Benchmarking for North Carolina Public Transportation Systems

Final Report

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16. Abstract

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Performance measurement is a precursor to benchmarking, and involves objective measurements of an organization's activities for comparison and improvement. Performance measures are of most value when they can be compared to something else. Benchmarking is a process of identifying standards against which appropriate comparisons can be made.

This research study built upon the findings from the recent NCDOT research study performed by ITRE, "*Use of Performance Standards and Measures for Public Transportation Systems*" (1). That study looked at the development of performance measures for North Carolina transit systems and their possible use in allocating transit funding. This study built upon those performance measures in order to incorporate effective standards or benchmarks.

The project was aimed at providing three primary products:

- A set of selected benchmarks for public transit systems, particularly efficiency and effectiveness benchmarks that are commonly used by other transit systems and funding agencies, and including benchmarks that specifically relate to important customer satisfaction factors identified as part of the study.
- A recommended benchmarking process and Guidebook that can be used by public transit systems in North Carolina to measure their performance and to then institute steps to improve any areas of low performance.
- A set of minimum statewide standards that would be used by NCDOT/PTD to provide incentives and disincentives that would encourage public transit systems to steadily improve performance.

In addition, an Internet listserv was created that will provide an effective communications method for sharing and disseminating information on, and questions about, benchmarking activities and best practices.

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EXECUTIVE SUMMARY

The North Carolina Department of Transportation, Public Transportation Division (NCDOT/PTD) requested recommendations for a benchmarking process for public transportation systems. This request was driven by the need to ensure that transit systems meet the needs of their communities, that they do so efficiently and effectively, and that they offer a variety and quality of services that meet the public demand. In addition, the request reflects NCDOT/PTD's overall desire to provide good stewardship of local, state and federal public funding dollars.

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The report includes highlights from selected literature on the subject of benchmarking, both general and transit-specific. It covers the various practices and processes used to perform benchmarking (including the use of peer groups for comparison purposes), discusses customer satisfaction as an important ingredient of performance measurement and benchmarking, and describes some other measures or benchmarks to consider.

An important concept related to measuring customer satisfaction is that of "importance" vs. "performance." For example, a customer may perceive performance to be very high on a particular factor. However, that factor may not be very important to the customer's overall satisfaction level. The key is to measure not just the transit system' performance on particular factors, but also the importance of those factors, and then to focus improvement efforts on areas where importance is high and system performance is low.

A number of key public transportation stakeholders were interviewed as part of the study in order to gain their perspective on such issues as the goals of benchmarking, the factors that should be benchmarked, the process of benchmarking vs. the imposition of minimum standards, making peer group comparisons, reconciling benchmarking practices with local goals, and using incentives and disincentives to encourage better performance. In

addition, a number of existing customer satisfaction surveys performed by transit agencies were reviewed in order to obtain information about the factors that customers consider to be important in terms of their satisfaction with transit service.

The report concludes with a number of recommendations regarding a three-part benchmarking process proposed for North Carolina transit systems, to include:

- Trend analysis—to be conducted at least annually by each transit system. This will provide a means to assess each transit system's performance, and by tracking various performance measures over time, to determine areas in which performance needs to be improved.
- Peer group analysis—to be conducted at least annually by each transit system and by the PTD. The PTD would be responsible for determining peer groups among North Carolina systems, both by type of transportation system/service operated and annual OPSTATS data. Transit systems would be responsible for determining their appropriate peers at the national level, and assessing their performance against the average of the peer group for various performance measures.
- Statewide minimum standards—transit system performance on a limited set of measures would be evaluated annually by the PTD. Poorly performing transit systems would be provided help to improving their performance, while exemplary performing systems would be recognized for their accomplishments.

A number of more specific recommendations in these three processes address specific benchmark measures to use, and methods to improve low performance. All these recommendations are summarized below.

- Benchmarking is best viewed as part of a larger organizational process that includes planning and goal-setting, performance measurement, and performance improvement.
- Transit agencies should use both trend analysis and peer comparisons as part of an internal benchmarking process:
    - Trend analysis: comparing current performance with previous performance—last month, last quarter, last year, etc.
    - Peer comparisons: comparing agency performance with the performance of a selected group of peers, either within North Carolina or nationally. The recommendations include suggested peer groups for this purpose.
- If performance is found to be less than desired, two methods are described for improving it:
    - Quality improvement processes such as Total Quality Management (TQM).
    - "Best practices" methodology.
- Specific benchmarks are proposed for use by transit agencies. These fall into four main categories:
    - Quantity and quality of service.
    - Efficiency and effectiveness of service.
    - Vehicle and employee utilization.
    - Customer satisfaction.

- Minimum state standards are recommended for use by NCDOT/PTD. These primarily involve efficiency and effectiveness measures. They would be set annually by NCDOT/PTD and would involve both incentives for high performance and disincentives for poor performance. Systems performing at a low level would be given time and help to improve before penalties would be imposed.
- A process is recommended that NCDOT/PTD can use to help transit systems meet the minimum standards. Various incentives and disincentives are proposed that would motivate transit systems toward this end.

Complementing this report is a Benchmarking Guidebook that was developed to provide public transportation managers in North Carolina with step-by-step guidance for conducting benchmarking processes within their organizations.

In the end, it is important to recognize that benchmarking is part science, part art. It is one of many tools that can be used to help organizations achieve better performance. However, its use requires good judgment and analysis. For example, apparent sub-par performance may only be the result of poor data, or differences in how performance measures are defined or reported. In addition, poor performance may be caused not by poor management, but instead by external factors over which management has little or no control. Used wisely, benchmarking can be a valuable tool. Used rigidly, or without good analysis, it can be misleading and counterproductive.

TABLE OF CONTENTS

I. INTRODUCTION **1**

II. LITERATURE REVIEW **3**

BENCHMARKING PRACTICES AND PROCESSES 3
CUSTOMER SATISFACTION AND BENCHMARKING 8
OTHER IMPORTANT MEASURES/BENCHMARKS 14

III. SUMMARY OF STAKEHOLDER INTERVIEWS **17**

GOALS OF A BENCHMARKING PROCESS 17
TRANSIT SYSTEM EXPERIENCE WITH BENCHMARKING 17
WHAT TO BENCHMARK 18
BENCHMARKING PROCESS VS. MINIMUM STATE STANDARDS 18
PEER GROUP FORMATION 18
RECONCILING BENCHMARKING AND LOCAL GOALS 19
INCENTIVES/DISINCENTIVES 19
OTHER IMPORTANT COMMENTS 20

IV. SUMMARY OF NC CUSTOMER SATISFACTION SURVEYS **21**

METHODOLOGY 21
FINDINGS 21
CONCLUSIONS 23

V. BENCHMARKING AS PART OF AN ORGANIZATIONAL IMPROVEMENT PROCESS **25**

INTRODUCTION 25
HOW BENCHMARKING FITS WITHIN THE OVERALL ORGANIZATIONAL IMPROVEMENT PROCESS 25
INTERNAL VS. EXTERNAL EVALUATION PROCESSES 26
INTERNAL COMPARISONS—TREND ANALYSIS 26
EXTERNAL COMPARISONS—PEER GROUP ANALYSIS 27
IMPROVING PERFORMANCE 29
Quality Improvement Processes *29*
Best Practices Methodology *30*

VI. BENCHMARKING FOR NORTH CAROLINA TRANSIT SYSTEMS **31**

SELECTING PERFORMANCE MEASURES 32
CUSTOMER SATISFACTION 32
TREND ANALYSIS AND PEER GROUP ANALYSIS 32
Recommended Benchmark Measures for Trend Analysis and Peer Group Analysis *33*
Forming Peer Groups *36*
Shifts among Peer Groups *37*
Networking with Peers and Others *37*
Suggested In-State Urban and Rural Peer Groups *38*
Forming National Peer Groups *47*
REPORTING ON BENCHMARKING TO THE NCDOT/PUBLIC TRANSPORTATION DIVISION 52

VII. MINIMUM STATE STANDARDS **53**

A NORTH CAROLINA-BASED APPROACH 53
A NATIONALLY-BASED APPROACH 55
THE RECOMMENDED APPROACH 55

REFERENCES **63**

APPENDICES **65**

APPENDIX 1: CUSTOMER SATISFACTION "QUADRANT ANALYSIS" 67

APPENDIX 2: LIST OF STAKEHOLDERS INTERVIEWED 69
APPENDIX 3: "CLEANSING" COST DATA OF PRICE INFLATION 71
APPENDIX 4: CUSTOMER SURVEY SAMPLING 73
APPENDIX 5: SELECTED STATISTICS FOR NORTH CAROLINA COMMUNITY TRANSPORTATION SYSTEM PEER GROUPS 75
APPENDIX 6: USING THE FLORIDA TRANSIT INFORMATION SYSTEM AND NATIONAL TRANSIT DATABASE 77
APPENDIX 7: CHARLOTTE PEER GROUP PROPOSAL 83
APPENDIX 8: COMPARISON OF NC URBAN SYSTEMS WITH THEIR NATIONAL PEERS 89
APPENDIX 9: SELECTING NATIONAL PEERS FOR RURAL AND SMALL URBAN TRANSIT SYSTEMS 95
APPENDIX 10: PERFORMANCE MEASURE INFORMATION FOR NORTH CAROLINA RURAL SYSTEMS..... 111

I. Introduction

The North Carolina Department of Transportation, Public Transportation Division (NCDOT/PTD) requested recommendations for a benchmarking process for public transportation systems. This request was driven by the need to ensure that transit systems meet the needs of their communities, that they do so efficiently and effectively, and that they offer a variety and quality of services that meet the public demand. In addition, the request reflects the NCDOT's overall desire to provide good stewardship of local, state and federal public funding dollars.

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In addition, an Internet listserv was created to provide an effective communications method for sharing and disseminating information on, and questions about, benchmarking activities and best practices.

II. Literature Review

This section includes highlights from selected literature on the subject of benchmarking, both general and transit-specific. It covers the various practices and processes used to perform benchmarking (including the use of peer groups for comparison purposes), discusses customer satisfaction as an important ingredient of performance measurement and benchmarking, and describes some other measures or benchmarks to consider.

Benchmarking Practices and Processes

There are many possible approaches to establishing benchmarks or performance standards. One comprehensive report done by the Transportation Research Board (TRB) on transit performance measurement offers several different methods (2, pp. 141-146):

- *Comparison to a Baseline*. The value for each measure is compared to the average value for the measure in the first year that the performance measurement system was initiated. Measures that fall below the baseline are targeted for improvement.
- *Trend Analysis*. This method simply compares the value of a measure in the current period with its value in prior periods (e.g. last month, last year, or the last several years).
- *Self-Identified Standards*. Management or the board may simply set a target or standard based on their judgment or what it is they want to achieve.
- *Comparison to Typical Industry Standards*. These may be determined by a survey of other agencies, or perhaps found in the literature.
- *Comparison to Peer Systems*. This involves the identification of relatively similar peer agencies and then comparing performance to the average performance of the peers.

The TRB report recommends using a combination of the above methods, each of which has pros and cons. It also suggests that different standards should be considered for different kinds of transit service and for different times of the day. For example, a commuter express bus service shouldn't be compared to a local bus route, and performance on weekdays shouldn't be compared to performance on weekends.

The federal National Performance Review published a benchmarking study in 1997 with the goal of making all publicly-funded programs accountable through a performance-based system. This study is meant to be a guide for service providers as they incorporate performance measurement systems into their organizations (3). Several criteria are cited as necessary for developing a good measurement system. A good measure should:

- Be accepted by and meaningful to the customer
- Tell how well goals and objectives are being met
- Be simple, logical, and repeatable
- Show a trend
- Be defined unambiguously

- Be compatible with economical data collection
- Be measured in a timely manner
- Be sensitive to customer concerns

In addition to these characteristics, a good measure should be thoroughly defined. This definition should consist of five aspects for each measure:

1. Specific goal or objective to be obtained by using the measure
2. Data requirements, including metrics, frequency of measure, and data source
3. Calculation methodology
4. Inclusion in organizational reports (with graphic presentation)
5. Relevant rationale for the measure

A more recent and very interesting study was *Benchmark Rankings for Transit Systems in the United States* (4). This study points out that benchmarks can be useful both for comparisons with other agencies and also for measuring progress over time. The study looked only at urban systems using data from the National Transit Database (NTD). According to the study, a key ingredient of benchmarking, and one of the most challenging, is the selection of appropriate peer groups for comparison purposes. The study used the following methodology to accomplish this:

- National transit systems were placed into five geographic groups: Southeast, Southwest, Midwest, Northeast and Northwest. Peer groups within each region were then selected by developing a simple scoring system based on five variables:
    - Service area population
    - Service area population density
    - Total operating expense
    - Vehicles operated in maximum service
    - Total annual vehicle miles
- A mean and standard deviation[1] for each variable were calculated for each system and each system then received a composite score. Peer groups were then formed based mainly on whether a system was greater than one standard deviation above the mean, above the mean but within one standard deviation, or below the mean.
- This resulted in 3-6 peer groups within each of the five regions. In a few cases, it became obvious that a system was placed in one group due to an unusually high score on one of the measures used in the scoring process. These agencies were then re-categorized into a more appropriate group. In addition, because very large systems in some of the regions (e.g. Chicago and New York City) did not have a

[1] In regard to a set of data, the standard deviation is a statistic that tells you how tightly all the various data points are clustered around the average or mean. It assumes that the data set is distributed in roughly the shape of a bell-shaped curve. When the data are bunched together fairly tightly and the bell-shaped curve is steep, the standard deviation is small. When the data points are spread apart and the bell curve is relatively flat, it indicates that you have a relatively large standard deviation. In general, about 68 percent of the data points will be found within one standard deviation above or below the mean, about 95 percent within two standard deviations, and 99 percent within three.

comparable system in their regions, three large-system groups were formed for them.

- In order to compare the systems within each peer group, six major performance categories were used, each comprised of several specific performance measures:
    - Service Supply/Availability (e.g. revenue miles and hours, total operating expense and revenue miles per route mile)
    - Service Consumption (e.g. passenger trips, passenger trips per capita, passenger trips per revenue mile, and passenger miles)
    - Service Quality (e.g. average speed, number of revenue miles between vehicle failures, and average interval between vehicles)
    - Cost Efficiency (e.g. operating expense per capita or per revenue hour, and administrative expense per operating expense)
    - Operating Ratios (e.g. farebox recovery, and local contribution per operating expense)
    - Vehicle Utilization (e.g. peak vehicles, vehicle miles per peak vehicle, and spare vehicle ratio)
- The mean and standard deviation were calculated for each performance measure, and a composite score was developed for each system that was used to rank each system within its peer group. In addition, a composite score was developed for each of the six major categories described above so that transit systems could be compared on the basis of any of the categories. These comparisons were used in analyzing or explaining a system's overall score that was particularly high or low.

The Advisory Committee used in this study believed that both peer comparisons and trend analysis have value. There were mixed opinions about the number of variables that ought to be used for benchmarking. Some believed that a large number should be used while others believed that the number should be relatively small—no more than 6-10. Committee members cautioned that any type of benchmarking should not be considered an "end in itself." Rather, the data should simply be considered as a starting point for further analysis and explanation.

As indicated by the above study, a key component of benchmarking is the utilization of peer comparisons, and the foundation for this is the selection of appropriate peer groups. The Advisory Committee used in the study observed that this can be one of the most challenging tasks in benchmarking because many transit systems believe that they are unique in one or more ways and that any comparisons made between so-called peers are not valid because they are not comparisons between "apples and apples." In spite of this common belief, peer group analysis is a common practice in the transit industry—many benchmarking efforts have found a way of forming peer groups that are similar enough to make intra-group comparisons valuable.

