

Knoxville Area Transit (KAT) Transit Development Plan



Submitted to:
Knoxville Area Transit
and Knoxville Knox County
Metropolitan Planning Commission

Submitted by:
The Corradino Group, Inc.

In association with:
PB Americas
Connetics, Inc.
Data Smarts
Hall Communications

Executive Summary

This report presents the Executive Summary for the Transit Development Plan (TDP) for Knoxville Area Transit (KAT). This plan provides guidance for operational and capital changes for KAT over the next five years. In addition, with the opening of its downtown transfer center – Knoxville Station – there will be a variety of immediate changes to systemwide operations. The need to redesign the system will also allow KAT to address longstanding routing and timing problems. This study focuses on providing this short-term guidance to KAT as well as maintaining a perspective of a longer term vision.

The work on this study included interaction with KAT staff, the Knoxville Transportation Authority (KTA) Board, and members of the community through meetings, surveys, and workshops. The specific objective of the plan was to generate efficiencies in the operations without sacrificing the overall service mission of KAT.

The issues and parameters facing transit systems like KAT are many. Obvious issues include funding, efficiency in operations, technology, union/labor, demographic change in the community, KAT's relationship with the University of Tennessee (UT), continuing and increasing traffic congestion in the urban area, and price of fuel. This study was developed in a time of an almost unprecedented surge in fuel prices for the general public and transit systems alike. This presented a dilemma for transit systems nationwide. While people were crowding transit buses, transit systems were faced with little choice but to cut services or raise fares to meet budgets. KAT was able to deal with the economic situation during this period by raising fares, eliminating one express route, and adjusting their ADA service area.



This report presents the Short-Range Transit Development Plan for KAT. It also includes summaries of information developed as part of two additional planning efforts – a downtown operations study focusing on KAT service and a high capacity transit corridor study prepared for the Knoxville Knox County Metropolitan Planning Commission. This report provides recommendations for system modifications and fare changes. It should be noted the fare changes were made during the course of the study and KAT continues to build on the route recommendations in this report.

KAT Operations

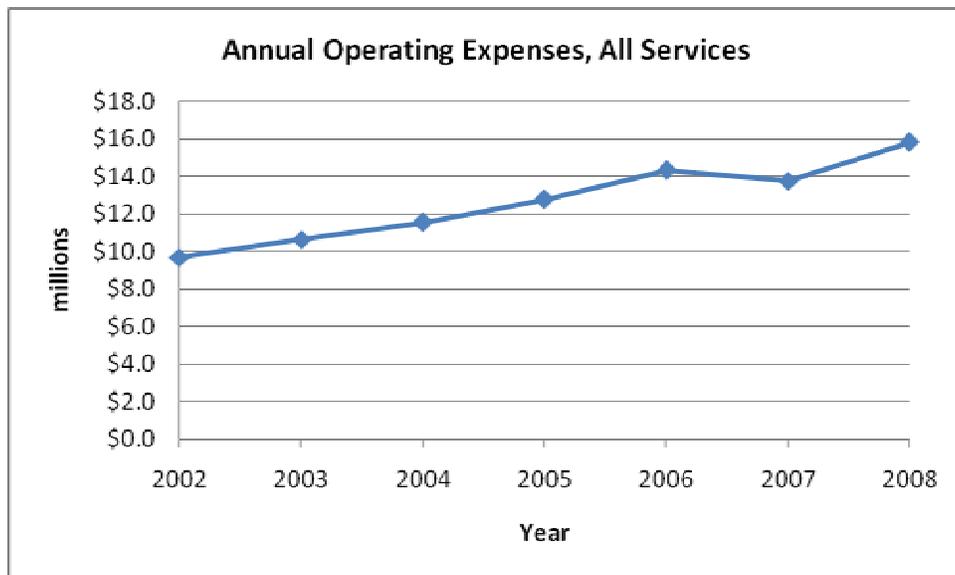
Existing conditions for the KAT system were examined using National Transit Database (NTD) data for the most recently-completed seven years (2002-2008). This data indicates a system that has expanded in recent years, with an increasing operating budget, a growing number of services provided, and ridership gains. The KAT system underwent a number of changes during the 2002-2008 time period, including implementing the “T” service on the University of Tennessee campus in 2003, changes to the fare structure in 2006, the conversion of the demand responsive Call-A-KAT to fixed-route service in 2007, and the loss of CMAQ operating funds in 2008. Externally, the 2002-2008 time period was marked by steadily rising fuel costs, culminating in record high diesel fuel prices in 2008, as well as the rising cost of providing fringe benefits to employees.

