild/ Palisades	16	C	50	E
Century Plaza/ Eastwood Mall	17	B	30	D
Fountain Heights	14	C	60	E
Zion City	15	C	50	E
Tarrant City	15	C	60	E
North Birmingham	16	C	45	E
Center Point	16	C	60	E
South Eastlake/ Roebuck	17	B	50	E
Graymont Avenue	16	C	30	D
Homewood/ Wildwood	12	D	30	D
Fairmont	16	C	60	E
Hollywood/ Brookwood Mall	13	D	45	E
Montclair	16	C	90	F
Bessemer	17	B	45	E
South Powderly	15	C	60	E
Mtn Brook / Belle Meade	3	F	90	F
Mtn Brook / Cherokee Bend	3	F	90	F
Mtn Brook / Euclid	2	F	60	E
Mtn Brook / Hermitage	2	F	60	E
Altadena	2	F	60	E
Cahaba Heights	2	F	60	E
Overhill	2	F	60	E
Center Point Express	3	F	45	E
Hwy 280 Limited	16	C	60	E
Hwy 31	16	C	90	F
Titusville shuttle	9	E	40	E
Westend Shuttle	9	E	30	D

Table 3-2: Huntsville Hours of Service and Transit Frequency LOS

Route	**Hours of Service**	**LOS**	**Headway (Min)**	**LOS**
Red core loop	12	D	30	D
Blue core loop	12	D	30	D
Madison Sq./ Holmes	11	E	60	E
Madison Sq./ University	12	D	60	E
Airport Rd./ Memorial Pkwy	12	D	60	E
SW Huntsville	12	D	60	E
Alabama A&M / Medaris	12	D	60	E
Medaris / Alabama A&M	12	D	60	E
NW Huntsville/ Oakwood College	12	D	60	E
Weatherly Road	12	D	60	E
Tourist Trolley	11	E	60	E

Table 3-3: Tuscaloosa Hours of Service and Transit Frequency LOS

Route	Hours of Service	LOS	Headway (Min)	LOS
Crestridge Rd./ Holt	13	D	60	E
VA- University	13	D	60	E
Greensboro / McFarland Mall	13	D	60	E
McKenzie Court	13	D	60	E

The analysis for transit supportive areas was not fully completed in this project due to issues relating to data collection. If the data were available, this measure would have produced a service coverage analysis. Using GIS, routes for the different transit systems were geocoded into ArcGIS software for Birmingham, Huntsville, and Tuscaloosa. Housing data were inputted for each city using available data from the Census Department, but a final analysis was not performed because employment data for the case study communities were not available.

The reliability LOS was completed for the Birmingham and Huntsville transit systems. The Tuscaloosa system was not included as this measure required site visits to monitor on-time performance and project constraints prohibited collection of such data. Based on the TQCSM), on-time performance was considered if the vehicle arrived between 0-5 minutes after the scheduled time. In addition, if the vehicle arrived early and departed early, it was considered late while waiting for the next vehicle to pass the stop location as a measure to limit passengers missing the bus when they arrive at the scheduled time. Forty-one field observations were collected in Huntsville and forty-two field observations were collected in Birmingham. Using the metric defined in Table 2-4, both systems would receive reliability LOS of F as the Huntsville buses were on-time for 73 percent of the observations and the Birmingham buses were on-time for 64 percent of the observations. In Huntsville, the average arrival time (after the scheduled pick-up time) of a bus was almost nine minutes. In Birmingham, the average arrival of a bus after the scheduled pick-up time was over 10 minutes.

The transit-auto travel time comparison was conducted for the Birmingham, Huntsville, and Tuscaloosa transit systems. It is shown in Tables 3-4, 3-5, and 3-6. The actual travel time for the transit route was based on the published schedule and the drive time by automobile was taken from the travel demand models used in each community to determine congested travel time (done as a proxy to driving the routes in real time as a cost saving measure). When conducting the analysis, most routes in the case study cities did not loop (instead traversed a large area of the community); therefore, a measurement of the travel time difference was taken at the halfway point and at the end of the route to provide two LOS values per route. However, if the route looped, one LOS measure was collected using the farthest point from the starting point. The results show that the vast majority of routes in all three locations operate at LOS of B or C, when Travel Time Difference LOS is selected as the measure of effectiveness.