An important perspective to maintain when using peer group comparisons is that they are only a beginning. They serve to indicate a possible area of concern, or to "raise a red flag," not to provide a final answer. Additional analysis is usually necessary to determine the likely causes of any seeming disparities between peers. For example, such disparities

can be caused by different operating policies or philosophies, or by external and usually uncontrollable conditions such as geography or demographics.

A common method of making peer comparisons is averaging peer group values (thus the importance of universal measurements), and comparing the target organization against the average. This was done by the Twin Cities Metropolitan Council in Minnesota in 2003 when it compared the values of its transit system, Metro Transit, with the transit averages of Cleveland, Denver, Houston, Pittsburgh, Portland, and Seattle (5, pp. 21-35). This peer group was formed based on:

- Population and population density of the service area
- Operating characteristics (passengers, operating expenses, peak vehicles, revenue hours, revenue miles and peak-to-base ratio)

Factors used in the peer group analysis were:

- Ridership
- Operating Cost per Passenger
- Passengers per Revenue Hour
- Operating Cost per Revenue Hour
- Operating Budgets
- Revenue Hours

These measures were averaged within the peer group and compared over an eight-year period. Comparisons were also made to individual transit systems. It was the Twin Cities Metropolitan Council's hope to use best practices and or "role model" theory to reach the level of the best service provider for each given measure. At minimum, the Council strives to reach the average for the entire peer group.

In King County, Washington, a transit management audit in 1999 included a peer group analysis (6). As part of this study a peer group for the King County transit system (King County Metro) was created. Using an Oversight Committee and data from the National Transit Database, the peer group was formed on the basis of such factors as system size, urban area characteristics, modes of transit operated, volume of service operated, funding sources, and governance structures. Key operating statistics used included operating expenses, revenue miles, revenue hours, and passenger boardings. The result was 12 urban systems deemed to be reasonably comparable to King County Metro. (Interestingly, Metro Transit in the Twin Cities was one of the peers identified in this audit, and conversely, King County Metro was one of the peers identified for Metro Transit in the 2003 Twin Cities audit.)

In West Virginia, a transit needs study that involved all the public transportation systems in the state used six peer groups (five within the state, one outside) (7):

- Remote Rural Counties and Small Villages
- Rural Counties and Small Towns
- Small Urban Counties and Communities
- Urbanized Counties and Small Cities
- Statistical Metropolitan Service Areas

- Large Urbanized Counties in Similar States

A performance standards effort in Wisconsin also created six peer groups for transit systems in the state. They were (8):

- Milwaukee (and similar-sized national peers)
- Madison (and similar-sized national peers)
- Medium Bus Systems (and similar-sized national peers)
- Small Bus Systems (in Wisconsin)
- Commuter Bus Systems (in Wisconsin)
- Shared-Ride Taxi Systems (in Wisconsin)

Wisconsin uses a very interesting process to evaluate the transit systems in relation to the standards developed through a peer comparison process. The cost efficiency measures that are used in the Wisconsin analysis are as follows:

- The ratio of passengers (unlinked trips) to service area population.
- The ratio of operating expenses to passengers.
- The ratio of operating expenses to revenue hours.
- The ratio of revenues to operating expenses.
- The ratio of passengers to revenue hours.
- The ratio of revenue hours to service area population.

The process involves a number of steps that are summarized below (these are described in more detail in the later section on Minimum State Standards):

- Using a standard deviation approach, minimum standards for each peer group are first developed for each of the measures. Systems are deemed to be in compliance if they meet the standards on 4 of 6 of the measures. If not in compliance, historical data is examined to see if there has been improvement in performance. If there is sufficient improvement, the system is considered in compliance.
- If still not in compliance, the system's progress on implementing prior performance audits is reviewed. Once again, if there has been adequate progress, compliance is achieved. If there has not been a recent performance audit, one is scheduled. Finally, if compliance is not achieved after three years, financial penalties can be imposed (a 10 percent reduction in funding).

StanCOG (the Stanislaus Council of Governments in Modesto, California) used the following criteria to form peer groups (9):

- Fixed route or demand responsive service?
- Local or regional?
- How many passengers?
- Public or ADA?

Six peer groups resulted:

- Local fixed route—1 to 8 million passengers
- Local fixed route—50,000-500,000 passengers

- Local ADA—50,000-150,000 passengers
- Local demand response—over 70,000 passengers
- Local demand response—25,000-70,000 passengers
- Local demand response—0-25,000 passengers

It should be noted that North Carolina has previously used "peer groups" of sorts. These are the groups that have been used to report operating statistics for all public transportation systems in the state. They are as follows:

Urban

- Urban Public Transportation Systems—Fixed-Route Segment
- Urban Public Transportation Systems—Dial-a-Ride (ADA)
- Regional Transportation—Fixed-Route Segment
- Small Urban

Rural

- Regional (multi-county)
- Single-County Community Transportation Systems
- Human Service Consolidated Transportation Systems
- Human Service Coordinated Transportation Systems

There are obviously a variety of approaches used in developing peer groups. For urban systems that report information to the National Transit Database, a common approach is to use this data to find systems that have reasonably similar operating characteristics such as operating expenses, passengers carried, and vehicles operated.[2] Sometimes population and population density of the service area are factored into this analysis. In addition, performance measures such as operating cost per passenger or passengers per revenue hour are sometimes used.

Another common approach, used particularly for rural systems or for small urban systems that don't report information to the National Transit Database, is to group them according to the areas they serve, e.g. small urban areas, rural counties, urban counties, and rural multi-county systems. Still another approach is to make the kind of service provided the key factor, e.g. urban fixed-route, urban demand response, or rural demand response. The key in peer group formation is to decide locally what factors are important in order to establish enough similarity that a reasonable "apples-to-apples" comparison can be made.

Customer Satisfaction and Benchmarking

In judging performance, it is important to look not only at traditional efficiency and effectiveness measures but to also consider whether customers are satisfied with the service provided. This consideration has been gaining more and more importance in recent years. Three questions arise:

[2] A useful tool in this regard is the Florida Transit Information System (FTIS) software program that allows easy access to and use of data from the NTD. This software is described in detail in Appendix 6.

- What are transit customers' concerns with service—what do they want and need?
- How should those concerns be ranked—what are the priorities for those wants and needs?
- How can these concerns (wants and needs) be measured?

The National Cooperative Highway Research Program Report 511 (*Guide for Customer-Driven Benchmarking of Maintenance Activities*) describes the benchmarking process as well as the role measurement plays in the process (10, p. 46). This report describes four types of measurements: inputs, outputs, outcomes, and the newest form, value-added.

1. *Inputs* are resources used to deliver a product or service, perform an activity, or undertake a business process. Inputs are most often expressed as labor or dollars.
2. *Outputs* are measures of production or accomplishment. These are usually tangible measures and are the results of input(s). An example of an output would be number of vehicle miles operated, or the number of passengers carried.
3. *Outcomes* are results, effects, or changes that occur due to delivering a product or service, conducting an activity, or carrying out a business process. Outcomes are frequently associated with customer satisfaction and quality of service. An example of an outcome would be improved access to desired destinations.
4. *Value-Added* measures are customer-oriented outcomes expressed in terms of the value received by the customer. These include increases in customer satisfaction or economic value to the customer. This measure stresses the importance of net value, not effectiveness. An example of this would be time or resources saved.

When developing a benchmarking system based on customer satisfaction, the report recommends that transit authorities use outcomes, resources (inputs), outputs, and hardship factors. Hardship factors are those factors that are outside the control of transit managers, such as climate and terrain (10, p. 47).

The report stresses that measures should be handled separately within their category. The purpose of this is to maintain the individual measures while keeping in mind the importance of outcomes in relation to the resources used. The report describes the three types of outcomes measurable in customer-driven benchmarking (10, p. 48):

1. Customer satisfaction
2. The condition of facilities and assets
3. The value received by the customer

The report goes on to recommend that statistically sound surveys are the only way to gauge customer satisfaction. There are several ways to develop or obtain a workable survey. If an organization decides to develop their own unique survey, the time and resources required must be taken into account (10, p. 53).

A five-year project is underway in Europe to develop a customer satisfaction-based benchmarking system. Benchmarking in European Service of Public Transport, or BEST, began in 2000 to increase customer demand of public transit systems in nine European countries. The core belief is that by meeting customer demands, based on the

customer's perceived level of satisfaction, a sense of loyalty will develop that will encourage transit usage (11, p. 3).

In the BEST project, each participating region interviews 1000 citizens by telephone about their experiences with public transit services. Respondents' answers to questions are based on a rating of 1 to 5. The interviews are carried out by contracted companies (11, p. 3). The questions pertain to the following measures:

- Citizen Satisfaction
- Traffic Supply (travel and wait time, frequency)
- Reliability
- Information
- Comfort
- Staff Behavior
- Safety and Personal Security
- Social Image
- Value for Money
- Loyalty

The primary objective of the surveys is to identify the "role model" within the peer group. The "role model" is the peer group member with the highest level of achievement in a particular measure. (This is some somewhat similar to the "best practices" approach often used in U.S. benchmarking processes.) It is hoped that by having an open and universal system of measurements, entities within the peer group will be able to implement best practices to reach "role model" status. The best practices model currently used by BEST was developed by the Swedish Institute for Quality (SIQ), and is basically as follows (11, p. 7):

1. Document your own process
2. Identify role models
3. Compare activities
4. Set new goals and prepare an action plan
5. Implement the plans and monitor results

The peer group used in this effort consisted of all member transit agencies within BEST. Three criteria were necessary for involvement in the program. For a transit agency to be included, it had to:

1. Serve a population of 1-3 million people
2. Offer a well-developed transit system, including bus and rail
3. Develop a strategy to improve service quality

Another model that could be followed when developing benchmarking practices is the model developed by the European Committee for Standardization (CEN) entitled, *Public Passenger Transport: Service Quality Definition, Targeting and Measurement*. The report describes a "quality loop" model and the four levels of perception that must be examined within the loop (12, p. 7):

1. Service Quality Sought
2. Service Quality Targeted

3. Service Quality Delivered
4. Service Quality Perceived

Service Quality Sought is the level of quality that is either explicitly or implicitly sought by the customer. The level of quality can be considered as the sum of a number of weighted quality criteria. The relative weight of these criteria can be assessed through qualitative analysis.

Service Quality Targeted is the level of quality the service provider aims to deliver to the customers. This is directly influenced by the quality sought and should be expressed in terms of three criteria: a service standard, a level of achievement, and a threshold of unacceptable performance. A service standard is the level of service normally provided by the organization. The level of achievement is the goal the organization sets by which its customer service ability will be evaluated. The threshold of unacceptable performance is the minimal level of compliance the organization seeks; any level of performance below the threshold is undesirable.

Service Quality Delivered is the level of quality achieved on a day-to-day basis, and is measured from the customer point of view. This is measured statistically and through observation.

Service Quality Perceived is the level of quality perceived by the customer. This depends on customers' personal experience with the service provided and the information they receive about the service.

The CEN report states that the differences between quality sought and quality targeted expresses how much the service provider is able to affect areas that customers find important. Also, the difference between quality targeted and quality delivered is an efficiency measure as to how well service providers are able to achieve their goals. The report notes that perceived quality, often measured in surveys, can be very different from delivered quality. The perceived quality measure is directly related to the customer's knowledge of the service and their unique personal experience (12, p. 8).

Criteria of transit quality are outlined in this report as well. They are as follows:

- Availability
- Accessibility
- Information
- Time
- Customer Care
- Comfort
- Security
- Environmental Impact

The CEN report also outlines measurement methods used to determine service quality. Three methods are currently in use to gather information about service quality (12, p. 23):

- Customer Satisfaction Surveys (CSS)

- Mystery Shopping Surveys (MSS)
- Direct Performance Measures (DPM)

Customer Satisfaction Surveys are imprecise measuring tools, but give valuable insight into customer service quality sought. These surveys should follow a model similar to market research analyses. This means that the sampling should be random and should include all points within the route. Because outside influences (such as experiences with other service providers) can affect customers' responses, this tool is not as effective as direct performance measures.

Mystery Shopping Surveys are based on objective observations made by trained survey teams. These teams act as customers and catalogue a detailed account of the transit experience. It is important to have in place a uniform system of measurements so as to eliminate variation among observers. MSS should be carried out on a regular basis in order to find trends in service provided.

Direct Performance Measures track the actual performance of the service either through operational records or sampled observations. Examples of DPM include access, walking distances, and times between travel points (12, p. 26).

The service provider should keep in mind that customer satisfaction surveys are relatively subjective measures, whereas mystery shopping surveys and direct performance measures are more objective.

The ITRE report on Performance Measurement looked at customer service concerns identified by six different studies (1). These are summarized in the following table.

Table 1: Summary of Key Customer Service Concerns

Chicago Transit Authority, 1997 (13)	**Florida DOT, 2000 (14)**	**TCRP Report 46, 1999 (15)**	**TCRP Report 47, 1999 (16)**	**TCRP Report 54, 1999 (17)**	**TCRP Synthesis 45, 2002 (18)** (*according to transit agencies)*
Availability Access to Service	System design Span of service	Wait quality	Frequency of transit service (span of service and headways)	Convenient and Accessible	Frequency of service
Reliability, On-time Performance	Timeliness	Vehicle quality	Reliability of transit service	Reliable	On-time service
Communica-tions, Driver Attributes	Experience of the bus ride	Trip quality	Behavior of other riders	Empathetic	Courtesy of employees
Fare Payment	Value	Information quality		Affordable	Personal safety (at facilities and on vehicles)

Chicago Transit Authority, 1997 (13)	**Florida DOT, 2000 (14)**	**TCRP Report 46, 1999 (15)**	**TCRP Report 47, 1999 (16)**	**TCRP Report 54, 1999 (17)**	**TCRP Synthesis 45, 2002 (18)** (*according to transit agencies)*
Personal Safety	Perceptions of safety			Safe and Secure	
Information	Printed schedule			Understandable and Intelligible	
Appearance Comfort				Clean and Comfortable	
Comfort at Stops					

While the differences in terminology used among the surveys make it difficult to generate exact comparisons among the surveys, customer service concerns that predominate include:

- Availability/sufficiency/frequency of service (temporal & spatial)
- Reliability/dependability/on-time performance
- Safety/security
- Employee courtesy/behavior
- Information/communication
- Appearance/cleanliness
- Comfort
- Cost/affordability

The ITRE study also identified a series of specific customer service-oriented attributes and associated measures that might be used by North Carolina transit systems in a performance measurement system.

Service frequency:

- Service span (the number of hours/day during which service is provided)
- Headways for fixed-route services
- Wait time for immediate response paratransit and as specified in advance reservation policies
- Wait time deviation (the difference between promised and actual pickup times)

Reliability:

- On-time performance—the percent of fixed-route vehicles on time (within five minutes of scheduled time) or paratransit trips picked up within a particular window (15 minutes)
- The number of vehicle road calls
- Rates of staff turnover, tardiness, and absenteeism
- The number of missed trips or runs

Safety/security:

- The number of accidents
- The number of crimes against passengers
- The number of crimes against staff
- The number of incidents of vandalism on vehicles and facilities
- The number of safety and security related passenger complaints

Onboard environment:

- Percentage of vehicles passing/failing a random visual inspection by managers noting dirt, odors, and graffiti
- Percentage of drivers passing/failing a random visual inspection for cleanliness and courtesy
- Passenger survey results or number of trip-related passenger complaints

Information:

- Presence of system/route timetables
- Presence of system Web site
- Passenger survey results on timetables and other printed/electronic information
- Number of community events attended by management to educate the public about services

In measuring customer satisfaction, two additional concepts are important. The first is the concept of customer "loyalty." This refers to not just whether a customer is satisfied, but whether he or she is likely to remain a customer if a similar or better alternative comes along. Customer loyalty can be measured by the customer's overall satisfaction with the service and by their response to questions about the likelihood of their continued use, and their likelihood of recommending the service to others (2, p. 229).