As Table S-1 and Figure S-1 indicate, annual operating expenses increased from \$9.7 million in 2002 to \$15.8 million in 2008, an increase of more than 60 percent over the time period. Table S-1 shows that the rate at which operating expenses are increasing continues to grow. The sharp rise in 2008 operating expenses can be at least partially attributed to the spike in diesel fuel costs in the summer of 2008, but other factors have also contributed to the continued rise in costs. Transit agencies across the country have seen operating expenses increase as a result of the rising cost of labor and fringe benefits, including health care, and the increase in demand for paratransit services. Implementation and expansion of service to the University of Tennessee during the 2002-2008 time period also contributed to the increase in KAT’s operating expenses.

Table S-1
Annual Operating Expenses, All Services

Year	Amount	Percent Change from Previous Year
2008	\$15.8	15.0%
2007	\$13.8	-3.9%
2006	\$14.3	12.0%
2005	\$12.8	10.8%
2004	\$11.5	8.5%
2003	\$10.6	9.9%
2002	\$9.7	

Figure S-1
Annual Operating Expenses, All Services



The fixed route system represents most of the overall budget (\$14.3 million in 2008). Nevertheless, KAT's paratransit costs are increasing and the service is much more costly to provide. The growth of paratransit-related expenses has been a problem in many transit agencies across the country, both large and small, and will be an important statistic to monitor going forward.

KAT Fare Policy Review and Future Options

The structure of KAT's fare policy is important for generating and maintaining ridership and the overall perception of the agency within the community. Obviously fares must be collected on routes as a way to partially offset the cost of the operations. If the fare is too low then it will not recoup an acceptable percentage of the operating costs. In 2008, KAT recovered only nine percent of its operating expenses from fare collection, a much lower rate than most transit agencies nationwide. However, if fares are set too high, it could dissuade riders from using the service by making other forms of travel more cost effective.

During the course of this study, KAT made several changes to its fare policy. Many of these changes were implemented upon recommendations that arose from this transit development plan, including changes in fare structure and farebox technology. Due to the immediate need to cover the cost of rising fuel prices, regular cash fares for local and express routes were increased in January 2009. The cost of all monthly and UT semester passes, discounted fares, and transfers were also raised at this time. In addition to changes in fare pricing, multi-trip and multi-day passes were added as new components to the fare structure. A new farebox technology was adopted to allow for the use of magnetic fare cards and possible integration with KAT's future AVL system.

Early ridership numbers for 2009 indicate that the new fare structure has had little impact on the ridership gains KAT has made in recent years. While ridership is down from 2008 levels, when rising fuel prices attracted new transit riders nationwide, ridership remains higher than in 2007. Moreover, farebox recovery – or the percent of operating expenses covered by fares – has improved with the new fare structure.

Route Analysis and Recommendations

The consultant team and staff conducted two planning workshops to review the route structure for KAT with the primary purpose to identify operational efficiencies while trying to provide the most effective service possible to KAT riders.

The analysis was based on the following:

- Results of a 100 percent boarding and alighting survey conducted on the system routes;
- Results of an on-board survey of riders;
- Input from drivers and staff (obtained by posting maps of individual routes in common areas for several days to allow for comment);
- Peer analysis with other communities; and,
- Information about running time, schedule adherence, and other factors developed during the study.

Following is a discussion of each of the tools used to develop the KAT recommendations.

Boarding/Alighting Survey

A 100 percent boarding and alighting survey of KAT routes was conducted in the fall of 2008. The survey was conducted by Data Smarts, a data collection firm specializing in surveys under subcontract to Corradino. Figures S-2 and S-3 present examples of the graphics prepared for each route.

Graphics for each route are presented in the appendix. Overall, like most transit system, the analysis shows distinct travel patterns based on generators. KAT does have a number of routes with large segments that have very little ridership. In addition, Route 90, while the most used route in the system, represents a disproportionate percentage of KAT's operating budget.