Table 3-4: Birmingham Travel Time Difference LOS

Route	Transit Ride Time	Auto Travel Time	Difference	LOS
Route 1: Central Station – Jefferson and 40th St	33	9	24	C
Route 3: Central Station – Princeton Medical Center	10	5	5	B
Route 3: Central Station – Jefferson and 31st St	18	10	8	B
Route 5: Central Station – Bessemer and Ensley Ave.	20	8	12	B
Route 6: Central Station – 8th Ave and Center St	10	5	5	B
Route 6: Central Station – Avenue F and 18th Street	29	12	17	C
Route 8: Central Station – 6th Ave and 12th Street	18	6	12	B
Route 8: Central Station – 2nd Street and Goldwire	27	9	18	C
Route 12: Central Station – 20th Street and 11th Ave	7	5	2	B
Route 12: Central Station – Clairmont and 42 Street	19	12	7	B
Route 14: Central Station – 20th Street and 11th Ave	14	5	9	B
Route 14: Central Station – Oxmoor and Barber	42	16	26	C
Route 17: Central Station – Georgia and Joppa	27	13	14	B
Route 17: Central Station – Century Plaza	42	18	24	C
Route 18: Central Station – 11th Court and Bankhead	18	8	10	B
Route 20: Central Station – 8th Ave and 31st Street	12	4	8	B
Route 20: Central Station – 10th Ave and 50th Street	24	8	16	C
Route 22: Central Station – 10th Ave and Coosa	20	8	12	B
Route 23: Central Station – 8th Ave and 24th Street	8	3	5	B
Route 23: Central Station – 30th Ave and 27th Street	18	9	9	B
Route 25: Central Station – Airport Blvd and 31st St	15	5	10	B
Route 28: Central Station – 1st Ave and 50th Street	14	5	9	B
Route 28: Central Station – Red Lane	32	12	20	C
Route 38: Central Station – Ave D and 19th Street	25	13	12	B
Route 39: Central Station – Wildwood North	53	11	42	D
Route 40: Central Station – 32nd Ave and 5th Street	26	9	17	C
Route 40: Central Station – 42nd Ave and 43rd Ave	50	22	28	C
Route 41: Central Station – Western Hills Mall	48	19	29	C
Route 42: Central Station – 28th Ave and 18th Street	24	15	9	B
Route 42: Central Station – Brookwood Hospital	36	24	12	B
Route 44: Central Station – St. Vincent Hospital	20	5	15	B
Route 44: Central Station – Oporto Way and Montclair	40	15	25	C
Route 45: Central Station – Western Hills Mall	37	13	24	C
Route 45: Central Station – 4th Ave and 10th Street	58	21	37	D
Route 48: Central Station – Dennison & Martin Luther King	23	7	16	C
Route 48: Central Station – Electra and Golden Pines	33	14	19	C
Route 50 Belle Meade: Central Station – Church and Euclid	29	16	13	B
Route 50 Belle Meade: Central Station – Rockhill and Bella Meade	51	24	27	C
Route 50 Cherokee: Old Leeds and Stone River – Central Station	46	29	17	C
Route 50 Euclid: Central Station – Church and Euclid	36	16	20	C
Route 50 Euclid: Central Station – Mountain Brook Jr High	48	24	24	C
Route 50 Hermitage: Central Station - Church & Euclid	28	16	12	B
Route 50 Hermitage: Central Station – Stone Ridge	59	28	31	D
Route 51: Central Station – Rocky and Old Rocky	48	17	31	D
Route 51 Cahaba Heights: Central Station – English Village	24	8	16	C
Route 51 Cahaba Hts: Central Station – Overton & Locksley:	48	16	32	D
Route 51 Overhill: Central Station – Hastings	26	16	10	B
Route 51: Central Station – Montevallo and Cahaba	48	23	25	C
Route 72: Central Station – Foxglen	28	17	11	B
Route 72: Central Station – Highlands	51	28	23	C
Route 280: Central Station – Summit	25	11	14	B
Route 280: Central Station – McDonalds	62	27	35	D
Route Highway 31: Central Station – Vestavia	20	11	9	B
Route Highway 31: Central Station – Galleria	41	17	24	C
Titus Shuttle	10	6	4	B
Westend Shuttle	13	5	8	B

Table 3-5: Huntsville Travel Time Difference LOS

Route	Transit Ride Time	Auto Travel Time	Difference	LOS
Red core loop	26	10	16	C
Blue core loop	23	11	12	B
Madison Sq./ Holmes	15	9	6	B
Madison Sq./ University	15	8	7	B
Airport Rd./ Memorial Pkwy	12	8	4	B
SW Huntsville	16	6	10	B
Alabama A&M / Medaris	11	8	3	B
NW Huntsville/ Oakwood College Alabama Career Center – Transfer Station	8	6	2	B
NW Huntsville/ Oakwood College Bonnel Dr.--Alabama Career Center	12	5	7	B
Weatherly Road: Bailey Cove Target—Parkway Place Mall	14	9	5	B
Weatherly Road: Parkway Place Mall – Logan Dr.	13	6	7	B
Tourist Trolley: Botanical Gardens – Transfer Station	21	9	12	B
Tourist Trolley: Transfer Station – Madison Square Mall	20	8	12	B

Table 3-6: Tuscaloosa Travel Time Difference LOS

Route	Transit Ride Time	Auto Travel Time	Difference	LOS
Crescent Ridge Rd./ Holt	37	23	14	B
VA- University	20	10	10	B
Greensboro / McFarland Mall	31	16	15	B
McKenzie Court	24	8	16	C

The passenger loading level of service was not calculated during this study. This was because there was no convenient method to observe transit ridership on specific routes without the use of electronic counting devices or physically riding the buses themselves, which was beyond the scope of the study.

Section 4
Conclusions

Several conclusions were drawn from the review of the Transit Capacity and Quality of Service Manual procedures for assessing transit operations and the findings from the three case studies focus on two specific areas. First, the actual LOS values obtained for the three case study cities ranged from LOS B to LOS F, depending on the measure examined. They are intended to provide system operators a glance at the service levels offered to their riders. The greatest deficiency was determined to be reliability – which admittedly is somewhat beyond the control of the transit provider as general traffic congestion might delay transit vehicles. This measure could potentially inform the providers that they need to rethink the routes and schedules to avoid vehicles arriving at late at scheduled stop locations, as this is seen by passengers as a significant obstacle to transit use. Again, these results are intended to provide the providers a measure to gauge their system performance.

The second conclusion was that the TCQSM uses only the passenger perspective to determine quality of transit service, whereas the operator's perspective was completely disregarded. For example, the hours of service headway between vehicles could be altered at the discretion of the operator to achieve better LOS; however, this improved service might come at the expense of increased operating cost and larger budget deficiencies. Incorporating budget and operating parameters into the LOS analyses could potentially improve the grading system and provide more meaningful results.

It is also recommended that the existing methodology be expanded to include an aggregated transit LOS-based assessment method that takes under consideration a variety of important transit system performance measures simultaneously and produces an overall LOS grade for each transit route considered.

Section 5
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