The second concept related to measuring customer satisfaction is that of "importance" vs. "performance." For example, a customer may perceive performance to be very high on a particular factor. However, that factor may not be very important to the customer's overall satisfaction level. The key is to measure not just the transit system' performance on particular factors, but also the importance of those factors, and to then focus improvement efforts on areas where importance is high and system performance is low. This concept can be used in a process called "quadrant analysis." This concept is explained in more detail in Appendix 1.

Other Important Measures/Benchmarks

In addition to indicators of customer satisfaction, there are also indicators of "need" for transit. By evaluating factors that lead to transit need, service providers are better able to allocate funds and expand service where it is required. Traditionally, population and population density in a given area have been primary indicators of transit need.

Data collected by the City of Los Angeles in 1995 examined factors beyond population and population density as a determinant of transit need (19). In the evaluation, the data collected included:

- Total households
- Average automobiles per household
- Percentage of households without automobiles
- Percentage of workers using transit
- Percentage of population below the poverty line
- Unemployment rate

Instead of using the traditional measures of population and population density to determine which community had the greatest transit need, the Community Planning Area chosen by the city as a transit priority was the community with the lowest average automobiles per household and one of the highest poverty and unemployment rates.

In addition to the above mentioned factors determining transit need, it is often helpful to consider mobility-limited and elderly persons. These groups are often dependent on transit availability and should be included when examining need-based indicators. The Department of Transportation of Monmouth County, New Jersey cites the need to investigate both the U.S. Census and the American with Disabilities Act (they have different requirements regarding limited mobility) when determining transit need status (20).

Another area that could be benchmarked has to do with geographic "coverage." Coverage indicators illustrate a transit system's ability to reach customers within a given geographic area. These indicators may help guide a transit manager as to where new lines are needed. Most often these indicators include such factors as:

- Percentage of population within a given distance of a transit route or stop
- Route or vehicle miles provided per square mile (or other unit of area)
- Passengers carried per capita.

Distance from a route or stop is a common indicator of service coverage. The Chicago Transit Authority uses ½ mile walk as a benchmark for coverage (21, p.1). The Southeastern Pennsylvania Transportation Authority (SEPTA) differentiates between "served" and "well-served" in regards to distance from the nearest route. An area is "served" when a stop is ½ mile from a passenger's point of origin. An area is "well-served" when distance to a stop is ¼ mile (22, p. 5). The Greater Vancouver Transportation Authority also cites ¼ mile as the acceptable distance from a stop (23, p.8).

III. Summary of Stakeholder Interviews

A number of key public transportation stakeholders were interviewed as part of the study. These individuals are listed in Appendix 2. The comments received are summarized below.

Goals of a Benchmarking Process

NCDOT officials articulated a number of goals for benchmarking:

- To provide measures that allow systems to evaluate themselves and how they compare to peers.
- To give the Public Transportation Division (PTD) and North Carolina transit systems something to aspire to in terms of performance, and to help the PTD know how hard to push them to seek performance improvements.
- To improve efficiency and effectiveness, <u>and</u> customer satisfaction.
- To provide a benchmarking process that can be used internally by transit systems as well as minimum state standards that transit systems would be required to meet (they noted that the Board of Transportation and legislature want some kind of minimum standards).
- At some point to link benchmarking to funding in some way, i.e. to reward good performance and penalize poor performance.

A Board of Transportation member mentioned that the Board is very interested in "measured results." Further, there is some sentiment that transit should "pay its own way," citing the highway program as an example (even though highway users don't actually pay for total highway costs).

Transit System Experience with Benchmarking

In general, benchmarking (as distinguished from performance measurement) does not seem to be widely practiced by North Carolina transit systems. Most systems use performance measures to some degree (especially in connection with the PTD's annual Operating Statistics (OPSTATS) reporting system). Some of them compare their current performance to past performance, which is a form of benchmarking (trend analysis). However, only a few appear to set performance goals or targets, or to compare their performance to peers (or to some kind of performance standards) on a regular basis. Several of the systems equate benchmarking with performance measurement.

One transit agency interviewed, Wake Coordinated Transportation Services (WCTS), has developed an interesting performance incentive program for its contract operator. This involves setting a range of expected performance on five measures:

1. Productivity (trips/hour)
2. On-time performance

3. Customer service
4. Vehicle maintenance
5. Safety

If the contractor exceeds the expectation, an incentive payment is earned. If performance falls below the expected range, a financial penalty is invoked.

What to Benchmark

The general consensus was that efficiency and effectiveness measures (riders per vehicle mile, cost per passenger trip, cost per vehicle mile, etc.) lend themselves most readily to benchmarking. There was also a lot of interest, particularly from PTD officials, for incorporating some kind of customer satisfaction measures as part of benchmarking. A state agency respondent suggested that it was important to measure "outcomes," not just the typical efficiency/effectiveness measures. Also, in assessing customer satisfaction, it is important not to just assess satisfaction with the service that exists, but to also try to determine whether there are transportation needs that are not being met.

Benchmarking Process vs. Minimum State Standards

There was a desire expressed by PTD officials for both an internal benchmarking process that transit systems could use to improve their own operations, and a set of minimum state standards that transit systems would be required to meet (which might be tailored to the type of system—urban vs. rural, large vs. small, etc.). The internal benchmarking process should include peer comparisons.

Several respondents expressed concern about "Raleigh" setting standards for individual systems. One respondent suggested involving the local Transportation Advisory Boards in any standards that are set for their systems. Another respondent suggested that the age or maturity of a system be considered in assessing whether it meets minimum standards.

Peer Group Formation

A strong desire, frequently expressed, was that any peer group comparisons should be made between similar systems ("apple and apples"). There is a fear that special local circumstances will be overlooked and that systems will thereby be penalized unfairly.

A somewhat different thought regarding comparisons among peer groups was to compare types of services instead (e.g. express bus service with express bus service, commuter shuttles with commuter shuttles, fixed-route with fixed-route, and demand-response with demand-response.).

One idea regarding peer groups was that there are a number of city/county systems that have formed, or are forming, that might make a natural peer group (Goldsboro/Wayne, Wilmington/New Hanover, Tar River Transit, AppalCART, and Hickory/Catawba). Also, small urban systems (such as Concord/Kannapolis, Henderson and Jacksonville)

might make another natural peer group. Another thought was that Human Service systems should be kept separate from Community Transportation systems.

One non-profit agency manager stated that it would be unfair to compare non-profits with public agencies. He believes that many county transit systems receive services from the county that non-profit agencies have to pay for (e.g. administrative or human resources support, or financial/accounting services) and that this would put the non-profits at a disadvantage.

When individual systems were asked about who they thought their peers should be, most did not have anything specific to suggest beyond some general ideas such as similar size, geography, etc. However, one system, Capital Area Transit in Raleigh, used a national peer group of nine systems in its 2003 Five Year Transit Plan. They also reported that they compare themselves to other large urban systems in North Carolina.

Reconciling Benchmarking and Local Goals

Ideally, performance measurement and benchmarking flow from organizational goals. For example, annual goals set by the agency board would become the basis for performance measures and related benchmarks. However, this creates a dilemma. Because local goals may differ from system to system, it is difficult to develop benchmarks or standards that would apply to everyone, or even to smaller "peer" groups of what seem to be relatively similar systems. For example, one county may have a goal of providing extensive geographic coverage and hours of service throughout the county. This might lead to relatively inefficient service, and the performance of this system would then compare unfavorably to another system whose goal is to minimize the cost of operating transit by providing service only in high-density areas on weekdays.

Most individuals interviewed recognized the difficulty that differing local goals create for a statewide benchmarking program. There were two thoughts for how to address this issue:

- Making the primary goal efficient and effective service, and not considering expansion of the system until that has been accomplished ("first tighten, then expand").
- Letting transit systems assume the extra cost of local goals or policies that lead to poor performance (see the section below on Incentives/Disincentives).

One respondent's comment: "good luck!"

Incentives/Disincentives

There was general recognition that if there are to be minimum state standards involved, there would have to be some kind of penalties imposed for not meeting them. However, there was also recognition that it is difficult to impose penalties. In addition, there was a general sentiment that before imposing penalties, some kind of process for helping a system to improve its performance should be provided. For example, one idea was for

PTD staff to meet with the system, review its performance, set performance improvement goals, and then monitor achievement of the goals. Another idea was to develop a peer review process involving managers from other systems.

There was a great deal of concern about linking benchmarking to funding. One manager stated that this would only lead to manipulation of the numbers and gaming of the system. This respondent also urged that PTD not "manage by the numbers." Each system has its own particular situation and constraints, and managing by the numbers from Raleigh would likely be detrimental to local needs and realities.

Some systems oppose penalties and believe that the State's role should simply be to provide comparative information or standards that the transit systems could then use to evaluate themselves.

There were several ideas expressed in regard to rewards for good performance. First, that if there are to be penalties for poor performance, there should be rewards for good performance. A related thought was that there should be an effort to increase funding for those systems that are working hard (and succeeding) at improving performance. One idea for rewards was special recognition programs, for example at the annual public transportation conferences.

As mentioned previously, the Wake County system has adopted an incentive program for its contract primary service provider that involves both financial incentives and disincentives related to performance.

Other Important Comments

- The quality of data is crucial to both performance measures and benchmarking. There must be consistent understanding and reporting of statistical information.
- Performance measurement and benchmarking are not easy. Any system adopted must consider the capability of both local and state staff.
- It will be important to not penalize systems for poor performance caused by factors outside of their control, e.g. an "unfriendly" transit environment created by local political choices.
- If PTD adopts some kind of benchmarking program, it should be with the commitment and resources necessary to sustain it. Don't let it become a "program du jour" that causes everyone a lot of work and frustration and then quietly disappears.

IV. Summary of NC Customer Satisfaction Surveys

The purpose of this part of the study was to obtain information that would be useful in determining what factors customers consider to be important in terms of their satisfaction with transit service. This information was used to help to identify key service attributes for benchmarking.

Methodology

As part of an e-mail survey conducted through the North Carolina Public Transportation Association (NCPTA) listserv in regard to benchmarking practices, recipients were asked whether they had conducted any kind of customer satisfaction surveys in the last three years. Transit agencies that responded in the affirmative were subsequently contacted and asked to send copies of the survey forms that they used, as well as a summary report of findings if available. Customer service surveys and/or reports were received from:

1. AppalCART
2. Capital Area Transit (Raleigh)
3. Concord/Kannapolis Area Transit
4. Lumber River Council of Governments
5. Mountain Mobility (Buncombe County)
6. Piedmont Wagon Transit System (Hickory)
7. Triangle Transit Authority
8. Wake Coordinated Transportation Services

Findings

The information received from the transit agencies is summarized below.

Most of the customer surveys asked standard questions such as:

- How often do you use the service?
- What days of the week do you ride?
- How long have you been using the service?
- Why do you use it?
- What was the purpose of this trip?
- Which route did you ride today?
- Etc.

The surveys also asked for demographic information such as age, gender, auto ownership, ethnicity, household income and ZIP Code. However, a problem with the surveys is that they tended to ask about perceptions of service quality on that system at that time. For the most part, respondents were asked to rate the performance of the transit system on a list of specified service attributes as opposed to answering an open-ended question about what is most important to them. Therefore, it is only known how respondents perceived the transit system's performance on the specified attributes, not

how important each one was to their overall satisfaction. (Nor is it known if there were other factors that were important but that weren't asked about.)

A few transit agencies asked questions that related to the importance of various service attributes. For example, one agency found that the three most important improvements that the system could make were (in priority order):

1. Increase the frequency of service.
2. Establish service on a certain street.
3. Run buses later in the evening.

A second agency also asked about what was the most important improvement the system could make and why. A variety of answers were received such as:

- Scheduling—schedules and pick up times. They screw up a lot.
- Scheduling—not enough time for the drivers to get from one place to another.
- Time schedules, patients getting to appointments late.
- Seatbelts.
- Everything is great except for a few drivers.
- Drivers that know the routes.
- Sometimes in dispatch they are not always nice.
- Long wait times to pick up dialysis patients.

A survey done by the Triangle Transit Authority (TTA) asked respondents to rate the importance of several possible service improvements.[3] Table 2 below indicates the percentage of respondents who rated the items "very important."

Table 2: Service Improvements Rated "Very Important"

Improvement Category	Percent
Increase frequency of service	47%
Run buses later in evening	43%
Provide express service	41%
Reduce travel time on trips	37%
Improve connections between TTA and local buses	36%
Improve on-time performance	35%
Start buses earlier in morning	29%
Add more park & ride lots	25%

Respondents were then asked to identify the first, second and third most important of the improvements. This resulted in the following service improvement priorities:

1. Run buses later in the evening.
2. Increase frequency of service.
3. Reduce travel time.

[3] The TTA survey was a sophisticated effort done with the help of a market research firm—CJI Research Corporation.

In addition to the service improvement priorities described above, the TTA survey effort used a regression analysis to determine the importance of TTA's actual performance on several factors in relation to the riders' overall satisfaction levels. (This technique is a way of determining the causal relationship between performance on individual factors and customer satisfaction.) Three factors stood out as most strongly and significantly related to overall satisfaction:

1. Total travel time.
2. Buses running on time.
3. Courtesy of the drivers.

Another study done for the City of Raleigh, DOT Transit Division,[4] found the following priorities for desired service improvements:

Table 3: Priorities for Desired Service Improvements

Improvement Category	Percent
Service to more locations now without service	31%
More shelters at bus stops	26%
Better on-time performance	24%
Overall faster travel time	20%
More frequent rush-hour service (10-15 min. vs. 30 min.)	18%
More frequent service on Saturdays	16%
Sunday service	14%
Weekday service until Midnight	10%

When asked to identify the most important improvement, the top three improvements were:

1. Serve new destinations
2. Service every 15 minutes
3. Overall faster travel time

(It should be noted that the above Raleigh survey results were for all respondents. There were significant differences in responses depending on whether a respondent was a current rider, a potential rider, or a staunch non-rider.)

Conclusions

The above summary of important customer satisfaction factors would logically form the basis for questions to be used in customer surveys. However, an issue with regard to customer satisfaction and benchmarking is that benchmarking typically tends toward quantifiable, objective measures. Customer satisfaction measurement generally involves qualitative, subjective ratings of service quality. In addition, customer satisfaction factors tend to be less consistently well defined. For example, on-time performance may be defined much differently by one system than by another.

[4] *Raleigh Five Year Transit Plan*, Urbitran Associates, July 2003.

Two actions are recommended to address customer satisfaction in a benchmarking process. First, each transit system can benchmark customer satisfaction survey information by comparing recent surveys with past surveys (trend analysis). Assuming that the same methodology and questions were used, it should be possible to determine if customer satisfaction is improving, staying the same, or deteriorating. This will require transit systems to conduct customer satisfaction surveys at a regular interval, e.g., annually.

Second, if transit agencies were to use a standardized survey instrument (possibly provided by the NCDOT/PTD), it would then be possible to compare one transit system with its peers. Several survey instruments (questionnaires) would need to be developed, each targeted to the various types of service operated, e.g., urban fixed route, express route, demand-responsive, etc. Each survey instrument would contain standard questions that all transit systems operating that type of service would use, but could also allow the addition of customized questions as desired by an individual system.