Figure S-2
Sample Boardings Graphic

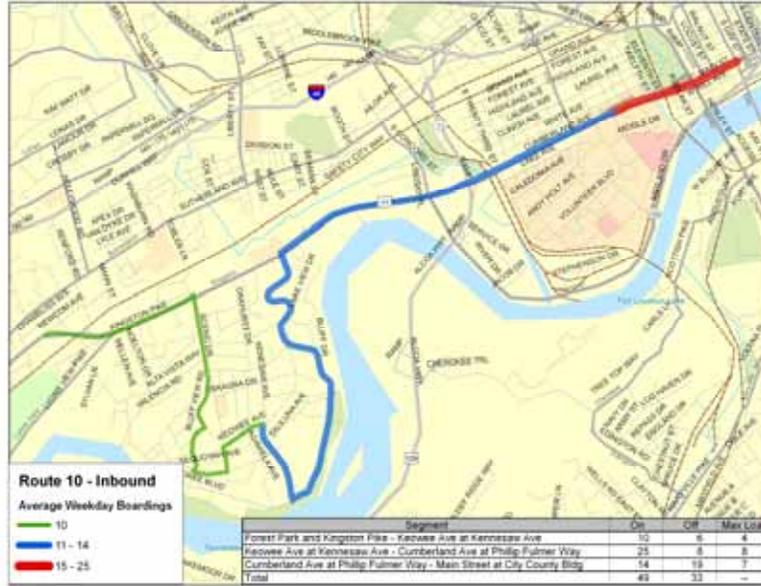
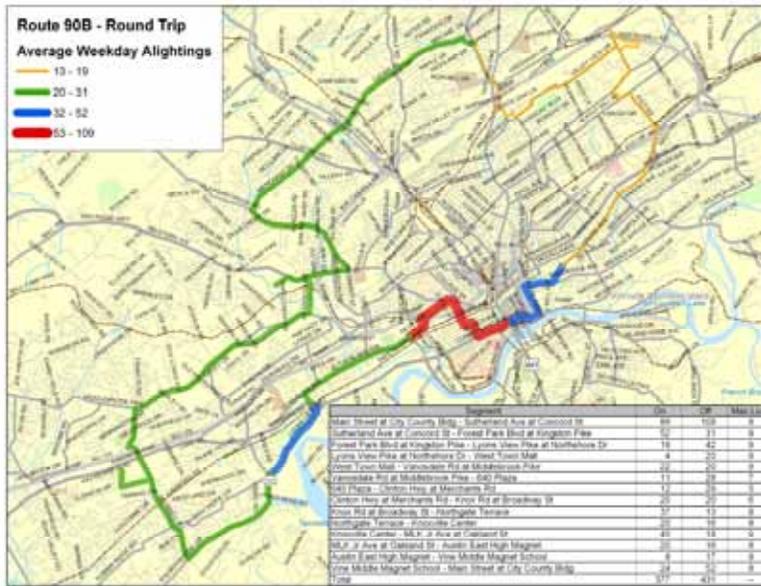


Figure S-3
Sample Alightings Graphic



On-board Survey

In September 2008, the consultant team conducted an on-board survey of KAT riders. The survey was conducted by intercepting and interviewing bus passengers on their trips. Four-hundred and seventy one surveys were collected for the fixed route survey representing most routes in the KAT system. Most trips (about 70 percent for both questions about where are you “going to” or “coming from”) were associated with home or work. Shopping and school together were the second largest response. About 35 percent of the respondents reported boarding the bus at the downtown transfer point. An additional 26 percent indicated they would get off the bus at the transfer point. Based on that information, over 60 percent of all KAT riders use the downtown transfer point. Approximately 46 percent of the riders indicated that they had gotten on the bus after transferring from another KAT bus.

Of those responding to the question about how they got on the bus 66 percent reported walking with the only other mode (besides transferring from another bus) of significance was driving a car, which likely indicates the increase in use of express bus and park-and-ride options. Over seventy percent of the riders use the bus several times a week with over fifty percent using it daily. Thirty percent reported using cash to pay their fare while about 40 percent used a monthly pass. Fifty-five percent of the respondents reported that they were licensed drivers and able to drive while 44 percent said they could not drive. Over fifty percent of the respondents did not have access to vehicles in their household while less than 25 percent of households reported having access to two or more vehicles. In terms of evaluation of KAT services, about 57 percent rated the system as “good” while 23 percent rated it as “excellent.” Two percent of the respondents rated the system as “poor.”

Seventy percent of respondents felt that KAT buses usually ran “on time” with twenty percent saying they always ran on time. This response is unusual when viewed at in light of the schedule adherence data developed in the boarding and alighting survey, which showed that the majority of buses were not operating on time. This survey was conducted in September 2008 when the fuel markets were in upheaval and the effects of the global recession were beginning to appear. In response to a question whether raising a fare to \$1.50 would affect their use of KAT, most riders (81%) said no.

Input From Drivers and Staff

Input from drivers and staff was gathered through a variety of means. Corradino presented the TDP plan and process during meetings that included drivers, maintenance employees, and others involved in KAT operations. One of the unique things done as part of this plan was an idea of KAT staff. Corradino developed large posters of each route which were then placed on boards located in common areas. Drivers and staff could take pen and marker and mark up the various maps. These proved very valuable during the route analysis process.

Peer Analysis

The consultant conducted a number of peer analyses for KAT through the TDP process. The most telling is passengers per hour. As shown in Table S-2, KAT does not appear to carry as many riders per hour as its peers.

Table S-2
Peer Analysis – Passengers Per Hour

Unlinked Passenger Trips per Revenue Hour	
Nashville MTA	28.47
TARC (Louisville)	24.67
IndyGo	20.80
Greenlink (Greenville, SC)	19.49
CARTA (Chattanooga)	16.14
KAT	14.98

The passengers per hour number shown for KAT includes UT ridership. Excluding UT ridership, KAT totals are even lower with the system averaging about 12 passengers per hour. The reasons for KAT’s lower productivity in terms of passenger per hour are unclear. The system has levels of service comparable to other systems in terms of frequency (headways), coverage, hours of service, and demographics.