V. Benchmarking as Part of an Organizational Improvement Process

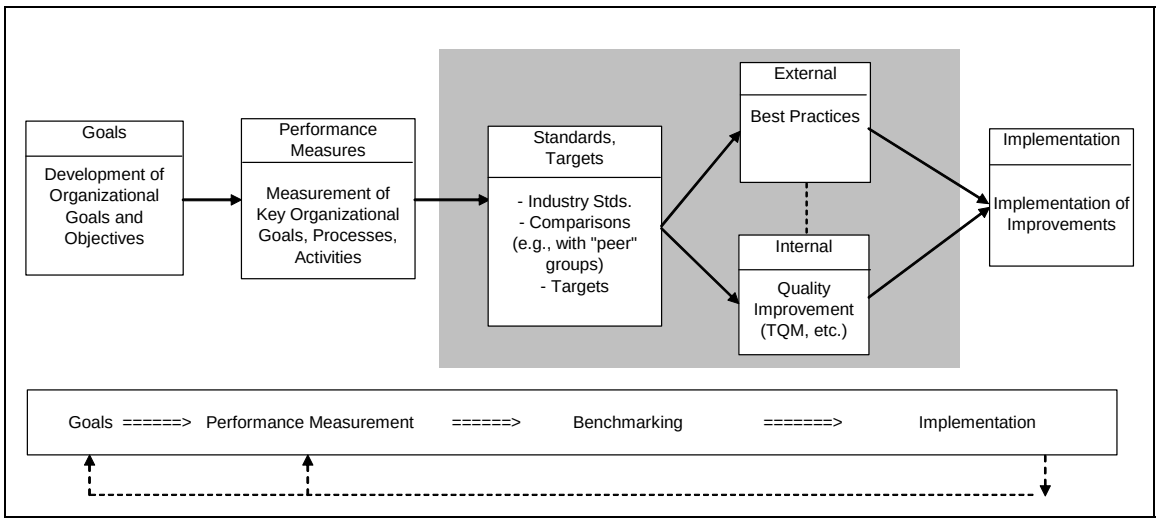
Introduction

For the purposes of this study, benchmarking was defined as a "process for establishing standards, targets and/or best practices in regard to improving performance." Benchmarking originated in the private sector where the primary focus has been on examining the "best practices" of other companies or industries as a way of improving an organization's own practices. The concept has been broadened somewhat in the public sector where more emphasis is placed on comparing performance against some kind of "benchmark" or standard such as past performance or the performance of peers. The basic idea is to provide something that an organization's performance can be compared to as a way of evaluating whether its performance needs to be improved.

How Benchmarking Fits within the Overall Organizational Improvement Process

Benchmarking is built on a foundation of performance measurement. Benchmarks are established for key performance measures as a way of evaluating whether performance is up to "par," i.e. whether it is reaching a desired standard or target. Ideally, the performance measures and benchmarks are based on the organization's key goals and objectives so that what is being measured and benchmarked is central to what the organization is trying to accomplish. This concept is shown in Figure 1.

Figure 1: Benchmarking as Linked to Goals and Objectives



The first step in setting up a performance measurement and benchmarking system should be to develop clear organizational goals and objectives. Only when this is done can good

performance measures be developed. This can be done as part of an annual planning or goal-setting process, or as part of the annual budget process.

For example, a key organizational goal might be to increase customer satisfaction and thereby increase ridership. Associated performance measures might be the level of customer satisfaction as determined through passenger surveys, and the actual level of system ridership. However, determining whether performance is good or bad calls for comparison with some kind of external or internal benchmark. An example of the former would be to compare performance to an accepted industry standard, or to the performance of other similar organizations. An example of the latter would be to compare current performance to past performance, or to a target set internally by the governing board or by management (e.g. achieving 95 percent on-time performance).

Internal vs. External Evaluation Processes

There are two basic ways that benchmarking can be used by an organization—by making comparisons between internal performance measures, e.g. comparing this year's performance with last year's, or by making comparisons with the performance of other agencies. The former is usually referred to as *trend analysis*, the latter as *peer group analysis*.

Both trend analysis and peer group analysis should be done at least once each year. Some transit systems, particularly the larger ones, may find value in doing trend analysis on a monthly or quarterly basis as well. In addition, when conducting peer group analysis some larger transit agencies may find it valuable to not only compare total system performance but the performance of particular types of transit services as well, e.g. fixed-route, commuter shuttle, or express bus services.

As mentioned above, there is also another way that benchmarking is sometimes used by organizations—setting a target or standard as a benchmark or goal. This is usually done by management and/or the board. For example, the board may decide to set a goal of achieving 95 percent on-time performance system-wide, or improving its customer satisfaction rating from 90 to 95 percent by the following year. The goal might be set arbitrarily, or it might be set based on either past performance or the performance of peers.

Internal Comparisons—Trend Analysis

The simplest and most common method for benchmarking is trend analysis—comparing an organization's current performance with its past performance. For example, performance in the latest fiscal year can be compared to last year's performance, or to the performance over the last 3-5 years. The goal is to continuously improve performance, or at least to make sure that it doesn't deteriorate. An example of trend analysis is shown in Table 4 below.

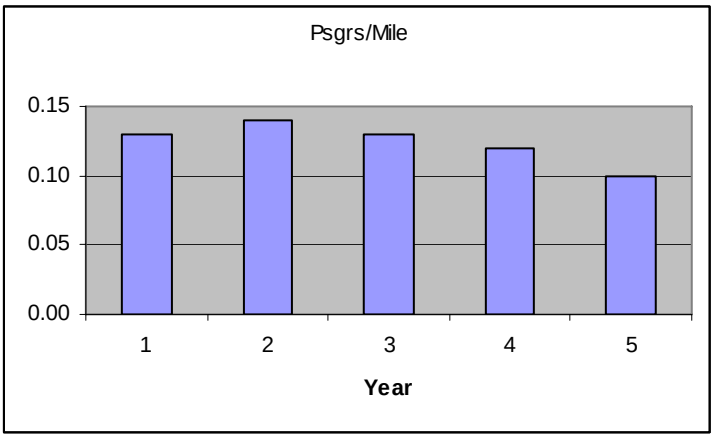
Table 4: Trend Analysis

Benchmark Measure	2000	2001	2002	2003	2004	% Change Previous Yr.
Passengers/Mile	0.13	0.14	0.13	0.12	0.10	-16.67%
Passengers/Hour	1.81	1.90	1.78	1.72	1.64	-4.65%
Cost/Mile	$1.30	$1.35	$1.38	$1.46	$1.44	-1.37%
Cost/Hour	$22.34	$22.45	$23.21	$23.89	$24.34	1.88%
Cost/Passenger	$11.42	$11.45	$11.59	$12.01	$12.34	2.75%

This shows that in 2004, system productivity as measured by passengers per mile and per hour went down. Cost per hour and per passenger went up. (It should be noted that measures that involve dollar figures will tend to increase each year if only due to economic inflation. The data can be "cleansed" of inflation (normalized) by dividing each period's dollar statistics by the appropriate inflation factor for that period. A method for doing this is explained in Appendix 3.)

Such data can also be easily charted to visually indicate trends over a period of years as shown in Figure 2.

Figure 2: Example Chart of Trend Analysis—Passengers per Vehicle Mile



Depending on the need, such an analysis could also be done on a monthly or quarterly basis. It addition, it can be done at a system-wide level, or at a lower organizational level. In the above example using passengers per vehicle mile, the trend analysis might also be done on a route-by-route basis, or by different types of services.

External Comparisons—Peer Group Analysis

It has become quite common in the transit industry to compare one's performance with the performance of a peer group. If it turns out that performance is substantially worse than a group of peers, the reason(s) causing the poor performance can be analyzed and steps can be taken to improve it. However, it is also possible that the "poor" performance

may be due to an organization's chosen goals. For example, a transit agency whose goal is to provide extensive service coverage, geographically and/or in service hours, is not likely to perform as well on various efficiency or effectiveness measures (e.g. passengers per service hour) as a system that limits service to only the most productive routes or hours.

Once the measures to be used for benchmarking are selected, the next step is to calculate the average of the peer group for each measure and then to compare the subject system to the peer group average. (The selection of specific benchmark measures and the selection of peers are discussed later.) If the subject system is worse than average on any of the benchmarks, the next step is to determine why. Starting with the benchmark that is either worst performing and/or most important, the problem-solving technique described below can be used to determine the cause, develop potential solutions, and implement appropriate changes. This should be done for each benchmark that is worse than average.

An example of such a comparative analysis using some commonly used performance measures is shown in Table 5.

Table 5: Peer Group Analysis

Benchmark Measure	Your System	Peer Group Average	% Diff.	Peer 1	Peer 2	Peer 3	Peer 4	Peer 5
Psgrs/Mile	0.13	0.12	9.23%	0.11	0.16	0.08	0.12	0.12
Psgrs/Hour	1.81	1.96	-8.29%	1.25	1.75	2.13	2.62	2.05
Cost/Mile	$1.30	$1.18	8.92%	$1.63	$1.30	$0.95	$1.00	$1.04
Cost/Hour	$22.34	$19.52	12.62%	$18.29	$14.56	$24.92	$21.42	$18.41
Cost/Psgr	$11.42	$10.35	9.40%	$14.57	$8.30	$11.71	$8.16	$8.99

In this example, "your system" is about 9-12 percent higher than average on all cost-related measures. It would therefore be worthwhile to analyze the reasons why. There may be good and valid reasons, but there may also be factors that can be addressed through various cost-cutting measures. (Even if the subject system is average or above, this can still be a useful method for improving performance even more.)

In addition to simply comparing numbers, it can be very useful to "network" or communicate with peers on a regular basis. Questions can be raised, information shared, and advice given or sought. This can be done by phone or e-mail, either individually or via a group e-mail or telephone conference call.

It needs to be emphasized that peer group comparisons are only an indication that performance may not be up to par. Think of it like a "red flag"—an indication that there may be a problem. Further analysis may reveal that it's not a problem after all, or that there are valid reasons for the performance difference. The method is not intended to provide a final answer, only a suggestion of an area that may warrant further inquiry.

A methodology for forming peer groups and suggested state and national peer groups for North Carolina transit systems are described in a later section.

Improving Performance

If, through trend analysis, peer group comparisons, or by comparison with an internally set target, a determination is made that performance is sub-par and needs to be improved, two excellent methods for doing so are:

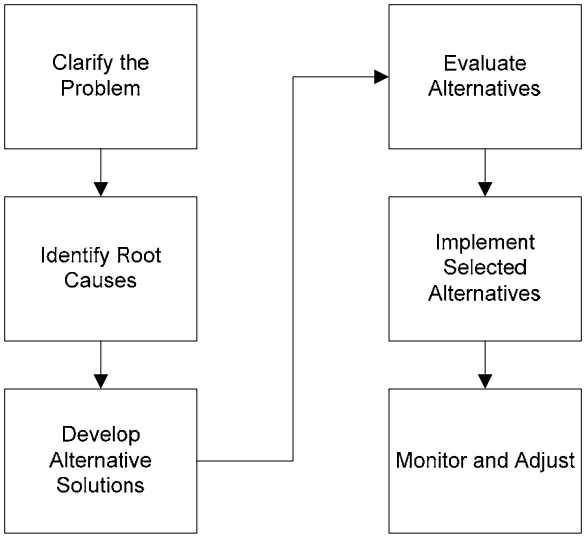
1. Using quality improvement processes such as TQM (Total Quality Management).
2. "Best practices" methodology.

Quality Improvement Processes

Quality improvement processes usually involve the concept of "continuous improvement." The underlying premise is that the way to achieve excellence is to make continuous small improvements in the quality of a product or service. To do this requires regular measurements of quality ("metrics") and the process therefore tends to be data driven. Wherever possible, an attempt is made to define quality from a customer perspective (whether the customer in an external or internal one).

If a determination is made that there is a quality (or performance) problem in a particular area, a common practice is to form a small team of people who have responsibility and/or expertise in that area. The team then conducts a problem-solving process to address it. Typically, such a process involves the following steps, as shown in Figure 3:

Figure 3: Quality Improvement Process



These steps are more fully explained below:

1. *Clarify the problem.* Make sure that the exact nature of the problem is clearly understood and agreed to by everyone.
2. *Identify the causes of the problem.* Dig down to determine the underlying root causes. Make sure that there is a cause and effect relationship.

3. *Develop alternatives for solving the problem.* Ideally this would include preventing the problem in the future rather than just fixing the current problem.
4. *Evaluate the alternatives and select the best one(s).* It can be useful as part of this effort to have the team develop and agree on the criteria that will be used to choose the best alternative(s).
5. *Implement the selected alternative(s).* It is important to have individuals who have responsibility for implementing the changes on the problem-solving team. This helps them to understand and accept what is proposed.
6. *Monitor the results and make adjustments as necessary.* A key to implementing change is to monitor actual results to make sure that they are what was intended. If not, make necessary adjustments.

Best Practices Methodology

In best practices methodology, if it is determined that an organization is falling short in a particular area of performance, a search can be made for another organization that performs well in that area (a "role model"). For example, perhaps another transit agency in a peer group excels on a particular measure on which the subject organization is doing poorly. That system can then be contacted to find out how or why it does so well. If appropriate, its practices can be adopted.

In addition, organizations outside the transit industry can be studied for relevant best practices. For example, the parcel delivery industry could provide useful information on vehicle scheduling and/or utilization that might provide lessons for transit operators. Other, non-related industries could serve as information sources for best practices in areas such as human resources management or financial management.

VI. Benchmarking for North Carolina Transit Systems

A three-part benchmarking process is proposed for North Carolina transit systems, to include:

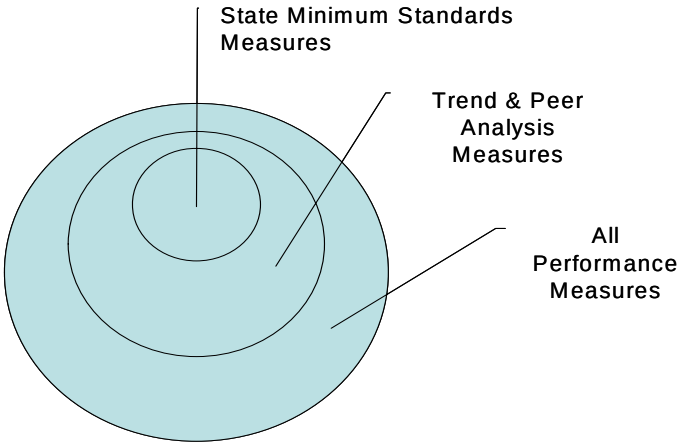
- Trend analysis—to be conducted at least annually by each transit system. This will provide a means to assess each transit system's performance, and by tracking various performance measures over time, to determine areas in which performance needs to be improved.
- Peer group analysis—to be conducted at least annually by each transit system and by the PTD. The PTD would be responsible for determining peer groups among North Carolina systems, both by type of transportation system/service operated and annual OPSTATS data. Transit systems would be responsible for determining their appropriate peers at the national level, and assessing their performance against the average of the peer group for various performance measures.
- Statewide minimum standards—transit system performance on a limited set of measures would be evaluated annually by the PTD. Poorly performing transit systems would be provided help to improving their performance, while exemplary performing systems would be recognized for their accomplishments.

This three-part approach is tied together through the use of a common set of performance measures. A total of 16-20 measures would be used in conducting trend analysis and peer group analysis. These measures gauge:

- Quality and quantity of service
- Efficiency and effectiveness of service
- Vehicle/employee utilization; and
- Customer satisfaction (and percent of general public passenger trips, for CT systems)

A subset of 10 measures is proposed for use to determine compliance with state minimum standards. This "nested" approach is depicted in Figure 4.

Figure 4: "Nested" Use of Performance Measures in the Benchmarking Process



The remainder of this section discusses the selection of performance measures to be benchmarked, incorporating an assessment of customer satisfaction into the benchmarking process, trend analysis and peer group analysis, and a process for reporting the outcomes of transit systems' benchmarking processes to the NCDOT/PTD.