Route Planning Workshops

Using the various data described above the consultant engaged a project steering committee in workshops to review the KAT operations. The objective of the work was to:

- Identify modifications to reduce inefficient and redundant service;
- Identify improvements that would support better schedule adherence throughout the system, including building time into the schedules for transfers; and,
- Minimize looping and other inefficient routing.

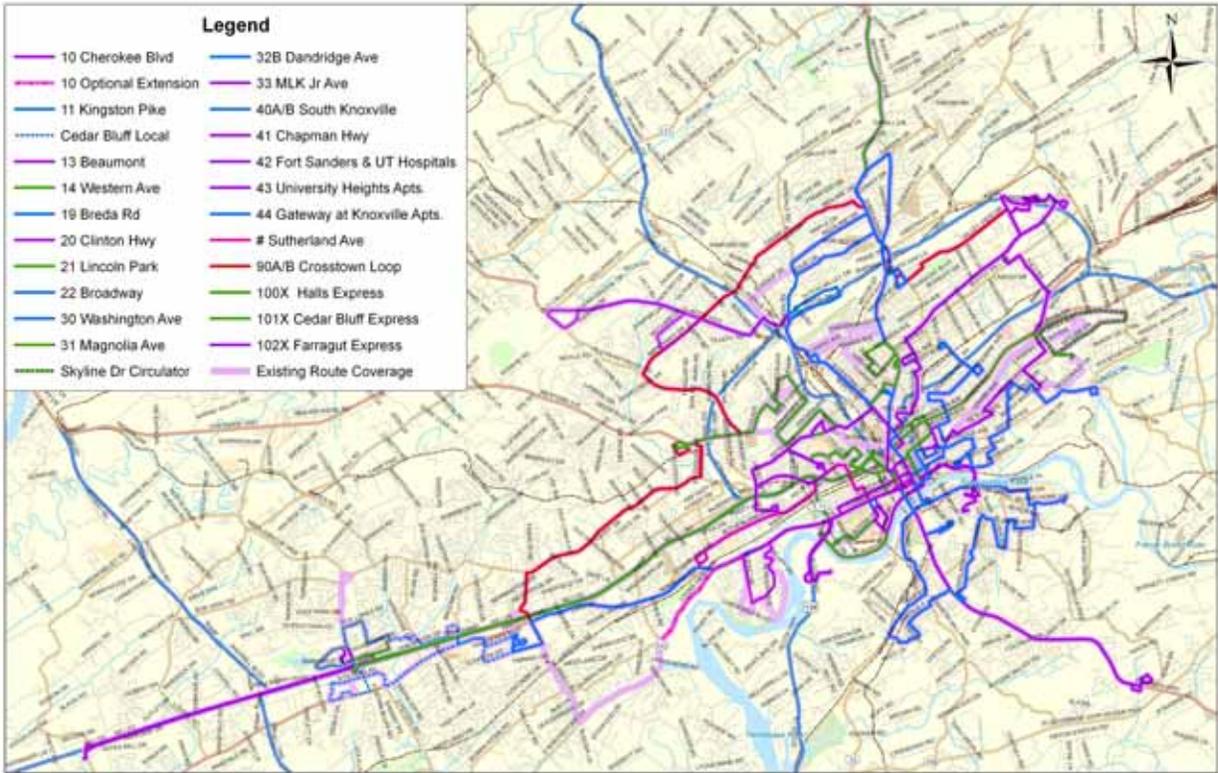
As a result of the workshops and subsequent refinements, the following routing changes are recommended as shown in Table S-3.