Selecting Performance Measures

One of the difficult challenges in conducting benchmarking is choosing, among hundreds of possibilities, the best measures to use. It is important to select measures that describe a variety of service attributes, e.g. the quantity or coverage of the service provided, its quality (as determined by both objective data and the subjective perceptions of the users), its efficiency and effectiveness, and how productively its employees and vehicles are being utilized.

The goal is to use a selected set of meaningful benchmarks that is large enough to adequately reflect overall system performance, but not so large as to be onerous or unmanageable.

It should be noted that there is often a tradeoff between measures of service quantity and quality, and efficiency and effectiveness. If the goal of a transit system is to have extensive service coverage, either geographically or in hours and days, this can result in lower efficiency or effectiveness when compared to a peer that provides service only in higher-density areas or during hours and days when ridership is highest. Looking at both types of measures together can help to explain why one system seems to be performing less efficiently or effectively than other comparable systems.

Customer Satisfaction

While it is important to measure such objective factors as efficiency and effectiveness, a key factor to measure is the subjective perception of customer satisfaction. Most passengers are much less concerned with system efficiency than they are with the quality of the service that they regularly use. If they perceive the quality to be low, they are likely to switch to an alternative means of travel if one is available. The best way to determine customer satisfaction is through customer surveys. An attempt can be made to survey all riders, but it is much more cost-effective to use survey sampling techniques. Information on survey sampling is provided in Appendix 4.

Trend Analysis and Peer Group Analysis

There are two basic ways to evaluate performance: 1) performing trend analysis using current and past statistics from the transit system itself or 2) comparing a transit system's performance with the performance of other similar systems (peer groups).

Recommended Benchmark Measures for Trend Analysis and Peer Group Analysis

Following are the measures recommended for trend analysis and the rationale for their use. Most of these can also be used for peer group analysis as discussed in a subsequent section. Any limitations that may restrict use of a measure for peer group analysis are discussed under particular measures.

Quantity and Quality Measures

"Square miles per vehicle in peak service," "vehicle miles per square mile," "vehicle miles per capita," "seat miles per capita," and "population per vehicle in peak service" are all measures of *service coverage*. The first emphasizes geographic coverage and the second is an indicator of both geographic coverage and level of service. The third, fourth and fifth are measures of service in relation to the number of people in the area.

(Note: the above measures of service quantity and quality could be used by NCDOT/PTD in making decisions about new or replacement vehicles.)

"Passenger trips per capita" is a measure of *service consumption* and reflects the degree to which service is actually being used in a specific area. "Revenue miles between failures" ("road calls per 100,000 vehicle miles," or "mean distance between failures" are similar terms that are sometimes used), and "accidents per 100,000 vehicle miles" are common measures used in transit. They are objective measures that to some extent reflect *service quality*.

"Complaints per 10,000 passenger trips" is another way of assessing *service quality*. "Percent on-time performance" is an important aspect of service quality but it can be difficult to define consistently and measure accurately. In addition, it may depend on the availability of technology such as Automatic Vehicle Location (AVL).

Efficiency and Effectiveness Measures

"Passenger trips per vehicle mile" and "passenger trips per vehicle hour" are common measures of *service effectiveness*. They measure the degree to which service is utilized in relation to how much service is provided. (If the data are available, it can be quite useful to examine both total vehicle miles or hours, and Monday-Friday vehicle miles or hours. Focusing on Monday-Friday service provides a consistent basis and facilitates comparisons with other systems which may or may not provide service on weekends.)

"Cost per passenger trip" and "recovery ratio" are measures of both *efficiency and effectiveness*. (Recovery ratio is defined here as the percentage of operating expenses that is recovered from the farebox or from other "system-generated revenue" such as charter bus or advertising revenue). Performance in relation to these measures can be improved by operating more efficiently (lowering costs), or by increasing ridership and/or revenue (effectiveness).

"Cost per vehicle mile" and "cost per vehicle hour" are both measures of *efficiency*. They indicate the amount of outputs (vehicle miles or hours) that are produced by a given amount of input (dollars).

"No shows as a percent of passenger trips" is important for measuring the *effectiveness* of demand-response service. If this factor is not kept under control, too much cost will be incurred without any benefit to riders. "Service denials as a percent of passenger trips" is another measure that is important for demand-response service, especially ADA service.

Vehicle/Employee Utilization

"Passenger trips per driver FTE" is a measure of *labor productivity*. (It's important to use FTE—full time equivalent—drivers because many drivers work part-time.) "Vehicle miles per vehicle" and "passenger trips per vehicle" are measures of *vehicle utilization*. They indicate whether vehicles are being used extensively or are not in use for a large part of the time.

Other Measures

"Customer satisfaction" is a key goal in public transportation. Unless customers are satisfied, they are less likely to remain as customers. (However, for this measure to be used in peer group comparisons, there will have to be a standard way for defining and measuring it. One way would be to use standard survey questionnaires for measuring it.)

Whether or not customer satisfaction is compared across systems, it is still a valuable indicator to measure internally. For instance, the results of a customer satisfaction survey can be compared to previous surveys to see if satisfaction is improving, stable, or deteriorating. In addition, it is recommended that "quadrant analysis" be utilized to assist in developing strategies to improve customer satisfaction. (A description of quadrant analysis is provided as Appendix 1.)

"General purpose passenger trips as a percent of total trips" is an indicator of the degree to which Community Transportation systems are achieving NCDOT/PTD's goal of serving more general purpose riders. This measure applies only to Community Transportation systems.

Table 6 below summarizes the benchmark measures recommended and the type of transit service they would apply to. Although this list is somewhat limited, the intention is that these would be the minimum measures for systems to use in benchmarking, both internally (e.g. in trend analysis), and in peer group comparisons (primarily with North Carolina systems, but also with national peers if desired and to the extent that the data are available). Individual systems are free, of course, to use any additional performance measures that are locally desired. (An excellent source for information about potential performance measures is TCRP Report 88: *A Guidebook for Developing a Transit Performance-Measurement System*.)

Note that not all of these measures are appropriate for peer group comparisons. For example, "complaints per 10,000 passenger trips" and "percent on-time performance" are

probably not appropriate because complaints and on-time performance are likely to be defined and/or reported in different ways by different transit systems. "Customer satisfaction" is another measure that is not suitable for peer comparisons unless a standardized questionnaire is used. However, these measures can and should be used in trend analysis.

A majority of these measures, or a variation thereof, are based on statistics already gathered and/or reported by North Carolina public transportation systems as part of the annual OPSTATS report to the NCDOT/PTD.

Table 6: Recommended Benchmark Measures for Trend Analysis and Peer Group Analysis

Benchmark Measure	Fixed Route	Urban Demand-Response/ ADA	Rural Demand-Response
Quantity and Quality of Service			
Square miles/vehicle in peak service	X		
Vehicle miles/square miles	X	X	X
Vehicle miles/capita	X		X
Seat miles/capita	X		X
Population/vehicle in peak service	X		X
Passenger trips/capita	X		X
Revenue miles between failures	X	X	X
Accidents/100,000 vehicle miles	X	X	X
Complaints/10,000 passenger trips	X	X	X
Percent on-time performance	X		
Efficiency and Effectiveness of Service			
Passenger trips/vehicle mile—total and/or M-F	X	X	X
Passenger trips/vehicle hour—total and/or M-F	X	X	X
Cost/passenger trip	X	X	X
Recovery ratio	X	X	
Cost/vehicle mile	X	X	X
Cost/vehicle hour	X	X	X
No-shows as percent of passenger trips		X	X
Service denials as a percentage of passenger trips		X	
Vehicle/Employee Utilization			
Passenger trips/vehicle	X	X	X
Vehicle miles/vehicle	X	X	X
Passenger trips/driver FTE	X	X	X
Other			
Customer satisfaction	X	X	X
General public trips as a percent of total trips (applies only to Community Transportation systems)			X

Notes:

- "Vehicle miles" is used here as a generic term. Rural systems may be more familiar with the use of "service miles." For urban systems, "vehicle revenue miles" may be a more common term.
- For urban systems, "passenger trips" are generally considered to be "unlinked passenger trips." For both urban and rural systems, "passenger trips" are "one-way passenger trips."

Sources used to develop Table 6 include:

- *Use of Performance Standards and Measures for Public Transportation Systems*, Institute for Transportation Research and Education, NC State University, September 2004.
- Victoria Perk and Nilgun Kamp, *Benchmark Rankings for Transit Systems in the United States*, National Center for Transportation Research, December 2004.
- *A Guidebook for Developing a Transit Performance-Measurement System*, TCRP Report 88, Transit Cooperative Research Program, Transportation Research Board, 2003.
- *Data Analysis Tool Process*, Institute for Transportation Research and Education, NC State University, April 2005.
- *Operating and Financial Statistics Report Instructions, FY 2005*, NCDOT/Public Transportation Division.

Forming Peer Groups

As mentioned in earlier sections, the selection or formation of appropriate peer groups is a key aspect of performing meaningful peer group analysis. This section discusses a methodology to use when forming groups of peer transit systems for comparison, and then lists suggested urban and rural peer groups for North Carolina transit systems. In-state peer groups are listed first, followed by potential peers on the national level.

Systems vs. Services

An excellent way to do benchmarking is to compare the performance of an organization with the performance of a group of similar organizations, commonly referred to as a peer group comparison or peer group analysis. This method can provide a good indication of whether the performance of a particular organization is substandard, about average, or above average in terms of the group. (Of course, it's always possible that all of the peers are underperformers and therefore above average performance may not mean a lot.)

In addition to comparing the performance of entire transit systems, larger systems that operate a variety of types of services may want to compare the performance of specific components of their systems, e.g. fixed-route service with fixed-route service, express bus with express bus, weekday with weekday, or weekend with weekend.

Overarching Methodology

A key aspect (and challenge) of peer group analysis is selecting the right peer group. The goal is to allow a comparison of "apples and apples," not "apples and watermelons." The problem is that even apples differ, and organizations often believe that they are unique and don't really have comparable peers. To some extent this is true, but usually peers with enough similarities can be found to allow a reasonable comparison.

There are numerous ways to decide what systems would make appropriate peers. In this study project, the primary method used was to identify systems of a comparable size as defined by a combination of the annual number of passengers carried, vehicle miles

operated and total operating expenses incurred. These factors basically reflect the amount of service consumed, the amount of service provided, and the cost of providing it. These numbers are those reported as part of annual operating statistics data.

For urban systems, due to their smaller number, this was the primary method by which suggested peer groups were formed. (In the case of Charlotte, for which a national peer group was recommended, population density was also considered.)

For systems that operate in rural areas, several steps were involved in forming peer groups. First, the systems were separated into smaller groups based on whether they were city/county systems, regional (multi-county) systems, human service systems or community transportation systems (single-county). The first three groups were small enough to be considered as peer groups unto themselves. The last group, Community Transportation (CT) systems (of which there were 66 in 2003), required two additional steps to split them into smaller, more manageable groups.

The first step was to split the 66 CT systems into three equal sub-groups based on system size (the total of their passengers carried, vehicle miles operated, and operating costs incurred). Then, each of these three sub-groups was subdivided into three smaller groups based on the population density of their service areas. The rationale for this second step was to provide a means to account for the relative ease or difficulty in operating transportation services. The result was nine community transportation system peer groups of 6-8 each, ranging from small systems serving low-density areas to large systems serving high-density areas.

Determining the appropriate number of peers for a peer group is more art than science. The group should be large enough to be representative and small enough to be manageable. A group of from 5-10 peers seems reasonable in most cases. A peer group should have a minimum of four transit systems because a group of three or fewer systems will not provide sufficient data for comparative purposes.

Shifts among Peer Groups

Things will change of course. At some point it may become appropriate for a system to move into another peer group. For example, a system may grow or shrink relative to its peers. Or, a single county system may become part of a larger regional system. If as a result of such shifts, there are fewer than four systems remaining in a peer group, that peer group should be reassigned by the NCDOT/PTD to other appropriate groups.

Networking with Peers and Others

As mentioned in an earlier section, it can be quite useful to communicate with peer systems in terms of sharing information, asking questions, and getting advice. In addition, communicating with other systems to find out about “best practices” is recommended.

Suggested In-State Urban and Rural Peer Groups

Following are suggested peer groups for both urban and rural systems in North Carolina. These groups were formed on the basis of the most recent annual operating statistics data—FY 2003. The groups are summarized in Figures 5 and 6 on the following pages. It is recognized that these suggested groups may need to be adjusted in order to account for important differences that were not adequately reflected by the methodology used to initially create them.

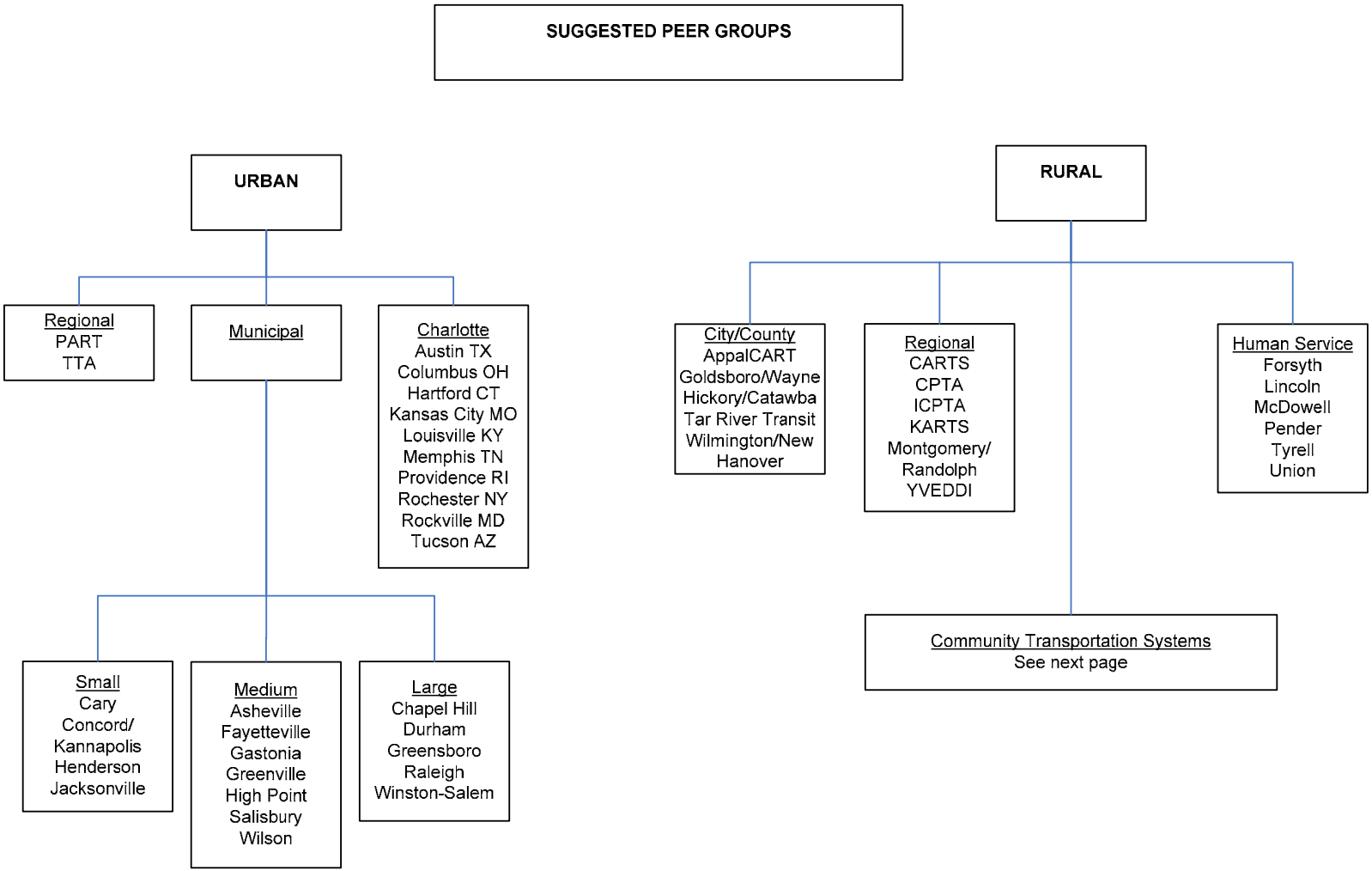


Figure 5: Suggested Peer Groups

Suggested Peer Groups
Community Transportation Systems

Small Size Low Density	Small Size Medium Density	Small Size High Density
Alleghany Bladen Graham Hyde Madison Swain Washington	Avery Beaufort Caswell Jackson Macon Mitchell Yancey	Alexander Cumberland Dare Greene Lee Richmond Scotland Transylvania
Medium Size Low Density	**Medium Size Medium Density**	**Medium Size High Density**
Anson Ashe Cherokee Clay Columbus Davidson Martin	Brunswick Carteret Haywood Hoke Person Polk Rutherford	Caldwell Henderson Iredell Lenoir Pitt Stanly Wilson
Large Size Low Density	**Large Size Medium Density**	**Large Size High Density**
Chatham Duplin Harnett Johnston Moore Sampson Robeson Wilkes	Burke Cleveland Durham Onslow Orange Rockingham	Alamance Buncombe Cabarrus Gaston Guilford Mecklenburg Rowan Wake

Figure 6: Suggested Rural Transit System Peer Groups

Urban Peer Groups
Two of the 18 urban systems that reported operating statistics to the NCDOT/PTD in FY 2003 did not fit well into the suggested North Carolina urban peer groups—Jacksonville, which is substantially smaller than any of the other systems (3,716 annual passengers), and Charlotte, which is substantially larger (18,400,000 annual passengers). For this reason, it was decided to form a national peer group for Charlotte (this is discussed below). Jacksonville could be included with the new small urban systems such as Concord/Kannapolis, Henderson and Cary (none of which was reporting operating statistics information as of FY 2003).