**Table S-3
Route Change Recommendations**

Route	Changes	Issues	Ridership Impacts	Cost Impacts	Schedule Adherence
10	<ul style="list-style-type: none"> ■ Terminates at Kingston-Scenic ■ Restructuring of route in Sequoyah Hills ■ Optional extension to Lakeshore Mental Health Hospital 	<ul style="list-style-type: none"> ■ Low ridership ■ Schedule adherence issues with interline with Route 21 ■ Realigned portion in Sequoyah Hills ■ Extension to Lakeshore Mental Health Hospital to cover eliminated portion of Route 90 	Low	Could increase costs	Improvement
11	<ul style="list-style-type: none"> ■ Consider using circulator (small bus) past West Towne Mall; create super stop on Kingston Pike at the end of the route. 	<ul style="list-style-type: none"> ■ Schedule adherence on the Kingston Pike route is a continuing problem 	Increase	Neutral	Improvement
12	<ul style="list-style-type: none"> ■ Combined with Route 14, named Route 14 	<ul style="list-style-type: none"> ■ Three routes in area (12, 13, 14) have similar alignments, mid-range ridership ■ Simplifies routes, saves one vehicle during weekday operation 	Possible	Savings	Improvement
14	<ul style="list-style-type: none"> ■ Combined with Route 12, named Route 14 				
15	<ul style="list-style-type: none"> ■ Proposed for elimination as part of KAT's Saturday service proposals 	<ul style="list-style-type: none"> ■ Low ridership 			
19	<ul style="list-style-type: none"> ■ Route 20B becomes Route 19 		Possible	Savings	NA
20A/C	<ul style="list-style-type: none"> ■ Combined 20A and 20C, all trips make 20C route pattern; renamed Route 20. 	<ul style="list-style-type: none"> ■ Simplify routes, eliminate confusion 	Increase	Increase	Improvement
21	<ul style="list-style-type: none"> ■ Terminate at Broadway at Oglewood 	<ul style="list-style-type: none"> ■ Low ridership on northern portion of route; schedule adherence issue 	Possible	Savings	Improvement
22	<ul style="list-style-type: none"> ■ Add additional vehicle to route operation 	<ul style="list-style-type: none"> ■ Schedule adherence issue; indirect route alignment on north end of route 	Increase	Increase	Improvement
30	<ul style="list-style-type: none"> ■ No alignment change recommended; may consider elimination of interline with Route 42. 	<ul style="list-style-type: none"> ■ Use interline with route 42 to improve on-time performance of another route. 	NA	NA	Improvement
31	<ul style="list-style-type: none"> ■ Consider using circulator (small bus) on Skyline Drive; create super stop on Magnolia at the end of the route. 	<ul style="list-style-type: none"> ■ Would provide more neighborhood friendly service on Skyline Drive. ■ Would reinforce Magnolia trunk line as a primary route. 	Increase	Increase	Improvement
32	<ul style="list-style-type: none"> ■ Eliminate 32A; expand 32B (rename 32). 	<ul style="list-style-type: none"> ■ Route Simplification; eliminate redundant service 	Possible	Savings	NA
33	<ul style="list-style-type: none"> ■ Eliminate portion of alignment east of Kirkwood; extend to Knoxville Center on existing 90A/B alignment 	<ul style="list-style-type: none"> ■ Replace 90A/B in this area 	Possible	Increase	Improvement
90A/B	<ul style="list-style-type: none"> ■ Eliminate southern segments of 90A/B between Knoxville Center and Westown Mall 	<ul style="list-style-type: none"> ■ Route consumes too high a proportion of system resources (15% of total budget); lower ridership in this segment; duplication of service. 	Possible	Savings	Improvement

With the proposed recommendations, the revised system is shown in Figure S-4.

Figure S-4
Revised KAT System Map



The overall impact of the proposed recommendations is a revenue neutral plan (i.e., operating costs will remain about the same) and a more efficient, customer friendly system. Any savings that may result from this plan should be used to address on-time performance issues. This amount could be absorbed into operations through service frequency improvements on the systems best performing routes (as recommended in the 2010 Action Plan produced in 2002) or to cover additional unforeseen operating expenses that occur with the transition to Knoxville Station in August 2010.

The following summarizes the impacts of the service recommendations, in terms of service hours and operating costs, and presents the steps required to implement the service recommendations concurrent with the move to Knoxville Station.

Service Recommendations

The estimated changes in annual revenue hours associated with the TDP recommendations and the resulting operating and maintenance (O&M) cost estimates by route are presented in Table 6-1. No capital cost estimates for vehicles are included, as the proposed service modifications result in a

net decrease to the peak requirement. Seven less regular and neighborhood service buses would be required in peak service. There would be no increase in the maximum number of trolley buses required.

The projected O&M costs per revenue hour have been developed using KAT's FY 2008 National Transit Database (NTD) report and FY 2009 operator wage rates for each fixed route service classification. Given the nation's current economic downturn, these FY 2008 and FY 2009 costs are assumed to remain constant prior to the opening of Knoxville Station (i.e., no inflation has been assumed).

KAT has four classifications of wage rates for bus operators with adjustments in pay scale for four different route classifications. Total costs per revenue hour (\$66.02), were adjusted to account for the variations in the wage rates. The resulting rounded costs per revenue hour by route classification are as follows:

- Regular Service Routes: \$72.40
- Trolley Service Routes: \$52.75
- T Operator: \$49.75
- Neighborhood Service Operator: \$48.60

Table S-4 presents the annual estimated revenue hours and estimated O&M costs by route for the proposed TDP route modifications and proposed changes to the downtown trolley system.

Table S-4
Service Hour and Operating Cost Impacts of Route Recommendations

Current				Future				Change		Comments
Route	Annual Service Hours	Annual Direct O&M Cost	Route	Annual Service Hours	Annual Direct O&M Cost	Annual Service Hours	Annual Direct O&M Cost			
10	Cherokee	3,410	\$165,705	10	Cherokee	3,078	\$149,567	(332)	(\$16,138)	Route 10 is shortened.
11	Kingston Pk.	17,531	\$1,339,342	11	Kingston Pk.	11,991	\$916,112	45	(\$151,799)	Route 11 is shortened to terminate at West Town Mall. The western sections of the route eliminated will be served by the Cedar Bluff Local.
					Cedar Bluff Local	5,585	\$271,431			
12	Western Ave	7,480	\$571,487	12	Combine with 14	-	\$0	(7,480)	(\$571,487)	Route 12 is replaced by Route 14, operating on the existing 12 C alignment.
13	Beaumont	3,641	\$278,203	13	Beaumont	3,641	\$278,203	-	\$0	
14	College St.	4,654	\$355,599	14	College St.	7,125	\$544,350	2,471	\$188,751	Existing 12C becomes Route 14 and maintains the existing Route 12 weekday headways and Saturday headways.
15	West Town Direct	508	\$38,805	15	Eliminate	-	\$0	(508)	(\$38,805)	
20	Central Ave.	7,937	\$606,378	19	Breda Rd	5,020	\$383,528	5,033	\$384,530	Route 19 is the existing Route 20B with some modifications and the same headways.
				20	Clinton Hwy	7,950	\$607,380			Route 20 is the existing Routes 20A and 20C combined. Same headways.
21	Lincoln Pk.	3,696	\$179,626	21	Lincoln Pk.	3,333	\$161,984	(363)	(\$17,642)	Route is shortened.
22	Broadway	9,733	\$743,592	22	Broadway	9,733	\$743,592	-	\$0	Vehicle on-time performance improved.
23	Millertown Pk.	4,883	\$373,076	23	Millertown Pk.	4,883	\$373,076	-	\$0	
30	Washington Ave.	3,592	\$274,417	30	Washington Ave.	3,592	\$274,417	-	\$0	
31	Magnolia	8,659	\$661,580	31	Magnolia	6,668	\$509,416	(1,992)	(\$152,163)	Assumed 23 percent of existing hours are devoted to what will be the Skyline Drive Circulator.
					Skyline Dr. Circulator	1,992	\$96,795	1,992	\$96,795	Skyline Dr Circulator will operate 23 percent of the previous Route 31 hours.

Table S-4 (continued)
Service Hour and Operating Cost Impacts of Route Recommendations

Current				Future				Change		Comments
Route	Annual Service Hours	Annual Direct O&M Cost	Route	Annual Service Hours	Annual Direct O&M Cost	Annual Service Hours	Annual Direct O&M Cost			
32	Dandridge	7,685	\$587,103	32	Dandridge	7,685	\$587,103	-	\$0	
33	MLK	5,749	\$439,199	33	MLK	10,682	\$816,105	4,933	\$376,906	Route nearly doubles in length to serve Knoxville Center and replace existing 90A/B service.
40	South Knox	7,061	\$539,485	40	South Knox	7,061	\$539,485	-	\$0	
41	Chapman Hwy.	6,963	\$531,969	41	Chapman Hwy.	6,963	\$531,969	-	\$0	
42	Ft. Sanders/ UT Hospital	7,350	\$561,540	42	Ft. Sanders/ UT Hospital	7,350	\$561,540	-	\$0	
43	University Heights Apts.	1,829	\$139,697	43	University Heights Apts.	1,829	\$139,697	-	\$0	
44	Gateway at Knox Apts.	1,749	\$133,624	44	Gateway at Knox Apts.	1,749	\$133,624	-	\$0	
50	UT Services	54,218	\$2,697,349	50	UT Services	54,218	\$2,697,349	-	\$0	
80	Blue Line Trolley	8,253	\$435,346	80	Blue Line Trolley	5,300	\$279,575	(2,953)	(\$155,771)	Blue Trolley is realigned, making a more efficient route.
82	Orange Line Trolley	11,962	\$631,019	82	Orange Line Trolley	13,600	\$717,400	1,638	\$86,381	Orange Trolley is realigned to allow passengers to get to other downtown locations without going to UT first.
84	Green Line Trolley	1,749	\$92,260	84	Green Line Trolley	-	\$0	(1,749)	(\$92,260)	Green Trolley is eliminated.
86	Late Line Trolley	1,383	\$72,964	86	Late Line Trolley	1,383	\$72,964	-	\$0	
				87	Red Line Trolley	5,300	\$279,575	5,300	\$279,575	Red Trolley is added.
90	Crosstown	17,358	\$1,326,133	90	Crosstown	10,752	\$821,453	(6,606)	(\$504,680)	Route 90 is shortened and converted to an east/west route that operates between Knoxville Center and West Town Mall without going downtown.
#	Sutherland Ave.	-	\$0	#	Sutherland Ave.	3,584	\$273,818	3,584	\$273,818	The Sutherland Ave. route replaces service eliminated on the south portion of Route 90A/B.
100	Halls Express	461	\$35,233	100	Halls Express	461	\$35,233	-	\$0	