Four systems that reported as urban systems in FY 2003—Goldsboro, Hickory, Rocky Mount, and Wilmington—are now part of combined city/county systems and, as discussed below, were categorized into a separate peer group.

The remaining 12 urban systems were ranked according to the combined total of annual:

- Passengers carried (a measure of the number of people served);
- Service miles operated (a measure of the amount of service provided); and,
- Operating expenses (a measure of the cost of providing the service).

Using the combined total of these three statistics (service consumed, service provided and cost of service) was believed to a better reflection of system size and scale than the use of any single statistic.

The result of this ranking was two potential peer groups of 5-7 members each as shown in Table 7:

Table 7: Suggested Urban Peer Groups

Peer Group	System	Passengers	Service Miles	Operating Expenses	Total
1	**Salisbury**	159,601	125,150	$576,713	861,464
1	**Wilson**	173,573	188,039	$608,074	969,686
1	**Greenville**	191,156	190,659	$748,083	1,129,898
1	**Gastonia**	406,266	287,838	$1,288,852	1,982,956
1	**High Point**	567,826	392,716	$1,372,336	2,332,878
1	**Asheville**	998,261	785,164	$3,013,463	4,796,888
1	**Fayetteville**	1,261,069	798,786	$2,781,841	4,841,696
2	**Greensboro**	1,999,302	1,303,440	$6,557,597	9,860,339
2	**Winston-Salem**	2,661,456	1,473,570	$6,690,762	10,825,788
2	**Raleigh**	3,098,320	1,942,765	$9,300,536	14,341,621
2	**Chapel Hill**	4,589,599	1,798,656	$8,015,041	14,403,296
2	**Durham**	4,050,192	2,327,520	$8,615,594	14,993,306

Source: FY 2003 OPSTATS, NCDOT.

As can be seen, Peer Group 1—Medium-Sized Urban Systems—had totals of from 861,000 to almost 5 million. Peer Group 2—Large-Sized Urban Systems—had totals of from 9.8 million to just fewer than 15 million.

For Charlotte, a national peer group of 10 transit systems is suggested. This is discussed in more detail in a later section—Forming National Peer Groups—as well as in Appendix 7.

Creating peers for the Triangle Transit Authority (TTA) and the Piedmont Authority for Regional Transportation (PART) presents a more difficult challenge. They are both large regional systems serving primarily urban areas. At least one NCDOT/PTD official thought they might be a peer group unto themselves. However, PART is much newer and has not yet developed a system of routes and services to the same extent that TTA has. Moreover, TTA is in the process of consolidating with some of the city systems in its service area (in particular Raleigh and Durham), and this will change its nature to some degree. TTA has tried to develop its own group of peers but reports that the members are more dissimilar than they are alike.

An alternative approach that might make more sense for TTA and PART (an approach that TTA is already using to some extent), is to conduct peer comparisons of specific types of routes or services instead of trying to find entire transit systems that are comparable.

Rural Peer Groups

Because there are a large number of rural systems, four primary categories of peer groups are suggested:

1. City/County Systems
2. Regional Systems
3. Human Service Systems
4. Community Transportation Systems

City/County Systems

There are now a number of city/county systems that could be considered as a peer group. These are AppalCART, Goldsboro/Wayne County, Hickory/Catawba County, and Tar River Transit. It is likely that more such systems will be formed. Table 8 provides comparative operating statistics for City/County systems. Note that the data available for AppalCART reflects the combined fixed route and demand-response statistics.

Table 8: City/County Systems

Name	Service Type(s)	Vehicles	Passengers	Miles	Op. Expenses	Pass. + Miles + Exp.
AppalCART (Boone-Wautaga)	Fixed route,					
	Demand-response					
	TOTAL	26	629,478	477,501	$1,079,304	2,466,450
Goldsboro / Wayne County	Fixed route,	4	75,531	186,894	$296,566	
	Demand-response	21	89,232	473,936	$567,423	
	TOTAL	25	164,763	660,830	$863,989	1,815,250
Hickory / Catawba County	Fixed route,	4	132,888	182,608	$790,586	
	Demand-response	20	15,671	100,445	$258,307	
	TOTAL	24	148,559	283,053	$1,048,893	1,624,733
Tar River Transit (Rocky Mount-Nash-Edgecombe)	Fixed route,	6	282,966	296,155	$795,481	
	Demand-response	36	81,886	951,783	$942,452	
	TOTAL	42	364,852	1,247,938	$1,737,933	3,396,066
Wilmington / New Hanover County	Fixed route,	14	1,475,912	606,276	$2,325,486	
	Demand-response	25	54,867	420,241	$977,534	
	TOTAL	39	1,530,779	1,026,517	$3,303,020	6,121,533
Average (Totals)		31	567,686	739,168	$1,606,628	3,084,806

Source: FY 2003 OPSTATS, NCDOT.

Regional Systems

This group includes the five regional, multi-county systems: CARTS (Craven Area Rural Transportation System), CPTA (Choanoke Public Transportation Authority), ICPTA (Inter-County Public Transportation System), KATA (Kerr Area Transportation Authority), and YVEDDI (Yadkin Valley Economic Development District, Inc.). These systems would constitute one peer group. (The new Montgomery/Randolph regional system could be considered for addition to this group.) Table 9 provides comparative operating statistics for the existing multi-county systems.

Table 9: Regional Rural Systems

Name	Service Type(s)	Vehicles	Passengers	Miles	Operating Expenses	Pass. + Miles + Exp.
CARTS	Demand-response	32	108,315	790,262	$706,983	1,605,560
CPTA	Demand-response	60	229,777	1,335,361	$1,402,430	2,967,568
ICPTA	Demand-response	26	101,769	764,991	$1,018,566	1,885,326
KATA	Demand-response	40	146,470	1,413,148	$1,074,668	2,634,286
YVEDDI	Demand-response	67	220,000	1,653,216	$2,219,773	4,092,989
Average		45	161,266	1,191,396	$1,284,484	2,637,146

Source: FY 2003 OPSTATS, NCDOT.

Human Service Systems

There were six such systems operating in FY 2003: McDowell, Pender, Tyrrell, Union, Lincoln and Forsyth Counties. However, only the first four were required to report statistical information for FY 2003. These systems could constitute another peer group. (One of the county systems, Tyrrell, is much smaller than the other three systems which reported data—2 vehicles vs. 12-20 vehicles for the others.) Table 10 provides comparative operating statistics for Human Service systems.

Table 10: Human Service Systems

Name	Service Type(s)	Vehicles	Passengers	Miles	Operating Expenses	Pass. + Miles + Exp.
McDowell	Demand-response	20	81,522	193,246	$0	274,768
Pender	Demand-response	12	36,873	347,960	$339,355	724,188
Tyrrell	Demand-response	2	13,866	36,663	$47,151	97,680
Union	Demand-response	19	55,104	541,418	$582,283	1,178,805
Average		13.25	46,841	279,822	$322,930	666,891

Source: FY 2003 OPSTATS, NCDOT.
Note: McDowell County did not report operating expenses in FY 2003.

Community Transportation Systems

There are 66 Community Transportation Systems (this excludes the Eastern Band of Cherokee Indians which is a special case and four county systems that have consolidated with a fixed route transit system, and were moved to the city/county category). Because of this large number, they were broken into nine smaller peer groups of 6-8 each using the following method. First they were sorted into three equal-sized groups according to system size—the smallest one-third, middle one-third and largest one-third. As with the urban systems, system size was based on a combined total of annual passengers, service miles, and total operating expenses (operating expenses include both operating and administrative expenses). The underlying premise was that system size should be the foremost consideration in creating peers.

Next, each of the three groups was subdivided into three smaller groups based on their population density.[5] The underlying premise of this was that a key determinant of system performance is the density of the area served. In general, it ought to be easier to operate efficiently in an area where there are more people per square mile than in an area where people are few and far between.

The result was nine peer groups as shown in Table 11 on the next page. Additional comparative statistics for each of these systems are provided in Appendix 5.

[5] Population density is the population of the area divided by the square miles of the area. Only land area was used. In rural counties in which an urban transit system operates, the square miles and population in the urban system's service area were subtracted from the counties' total land area and population.

Table 11: Suggested Rural Peer Groups

	Low Density	Medium Density	High Density
Small System Size Counties (24)	Alleghany Bladen Graham Hyde Madison Swain Washington	Avery Beaufort Caswell Jackson Macon Mitchell Yancey	Alexander Cumberland Dare Greene Lee Richmond Scotland Transylvania
Population • Range • Average	 5,826-32,278 14,202	 15,687-44,958 26,003	 18,974-172,201 51,960
Service Area (sq. mi.) • Range • Average	 236-613 475	 222-828 436	 260-589 366
Population Density • Range • Average	 10-45 31	 54-71 61	 71-292 131
Medium System Size Counties (23)	Anson Ashe Cherokee Clay Columbus Davidson Martin	Brunswick Carteret Haywood Hoke Person Polk Rutherford	Caldwell Henderson Iredell Lenoir Pitt Stanly Wilson
Population • Range • Average	 7,246-54,749 24,331	 18,324-73,143 48,150	 59,648-122,660 79,092
Service Area (sq. mi.) • Range • Average	 221-954 519	 239-855 504	 374-626 465
Population Density • Range • Average	 13-57 46	 86-114 94	 116-238 173
Large System Size Counties (23)	Chatham Duplin Harnett Johnston Moore Sampson Robeson Wilkes	Burke Cleveland Durham Onslow Orange Rockingham	Alamance Buncombe Cabarrus Gaston Guilford Mecklenburg Rowan Wake
Population • Range • Average	 49,063-123,339 79,410	 44,314-150,355 89,637	 112,365-316,793 156,310
Service Area (sq. mi.) • Range • Average	 601-951 786	 205-767 484	 284-732 479
Population Density • Range • Average	 60-153 103	 161-216 188	 223-544 335

Note: system size data based on FY 2003 OPSTATS, NCDOT.

Forming National Peer Groups

A key part of benchmarking is comparisons with peers outside North Carolina. As mentioned previously, while a transit system may be performing well in comparison to its peers within the state, it is also necessary to compare the performance of North Carolina transit systems with that of peers from throughout the country to show how well North Carolina systems perform at the national level.

Medium and Large Urban Peer Groups
For urban systems that report data to the National Transit Database, there is a software program that allows easy access to and use of comparative information from transit systems both within the state and throughout the US. This software is particularly useful for forming peer groups. (This tool, the Florida Transportation Information System—FTIS—is explained in detail in Appendix 6. This Appendix also provides information on how to access and use the National Transit Database.)

Use of this tool resulted in the following peer group of 10 for the medium-sized North Carolina urban systems of Asheville, Fayetteville, and High Point:[6]

1. Lynchburg, VA
2. Charlottesville, VA
3. Fairfax, VA
4. Jackson, MS
5. Augusta, GA
6. Columbus, GA
7. Bradenton, FL
8. Lakeland, FL
9. Athens, GA
10. Macon, GA

For the large-sized North Carolina systems of Chapel Hill, Durham, Greensboro, Raleigh, and Winston-Salem, the following peer group of 10 resulted:

1. Alexandria, VA
2. Lexington, KY
3. Savannah, GA
4. Gainesville, FL
5. South Daytona, FL
6. Tallahassee, FL
7. Birmingham, AL
8. Columbia, MD
9. Marietta, GA
10. Charleston, SC

In brief summary, these peer groups were selected by specifying the three variables of annual passenger trips, vehicle miles and operating expenses, and then constraining the search for peers to the Southeast U.S. Comparing the North Carolina systems to the average performance of these peers will provide a good sense of how well North Carolina systems perform compared to similar systems outside the state.

Charlotte Peer Group
For Charlotte, a suggested peer group was formed as follows:

[6] The smaller systems in this medium size peer group—Gastonia, Greenville, Salisbury and Wilson—do not report data to the National Transit Database. Therefore, they were not used in forming this peer group.

1. Two other peer groups that included Charlotte had been formed as part of studies in other states. A list of each of these peer groups was assembled.
2. A third list was generated by ITRE using the software tool FTIS (Florida Transportation Information System) that uses data from the National Transit Database to create a specified number of peers.
3. These three lists were compared and those transit systems that appeared in at least two of the lists were identified. A list of 16 systems resulted (excluding Charlotte).
4. A table was then created listing key operating data for these systems. A total figure was calculated that was the sum of each system's annual passengers, vehicle miles and operating expenses. The average (mean) and standard deviation for this data was calculated.[7] Thirteen systems fell within one standard deviation of the average.
5. Next, the service area and population density for each system were analyzed. Three systems that had unusually large or small service areas, and unusually high or low population densities, were eliminated.

These steps resulted in the following proposed peer group of 10:

1. City of Tucson
2. Memphis Area Transit Authority
3. Rochester Genesee Regional Transportation Authority
4. Connecticut Transit, Hartford Division
5. Transit Authority of River City (Louisville KY)
6. Kansas City Area Transportation Authority
7. Rhode Island Public Transportation (Providence)
8. Ride On Montgomery County (Rockville MD)
9. Central Ohio Transit Authority (Columbus OH)
10. Capital Metropolitan Transportation Authority (Austin TX)

The process used to form this peer group is described in more detail in Appendix 7.

By including only those systems that fell within one-half standard deviation, the above list could be reduced to five:

1. Connecticut Transit, Hartford Division
2. Transit Authority of River City (Louisville KY)
3. Kansas City Area Transportation Authority
4. Rhode Island Public Transportation (Providence)
5. Ride On Montgomery County (Rockville MD)

[7] In regard to a set of data, the standard deviation is a statistic that tells you how tightly all the various data points are clustered around the average or mean. It assumes that the data set is distributed in roughly the shape of a bell-shaped curve. When the data are bunched together fairly tightly and the bell-shaped curve is steep, the standard deviation is small. When the data points are spread apart and the bell curve is relatively flat, it indicates that you have a relatively large standard deviation. In general, about 68 percent of the data points will be found within one standard deviation above or below the mean, about 95 percent within two standard deviations, and 99 percent within three.

Appendix 8 provides a comparison of how these medium and large North Carolina systems compared to their national peers. (Only those North Carolina systems that reported data to the National Transit Database in 2002 were compared.) This peer group analysis revealed that in general North Carolina transit systems compare favorably with their peers. More specifically:

- Medium-sized North Carolina systems perform much better than their peers on such effectiveness measures as passengers per revenue mile and per revenue hour, operating expense per passenger, and recovery ratio. They also perform significantly better on the productive utilization of employees (passenger trips per FTE). They perform worse on such efficiency measures as operating expense per revenue mile and per revenue hour. In addition, they do not utilize their vehicles as much their peers and they have fewer revenue miles between failures.
- Large-sized North Carolina systems also outperform their peers based on passengers per revenue mile and per revenue hour, operating expense per passenger, and recovery ratio. They perform worse on the efficiency measures of operating expense per revenue mile and per revenue hour. They utilize their employees and vehicles more productively, and do slightly better on revenue miles between failures.
- Charlotte performs slightly better or the same on the effectiveness measures of passengers per revenue mile or per revenue hour. It performs significantly better on the measures that relate to operating expense per passenger or per revenue mile/hour. Conversely, Charlotte performs worse on such measures as recovery ratio, passenger trips per employee, vehicle miles per vehicle, and revenue miles between failures.

Rural and Small Urban Peer Groups

Determining potential peers for North Carolina rural, small, and some medium-sized urban transit systems is more complicated than doing so for larger urban transit systems due to these transit systems not being required to report operating statistics data to the National Transit Database (NTD). Correspondingly, the FTIS can't be used to locate appropriate peer systems as was possible for urban transit systems in larger urbanized areas. Therefore, the methodology described below was developed to locate appropriate peers from other states for North Carolina rural transit systems, and for those smaller-sized urban systems that do not report to the NTD. This report was prepared based on data from FY 2003. Smaller-sized urban systems that did not report to the NTD at that time included:

- Salisbury
- Wilson
- Greenville
- Gastonia

Methodology

The methodology for finding potential peers for rural and small urban transit systems involves the following steps, each of which is described in greater detail in Appendix 9:

1. *Gather data*—conduct an Internet search of state departments of transportation to determine which state DOT websites contain operating statistics and other data for rural and small urban transit systems.
2. *Compile the available data*—use Excel or another spreadsheet software to compile the data in tabular format for each of the various categories of transit systems—human service, tribal, single-county rural, multi-county rural, city/county, small urban, and some medium-sized urban.
3. *Filter the data*—delete from further consideration transit systems whose operations are not similar—include only those transit systems with characteristics similar to those of the North Carolina transit system(s) to be compared.
4. *Determine the peers' size*—calculate the combined total of annual passenger trips, service miles, and operating expenses (similar to the calculation described earlier for North Carolina transit systems).
5. *Find the closest matches*—select those national transit systems that have statistical values that are closest to the North Carolina transit system(s) to be compared.
6. (Optional) *Refine the search according to population density*—if a closer similarity among transit systems is desired, determine the population density of the potential national peers. Refer to U.S. Census data for county and/or municipal populations and land areas.
7. *Make the final selection*—select as peers those national systems that most closely match the size (as determined by the sum of passenger trips, service miles, and operating expenses) and the operating area characteristics (using population density).

Following is a description of some of the opportunities and constraints experienced in developing a list of potential national peer systems for the following types of North Carolina transit systems:

- Human service transportation systems
- Tribal transportation systems
- Single-county community transportation systems
- Multi-county community transportation systems
- City/county transportation systems
- Small urban transportation systems

Human Service Transportation Systems

There are few human service transportation systems available for use as peers. This is because the majority of states for which operating statistics data are available on the Internet do not operate *coordinated* human service transportation systems, but simply provide FTA Section 5310 funds to individual human service agencies for vehicle purchase. Information for nine potential peers is provided in Appendix 9.

Tribal Transportation Systems

While transportation systems operated by Native American tribes provide service in several states, many of those transportation systems operate fixed route service, and so are dissimilar to the operations of the Eastern Band of Cherokee Indians (EBCI) Transit

Services in North Carolina. However, information is provided for two potential peers, one each in Minnesota and New Mexico, in Appendix 9.

Single-County Community Transportation Systems
In developing the list of potential peers for single-county community transportation systems, care was taken to include only those transit systems that operate demand-response service and that also report operating statistics within ranges similar to those reported by North Carolina systems. Information is provided in Appendix 9 for 60 transit systems operating in eight states.

Multi-County Community Transportation Systems
Care was also taken when selecting multi-county transportation systems to match values for operating statistics and for the number of counties served as closely as possible to ranges of values for North Carolina multi-county systems. Information is provided in Appendix 9 for 17 multi-county transit systems operating in six states.

City/County Transit Systems
Again, in developing a list of potential peers for city/county transit systems, operating statistics values were reviewed carefully to correspond as closely as possible to ranges of values for North Carolina systems. Note that some states provide information separately for fixed route and demand-response services, while others provide only combined data. Data for the ten potential peer transit systems in Appendix 9 contains combined totals for all potential peers plus information for fixed route and demand-response services, as available.

Small and Small Medium-Sized Urban Systems
Selecting peers for very small North Carolina urban systems (Cary, Concord/Kannapolis, Henderson, and Jacksonville), was somewhat difficult due to the lack of available operating statistics data for some North Carolina systems in this category. Nonetheless, operating statistics data for eight potential peers operating in five states are presented in Appendix 9. These systems were selected based on the information available for North Carolina transit systems, and provide the best matches given the information available as of December 2005.

Twenty-three transit systems operating in nine states constitute potential peers for the smaller medium-sized urban transit systems in North Carolina (those that don't report statistics to the NTD—Gastonia, Greenville, Salisbury, and Wilson). Selection was again based on similarities among operating statistics to the range of statistics reported by North Carolina transit systems in this category. Most statistics are those for combined fixed route and demand-response services; separate statistics are included as available.

Appendix 10 provides performance measure information for North Carolina human service, multi-county, city/county and single-county transit systems.

Reporting on Benchmarking to the NCDOT/Public Transportation Division

Transit agencies should provide a summary of their benchmarking activities and results to NCDOT/PTD annually. This report should be submitted to NCDOT/PTD in conjunction with the annual OPSTATS reporting each fall. At minimum, this report should include a description of the following:

1. The process used (e.g. a comparison with last year's results, and/or a peer group analysis).
2. Who was involved in the process (staff? management? board?), and how.
3. The specific performance measures used.
4. The results of the comparisons or analysis, and the conclusions drawn from them.
5. The steps taken or in progress to improve performance in those areas found lacking.

VII. Minimum State Standards

In addition to requiring that North Carolina public transportation systems conduct an internal benchmarking process as a way of improving performance, it is recommended that the NCDOT/PTD adopt minimum benchmark standards for all systems. A small number of performance measures drawn from the list developed in a previous section of this report (refer to Table 6, on page 34) are recommended in order to keep the method relatively simple to understand and administer. The proposed standards are efficiency and effectiveness measures, under the assumption that the primary goal of the NCDOT/PTD is to increase system productivity and to use limited state funding most effectively. For this reason, standards relating to "service coverage" have not been included because they can often result in less efficiency and/or effectiveness.

The recommended benchmark measures for which to apply minimum standards are shown in Table 12 below:

Table 12: Recommended Measures for Minimum State Standards

Benchmark Measure	Fixed Route	Urban Demand Response/ ADA	Rural Demand Response
Passengers trips/vehicle mile	X	X	X
Passenger trips/vehicle hour	X	X	X
Cost/passenger trip	X	X	X
Cost/vehicle mile	X	X	X
Cost/vehicle hour	X	X	X
Vehicle miles/vehicle	X	X	X
Passenger trips/driver FTE	X	X	X
Accidents/100,000 vehicle miles	X	X	X
Revenue miles between failures	X	X	X
Recovery ratio	X		
No shows as a percent of passenger trips		X	X

The minimum state standard for each benchmark measure could be set in one of two basic ways: 1) using a North Carolina-based approach, or 2) using a nationally-based approach. Each of these is discussed, concluding with a recommended approach.

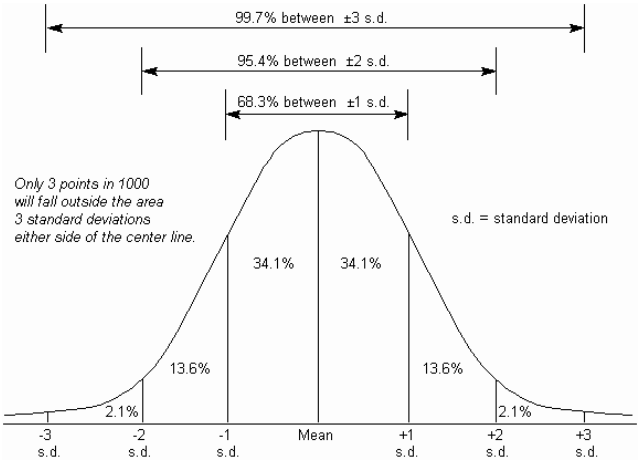
A North Carolina-Based Approach

For each desired benchmark measure, the mean (average) could be calculated for each relevant peer group. The standard deviation for each measure within each group would then be calculated.[8] The minimum standard for each benchmark measure would be

[8] The simplest way to calculate the standard deviation of a set of data is to use the standard deviation formula in Excel (or a comparable spreadsheet program). For example, in Excel, the standard deviation of

defined as one standard deviation below the mean. As indicated by Figure 7 below, this would mean that approximately 5/6th of the data would be above the standard, and 1/6th below.

Figure 7: Standard Deviation



A problem with the standard deviation approach is that it sets the bar fairly low. Assuming that the data represents a relatively normal distribution (as in the bell curve above), only about 16 percent of the data would be more than one standard deviation below the mean. However, some states do use this approach. (As an alternative, the minimum standard could be set at ½ a standard deviation from the average—approximately 30 percent would then be less than the minimum standard.)

Somewhat simpler to understand and administer, a percentile approach could be used instead of a standard deviation. For example, the data could be arrayed from lowest to highest and any measures at the 25th percentile or less (the lowest one-quarter) would be considered substandard.

A better approach than this simple "pass/fail" concept would be to create a four-tier "excel/pass/warning/fail" concept instead. For example,

- "Excel" = one standard deviation or better above the mean (or the 85th percentile or above).
- "Pass" = better than ½ standard deviation below the mean but less than one standard deviation above the mean (or better than the 25th percentile but less than the 85th percentile).
- "Warning" = from ½ to 1 standard deviation below the mean (or between the 15th and 25th percentiles).
- "Fail" = more than one standard deviation below the mean (or less than the 15th percentile).

---

an array of data in cells A1-A10 can be calculated by the formula "=STDEVA(A1:A10)" if the data represents the entire population, or "=STDEVPA(A1:A10)" if the data represents a sample of the population.

Another North Carolina-based approach could be for some kind of performance standard to be imposed by the NCDOT/PTD, the NCDOT Board of Transportation or the North Carolina Legislature. For example, some states require that transit systems meet a minimum farebox recovery ratio. A disadvantage to this approach is its rigidity during times of change.

A Nationally-Based Approach

The second approach would be to set standards for each desired category of transit system based on, for example, the performance of comparable systems outside the state. However, developing comparable national peer groups is not simple even for urban systems for which data from the National Transit Database is available. It is even more difficult for small urban or rural systems for which such comparative national data is not available.

The Recommended Approach

It is recommended that a North Carolina-based approach be used. North Carolina-based standards will be easier to develop and should be more acceptable than standards based on transit systems outside of North Carolina. (A nationally-based approach may be the only realistic alternative in the case of Charlotte.)

Two possible North Carolina-based approaches are suggested below:

1. An approach modeled after one used in the State of Wisconsin wherein transit systems are evaluated within peer groups based on a number of performance measures (six in the case of Wisconsin). For each performance measure, the average (mean) and standard deviation are calculated. For a system to "pass muster," it must perform better than one standard deviation below the average on some number of the measures (for Wisconsin it's 4 out of 6).
2. An approach based on scores developed using a number of performance measures. These scores are developed within peer groups, and then used to compare all transit systems to one another.

Note: Each of these approaches has several possible variations. For example, instead of using the concept of standard deviations as a component, percentiles could be used.

These two approaches are described in more detail below.

1. The Wisconsin Model

The Wisconsin Department of Transportation (WisDOT) has adopted an interesting approach. WisDOT uses six performance measures. Without debating their merits, they are:

1. Passenger trips per capita
2. Cost per passenger trip
3. Cost per vehicle revenue hour

4. Recovery ratio
5. Passenger trips per vehicle revenue hour
6. Vehicle revenue hours per capita

For each measure, the average (mean) and standard deviation are calculated within the following six peer groups.

1. Milwaukee (and similar-sized national peers)
2. Madison (and similar-sized national peers)
3. Medium Bus Systems (and similar-sized national peers)
4. Small Bus Systems (in Wisconsin)
5. Commuter Bus Systems (in Wisconsin)
6. Shared-Ride Taxi Systems (in Wisconsin)

Based on these calculations, a process involving up to four steps is used to determine whether a system meets the minimum standards.

Step 1: Systems that are not more than one standard deviation below the mean on four of the six measures are considered in compliance.

Step 2: For systems not in compliance, tables showing their performance for each of the measures for the previous five years are prepared. Systems that show improvement in measures for which they were out of compliance are deemed in compliance if the number of these measures, when added to the in-compliance measures from Step 1, total four or more.

Step 3: For systems still not in compliance after Steps 1 and 2, their implementation status in regard to their most recently completed management performance audit is assessed. A system that has made significant progress in implementing the majority of recommendations aimed specifically at efficiency/effectiveness is deemed in compliance.

Step 4: If a system remains out of compliance after Step 3, the state provides technical assistance to aid in implementation of the management performance audit recommendations. (If consultant services are required, the system pays the non-federal share of the costs.) If a management performance audit has not been performed in the last three years, WisDOT schedules an audit as soon as possible.

Systems out of compliance as outlined above are given a three-year period to comply before being assessed a financial penalty. After three years of non-compliance, a 10 percent funding penalty is imposed, i.e. the system receives only 90 percent of what it would have otherwise been entitled to. The penalty stays in effect until the system comes into compliance.

NCDOT/PTD might adopt this general approach with the following modifications:

- Rather than a simple pass/fail dichotomy, four categories of performance could be established—fail/warning/pass/excel. (It's important to reward high performance, not just penalize poor performance.)
- Because 10 benchmark measures are proposed for North Carolina vs. the six used by Wisconsin, compliance could be defined as receiving a passing or warning grade on seven of the 10 measures rather than four of the six. At least five of the seven might be required to be at least at the passing level.
- In Step 2, three rather than five years of previous performance ought to be sufficient for this purpose.
- In Step 3, because North Carolina systems are not required to undertake regular management performance audits, this step could instead be altered to indicate compliance if the system is using an internal benchmarking process in a meaningful way as recommended in this Benchmarking report. In addition, a procedure could be established whereby PTD staff would meet with transit agency management and jointly establish performance improvement goals. Progress on the goals would be then monitored by PTD.
- Penalties could be imposed sooner, e.g. after two years instead of three.
- Penalties could be made progressive, e.g. a 10 percent funding reduction the 1st year, 20 percent the 2nd, and 30 percent thereafter.

Systems with several measures in the "warning" zone would be forewarned that consideration of corrective action would be appropriate.