Table S-4 (continued)
Service Hour and Operating Cost Impacts of Route Recommendations

Current				Future				Change		Comments
Route	Annual Service Hours	Annual Direct O&M Cost	Route	Annual Service Hours	Annual Direct O&M Cost	Annual Service Hours	Annual Direct O&M Cost			
101	Cedar Bluff Express	1,492	\$113,977	101	Cedar Bluff Express	1,492	\$113,977	-	\$0	
102	Farragut Express	1,948	\$148,824	102	Farragut Express	1,948	\$148,824	-	\$0	
	Total	212,934	\$14,073,530		Total	215,947	\$14,059,540	3,013	(\$13,990)	

Discontinued Routes			
87	Red Line Trolley	2,419	127,612.80
103	Oak Ridge Express	2,016	154,022.40
104	Dtwn/Oak Ridge Express	799	61,031.38
		218,168	14,416,196
vs. FY 2008 KAT Report			
		218,176	

TDP Next Steps

In August 2010, KAT is scheduled to open Knoxville Station, its new off-street transit center in downtown Knoxville. The move to the new station will involve the re-routing and scheduling of more than 20 routes. Concurrently, the TDP service recommendations, including regular service, neighborhood service, and trolley service routes, are also proposed for implementation. These combined activities will warrant a significant change in scheduling structure, likely resulting in new interlining strategies.

The move to Knoxville Station will be a complex and challenging process over the next 13 months. To ensure a successful move, a schedule of activities has been developed, as shown in Table S-5.

Table S-5
Timeline for Implementation of TDP Recommendations

2009	
July	<ul style="list-style-type: none"> ■ Run all routes from TDP recommendation for timing and mileage
August	<ul style="list-style-type: none"> ■ Design routes and schedules based upon KTA guidelines ■ KTA committee updates of progress
September	<ul style="list-style-type: none"> ■ Cost analysis of routes and revisions
October	
November	<ul style="list-style-type: none"> ■ Finalize route proposals ■ Run proposed routes to confirm viability
December	<ul style="list-style-type: none"> ■ Prepare information for public and board
2010	
January	<ul style="list-style-type: none"> ■ Schedule public meetings and outreach ■ Meet with all operators ■ Introduce routes to board
February	<ul style="list-style-type: none"> ■ Public meetings ■ Schedule board workshop, if necessary
March	<ul style="list-style-type: none"> ■ KTA public hearing
April	<ul style="list-style-type: none"> ■ Final public meeting ■ KTA vote
May	<ul style="list-style-type: none"> ■ Schedule revisions
June	<ul style="list-style-type: none"> ■ Run cut
July	<ul style="list-style-type: none"> ■ Run cut ■ Operator pick
August	<ul style="list-style-type: none"> ■ Begin operations from Knoxville Station August 16, 2010

The schedule begins with a route-by-route analysis requiring the following steps:

1. Run all routes per the TDP recommendations in the appropriate vehicle (some with both bus and van to determine an average percent difference in run time) during peak congestion to determine run time and mileage, taking into consideration stop time, estimated number of stops, etc.
2. Using the running time analysis, develop interlining strategies for weekday (including evening), Saturday and Sunday service schedules that allow for prescribed layover and recovery times. Route streamlining will also be considered as an alternative to achieve desired running times where feasible.
3. Assess cost impacts of the proposed routes and revisions.
4. Finalize proposals, including interlines, based on KAT's fiscal constraints, and run all routes to confirm viability.
5. Compile route information for presentation to the KTA Board and public and make final changes to the plan.

The remaining activities are standard processes that are engaged in a typical service change. It will be critical that KAT adhere to the recommended timeline to ensure the successful opening of Knoxville Station, as well as the multiple service changes that are scheduled to occur concurrently.

Beyond Knoxville Station

Following the opening of Knoxville Station, route adjustments should be held to a minimum for at least one year, to allow sufficient time for passengers to adjust to the changes and for ridership levels and patterns to mature. Regular service monitoring will be particularly important during this time period.

Future service changes will be largely dictated by passenger needs and revenue projections, including farebox revenues and federal, state, and local funding levels. Rather than route alignment adjustments, priorities for future service changes may include frequency improvements from hourly to half-hourly service on select routes, span of service expansion, and expansion of weekend service. As part of the TDP final report, a set of performance guidelines to be used by staff for making minor changes is presented.

Additionally, two separate reports were prepared as part of the TDP effort and are summarized in the full TDP report. These are a Downtown Operations Plan, which focuses on KAT's bus and trolley routing in the downtown and report prepared for the Metropolitan Planning Commission that examined from a planning perspective future possible high capacity corridors in the Knoxville area.

Table of Contents

- 1. Introduction 1
- 2. Existing Conditions 3
 - KAT History 3
 - KAT Operations 4
- 3. Fare Analysis 13
 - KAT Fare Policy Review and Future Options 13
 - KAT's Existing Fare Policy 13
 - Peer Fare Policy Review 16
 - Fare Economics 16
 - Suggestions for Fare Structure and Policy 17
- 4. Technology Assessment 23
 - Overview 23
 - Recommended ITS Applications/Technologies for KAT 27
 - Human Resources 28
- 5. Route Analysis and Recommendations 31
 - Boarding/Alighting Survey 31
 - On-board Survey 33
 - Input From Drivers and Staff 33
 - Peer Analysis 34
 - Schedule Adherence Data 34
 - Route Planning Workshops 35
 - Knoxville Area Transit Revised System Map 47
- 6. Implementation Plan 49
 - Service Recommendations 49
 - TDP Next Steps 53
 - Beyond Knoxville Station 54

Table of Contents (continued)

7. Service Guidelines	55
Proposed Service Guidelines	55
8. Marketing Plan	57
9. Downtown Transit Plan	59
Trolley Recommendations	59
Downtown Fixed-Route Operational Recommendations	64
10. Corridor Analysis	67
Appendix A – Fall 2008 Boarding and Alighting Survey	
Appendix B – On-board Survey, October 2008	

I:\Projects\3880\wp\Reports\Final Report\text.doc

List of Figures

Figure 2-1	Annual Operating Expenses, All Services	5
Figure 2-2	Annual Operating Expenses, Demand Responsive Service	7
Figure 2-3	Annual Passenger Miles, All Services	8
Figure 4-1	Transit ITS Matrix	24
Figure 5-1	Sample Boardings Graphic	32
Figure 5-2	Sample Alightings Graphic	32
Figure 5-3	Existing KAT Service Map	37
Figure 5-4	Route 10 (Cherokee Boulevard)	38
Figure 5-5	Route 11 (Kingston Pike)	39
Figure 5-6	Routes 12 (Western Ave), 13 (Beaumont), 14 (College St.)	40
Figure 5-7	Routes 19 (Breda Road) and 20 (Central Avenue)	41
Figure 5-8	Route 21 (Lincoln Park)	42
Figure 5-9	Route 31 (Magnolia Avenue)	43
Figure 5-10	Route 33 (Martin Luther King Jr. Avenue)	44
Figure 5-11	Route 50 (Sutherland – New Route)	45
Figure 5-12	Route 90 (Crosstown)	46
Figure 5-13	Revised KAT System Map	47
Figure 8-1	The New KAT	57
Figure 8-2	KAT Bus – A New Look and a New Slogan	57
Figure 9-1	Proposed Weekday Trolley Routes	62
Figure 9-2	Proposed Night Trolley Routes	63
Figure 9-3	Proposed Local Route Bus Patterns, Weekday Service	66
Figure 10-1	Corridors with Greatest Potential for High Capacity Transit	68
Figure 10-2	Evaluation Rating Structure	74

List of Tables

Table 2-1	Annual Operating Expenses, All Services	4
Table 2-2	Farebox Recovery Ratio, All Services	5
Table 2-3	Annual Operating Expenses, Fixed-Route Service	6
Table 2-4	Annual Operating Expenses, Demand Responsive Service	6
Table 2-5	Annual Operating Expenses for Demand Responsive Service as Percentage of Total Operating Expenses	7
Table 2-6	Annual Passenger Miles, All Services	8
Table 2-7	Annual Passenger Miles, Demand Responsive Service	9
Table 2-8	Operating Expense per Unlinked Trip, All Services	9
Table 2-9	Operating Expense per Unlinked Trip, Demand Responsive Service	10
Table 2-10	Operating Expense per Vehicle Revenue Hour, Fixed-Route Service	10
Table 2-11	Operating Expense per Vehicle Revenue Mile, Fixed-Route Service	10
Table 2-12	Operating Expense per Vehicle Revenue Hour, Demand Responsive Service	11
Table 2-13	Operating Expense per Vehicle Revenue Mile, Demand Responsive Service	11
Table 3-1	Fare Policy Review for KAT and Peer Agencies	15
Table 4-1	Typical ITS Technologies Related to Transit	25
Table 4-2	KAT Overview within Context of ITS Assessment	26
Table 4-3	Other Agencies with ITS Involvement	27
Table 5-1	Peer Analysis – Passengers Per Hour	34
Table 5-2	Schedule Adherence Summaries	35
Table 5-3	Route Change Recommendations	36
Table 6-1	Service Hour and Operating Cost Impacts of Route Recommendations	50
Table 6-2	Timeline for Implementation of TDP Recommendations	53
Table 10-1	Quantitative Evaluation Table	70
Table 10-2	Qualitative Evaluation Matrix	71
Table 10-3	Technical Prerequisites	73