In addition to considering penalties for poor performance, it is recommended that some kind of rewards be given for "exemplary" performance. Exemplary performance might be defined as a system that excels on at least six of the 10 benchmark measures. There are several possibilities for rewards:

- *Recognition Programs*. For example, systems that achieve exemplary performance could be given special recognition at the NCPTA or Community Transportation Conference annual meetings.
- *Financial Incentives*. Exemplary systems might be given financial rewards such as increased administrative funding, or higher priority for capital equipment investments.
- *Administrative Incentives*. High-performers could be given relaxed reporting requirements, or increased budget flexibility.

Because the recommended NC peer groups are relatively small (from 5-9 members each), it may make sense to use larger aggregations of systems for purposes of applying the minimum standards under this approach, e.g.:

- Urban fixed route systems
- Urban ADA/demand-response systems
- Urban regional systems
- Rural regional systems
- Rural city/county systems
- Rural community transportation systems

- Rural human service systems

2. A "Scoring" Approach

A somewhat different approach involves calculating a total "score" for each transit system based on its performance on the selected measures within its peer group. The following steps would be involved:

1. Within each peer group and for each performance measure, an average (mean) and standard deviation (std dev) would be calculated. Transit systems would be given a score for each measure as follows:

Table 13: Scoring Criteria

Score	Description	Criteria
0	Fail	More than 1 std dev below the mean
1	Warning	From 1 to ½ std dev below the mean
2	Pass	½ std dev below the mean or greater
3	Above Average	Above the mean
4	Excel	1 std dev above the mean or greater

2. The scores for each measure would then be summed and an average calculated. The result would be a total score for each transit system. An example of this using seven common performance measures is shown in Table 14 below.

Table 14: Mid-sized Urban Systems

Transit System		Psgrs/Veh Mi.	Psgrs/Veh Hr.	Cost/Psgr	Cost/Veh Mi.	Cost/Veh Hr.	Veh Mi/Veh	Recovery Ratio	Avg. Score
		Fail < 1.00 Pass > 1.12 Avg > 1.24 Excel > 1.47	Fail < 15.60 Pass > 16.97 Avg > 18.33 Excel > 21.06	Fail > $3.60 Pass < $3.30 Avg < $3.00 Excel < $2.41	Fail > $4.37 Pass < $4.01 Avg < $3.65 Excel < $2.94	Fail > $60.20 Pass < $56.95 Avg < $53.71 Excel < $47.21	Fail < 40,562 Pass > 42,846 Avg > 45,131 Excel > 49,700	Fail < 13.7% Pass > 16.1% Avg > 18.6% Excel > 23.5%	
1	Value	1.28	17.77	3.61	4.61	64.22	41717	11.8	
	Score	3	2	0	0	0	1	0	0.86
2	Value	1.00	14.53	3.91	3.92	56.85	47665	11.5	
	Score	1	0	0	2	2	3	0	1.14
3	Value	0.92	13.88	3.50	3.23	48.63	47010	20.1	
	Score	0	0	1	3	3	3	3	1.86
4	Value	1.41	20.08	3.17	4.48	63.71	47973	14.9	
	Score	3	3	2	0	0	3	1	1.71
5	Value	1.45	19.98	2.42	3.49	48.29	35701	24.8	
	Score	3	3	3	3	3	0	4	2.71
6	Value	1.61	21.26	2.39	3.84	50.80	49073	21.3	
	Score	4	4	4	2	3	3	3	3.29
7	Value	1.25	17.62	2.79	3.48	49.09	49924	20.3	
	Score	3	2	3	3	3	4	3	3.00

Key: 0 = fail, 1 = warning, 2 = pass, 3 = above avg, 4 = excel

3. Scores for all transit systems (for all peer groups) would then be arrayed from lowest to highest. There are three ways that this data could be evaluated:
    a. A mean and standard deviation for all the scores could be used in order to determine acceptable or unacceptable performance. The same standard deviation method used in the last two columns of the table above could be used to decide which systems would receive a fail, warning, pass or excel grade.
    b. Similarly, a simple percentile approach could be used. For example, systems falling below the 15th percentile would fail. Systems between the 15th and 30th percentiles would be in a warning status. Systems above the 30th percentile would pass. And systems above the 85th percentile would receive an excel rating.
    c. Finally, the scores themselves could be used. For example, if a system had a total score less than 1, it would fail, from 1-2, it would receive a warning, 2 or above, it would pass, and 3 or above, it would excel.

Table 15 on the next page shows examples of these three alternatives.

Table 15: Minimum Standards Scoring

Minimum Standards Scoring

System	System Type	Score	Percentile	Method 1 Std Dev	Method 2 Percentile	Method 3 Basic Score
1	R-S	0.67	0%			
2	R-L	0.67	0%			
3	R-S	0.83	2%			
4	R-M	0.83	2%			
5	U-M	0.86	5%			Fail ↑
6	U-L	1.00	6%			
7	U-M	1.14	7%			
8	R-S	1.17	8%			
9	R-M	1.17	8%			
10	R-M	1.17	8%			
11	R-L	1.17	8%			
12	R-R	1.17	8%			
13	R-L	1.33	14%			↑
14	R-L	1.33	14%		Fail ↑	Warning
15	U-L	1.43	17%			↓
16	R-S	1.50	18%			
17	R-M	1.50	18%			
18	R-L	1.50	18%	Fail ↑		
19	R-S	1.67	22%			
20	U-M	1.71	23%	↑		
21	R-S	1.83	24%	Warning	↑	
22	R-S	1.83	24%	↓	Warning	
23	R-S	1.83	24%		↓	
24	U-M	1.86	28%	Pass↓		
25	R-S	2.00	29%			Pass↓
26	R-S	2.00	29%			
27	R-S	2.00	29%			
28	R-M	2.00	29%			
29	R-M	2.00	29%			
30	R-L	2.00	29%			
31	R-S	2.17	36%		Pass↓	
32	R-S	2.17	36%			
33	R-M	2.17	36%			
34	R-M	2.17	36%			
35	R-M	2.17	36%			
36	R-M	2.17	36%			
37	R-L	2.17	36%			
38	R-L	2.17	36%			
39	R-L	2.17	36%			
40	R-S	2.33	47%	Above Avg ↓		
41	R-S	2.33	47%			
42	R-M	2.33	47%			
43	R-M	2.33	47%			
44	R-L	2.33	47%			
45	R-L	2.33	47%			
46	R-L	2.33	47%			
47	R-R	2.33	47%			
48	R-S	2.40	57%		Above Avg ↓	
49	R-M	2.40	57%			
50	U-L	2.43	59%			
51	U-L	2.43	59%			
52	R-S	2.50	61%			
53	R-M	2.50	61%			
54	R-L	2.50	61%			
55	R-L	2.50	61%			
56	R-L	2.50	61%			
57	R-S	2.67	67%			
58	R-S	2.67	67%			
59	R-S	2.67	67%			
60	R-M	2.67	67%			
61	R-M	2.67	67%			
62	R-M	2.67	67%			
63	R-M	2.67	67%			
64	R-L	2.67	67%			
65	R-L	2.67	67%			
66	R-R	2.67	67%			
67	U-M	2.71	80%			
68	R-M	2.83	81%			
69	R-M	2.83	81%			
70	R-L	2.83	81%			
71	U-M	2.86	84%			
72	R-S	3.00	86%	Excel↓	Excel↓	Excel↓
73	R-M	3.00	86%			
74	R-L	3.00	86%			
75	R-R	3.00	86%			
76	R-R	3.00	86%			
77	U-M	3.00	86%			
78	U-L	3.14	93%			
79	R-S	3.17	94%			
80	R-S	3.17	94%			
81	U-M	3.29	96%			
82	R-L	3.33	98%			
83	R-L	3.33	98%			
84	R-M	3.50	100%			

Key to System Types:
R-S = Rural Small
R-M = Rural Medium
R-L = Rural Large
R-R = Rural Regional
U-M = Urban Medium
U-M = Urban Large

Method 1 (Std Dev):
Fail = <-1 std dev
Warning = -1 to -l/2 std dev
Pass = >-l/2 std dev =
Above average = >avg std dev
Excel = >1 std dev

Method 2 (Percentile):
Fail = <15 percentile
Warning = 15-30 percentile
Pass = 30+ percentile
Above average = >50+
Excel = 85+

Method 3 (Basic Score):
Fail = <1
Warning = 1-2
Pass = 2+
Excel = 3+

Standard Deviation Calculations:
Average score = 2.20
Std Dev = .69

Fail = <1.51
Warning =1.51-1.86
Pass = >1.86
Above average = >2.20

This approach has several benefits and it is therefore recommended:

- A total score can be developed for a system even if for some reason it's missing data for some measures.
- It provides a simpler and more comprehensive method than having to decide fail/pass within each peer group. Systems would in effect be obtaining a score within their peer group, but they would be judged as passing or failing in the context of all North Carolina transit systems.
- It avoids the problem of cost-based measures having to be "de-inflated" (otherwise these measures would tend to get worse each year just from the effects of price inflation).

As in the Wisconsin model, a process of remediation could be developed to help systems that are at the fail or warning level to improve their performance and achieve compliance. For example, if they have implemented (or agree to implement) a meaningful benchmarking process, including both trend analysis and peer comparisons, they could be deemed to be in compliance for that year. In addition, they could be required to meet with PTD staff, mutually set performance improvement goals, and discuss strategies to achieve the goals. The PTD would then monitor progress over the year. As appropriate, PTD staff could provide some kind of technical assistance.

Under either approach, once standards are set, they should be communicated to each transit system.

One question that arises is "how often should the standards be set and for how long should they be in force?" There are at least three alternatives:

1. The standards could be set at the beginning of the benchmarking program and remain in effect for a period of years. (However, at minimum they should be revisited every 3-5 years.)
2. They could be set each year at the time that OPSTATS reports are received and processed by NCDOT/PTD, and then be applied to the following fiscal year.
3. They could be set contemporaneously, i.e. they would be set when the OPSTATS data is final and they would apply to the current fiscal year.

It is recommended that the standards be developed each year and then apply to the succeeding year (Alternative 2 above). Developing the standards each year will provide at least two benefits. First, the standard will better reflect changing conditions. Second, performance improvement by NC transit systems will lead to a gradual raising of the performance bar. By lagging the application of the standards by one-year, the transit systems would have advance warning in the event they don't currently meet the standards. They would then be able to take steps to make necessary changes by the time the standards take effect the following year.

It is possible that some systems will be unable to meet the minimum standards due to local goals (such as providing broad geographic coverage). In such a case, the NCDOT/PTD could treat such a system the same as any other system that is not meeting minimum standards, e.g. by providing progressively reduced funding. The system could

then choose to either raise its performance or provide more local funds in support of its more costly local goals.

A factor that needs to be considered in assessing compliance with minimum standards is the age of the system. A new system is likely to perform less productively than a mature system if only because it takes time to build ridership and iron out startup problems. For this reason, it is proposed that transit systems not be included in such an assessment until they have operated at least two years.

In the end, it is important to recognize that benchmarking is part science, part art. It is one of many tools that can be used to help organizations achieve better performance. However, its use requires good judgment and analysis. For example, apparent sub-par performance may only be the result of poor data, or differences in how performance measures are defined or reported. In addition, poor performance may be caused not by poor management, but instead by external factors over which management has little or no control. Used wisely, benchmarking can be a valuable tool. Used rigidly, or without good analysis, it can be misleading and counterproductive.

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Appendices

Appendix 1: Customer Satisfaction "Quadrant Analysis"

In quadrant analysis, customers are asked not only how satisfied they are with a particular aspect of performance, but how important it is to their overall satisfaction level. For example, a customer may consider "safety" to be a very important factor in using transit, but if he or she perceives the safety of the system to be very high, then it is not as great of a consideration as another factor deemed to be very important to that customer, on which the system may not be performing as well. The key is to measure not just the perceived performance of the transit system in regard to a particular factor, but also its importance, and to then focus efforts on areas where importance is high and system performance is low.

Quadrant analysis allows each factor to be placed in an appropriate quadrant in the following table:

Quadrant Analysis

		Importance	
		High	***Low***
Performance	***High***	I Strengths	II Maintain
	Low	III Opportunities	IV Non-critical

Factors that rate high in both importance and performance (Quadrant I) are considered system strengths. The appropriate strategy for these is to "keep on doing what you've been doing." Factors that have low importance and high performance (Quadrant II) should be low in priority but should be maintained if possible. Factors high in importance but low in performance (Quadrant III) should be considered as opportunities. Improvements in these factors can have a high payoff in terms of customer satisfaction. Factors that are both low in importance and low in performance (Quadrant IV) suggest a strategy of shifting resources from these factors into higher-payoff areas.

Appendix 2: List of Stakeholders Interviewed

Category	Name	Title/Affiliation
NCDOT	David King	Deputy Secretary
	Miriam Perry	Director, Public Transportation Division (PTD)
	Charles Glover	Assistant Director, Community Transportation Branch
	Mike Kozak	Assistant Director, Metropolitan Transportation Branch
North Carolina Board of Transportation	Nancy Dunn	Board of Transportation, and Piedmont Authority for Regional Transportation (PART)
North Carolina Public Transportation Association	David Eatman	President
Transit System Manager—Rural	Denise Braine	Mountain Mobility
	Rebecca Clayton	Martin County Transit
	Tom Crider	Transportation Administration of Cleveland County
	Keith McCoy	Transylvania County Transport
	Priscilla Dorsey	Lumber River Council of Governments
	Don Willis	Wake Coordinated Transportation Services
Transit System Manager—Urban	David Nuckolls	Concord/Kannapolis Area Transit
	Patrick McDonough	Triangle Transit Authority
	David Eatman	City of Raleigh CAT
	Libby James	Greensboro Transit Authority
Counties	Bob Sorrels	Wake County, Deputy Director of Human Services
Human Service Agencies	Phyllis Bridgman	NC Department of Health and Human Services (DHHS), Division of Aging
	Kathy McGehee	NC DHHS

Appendix 3: "Cleansing" Cost Data of Price Inflation

In the normal course of events, costs will increase year after year if only due to inflation. Using these inflated costs in calculating performance measures can make it look like performance is deteriorating when in actuality it is stable or improving. It is therefore valuable to remove the inflationary effects before analyzing performance.

One method for doing this is to use Consumer Price Index data to "de-inflate" the cost figures. This method is described below.

Step 1—Determine Inflation Factor for Desired Years

First, obtain price inflation data for the years under consideration. This can be obtained from the U.S. Bureau of Labor Statistics at www.bls.gov/cpi/home.htm. At that website, click on "Get Detailed CPI Statistics. A good CPI index to use is "Urban Wage Earners and Clerical Workers (Current Series) because this reflects labor costs which are the primary component of transit operating expenses. If you click on that index, you'll go to a webpage that allows you to choose more specifically the kind of price data you want. Check the box for "South Region All Items," then click on "Retrieve Data," and you will get a table of the relevant index numbers.

Next, convert this data to a new base year (by dividing each year by the value of the first year and multiplying by 100). The following provides an example of this.

	2000	2001	2002	2003	2004
CPI[9]	165.5	169.2	170.8	174.4	178.6
Convert to new base year (new inflation factor)	100.0	102.2	103.2	105.4	107.9

Step 2—"De-Inflate Cost Data

The next step is to de-inflate cost data using the new inflation factor calculated in Step 1. To do this, divide the cost data by the new inflation factor and multiply by 100.

	2000	2001	2002	2003	2004
Transit system costs	$354,873	$361,492	$365,930	$373,984	$382,539
Inflation factor from Step 1	100.0	102.2	103.2	105.4	107.9
System costs without inflation	$354,873	$353,587	$354,575	$354,899	$354,480

Note that in this example, rather than costs increasing from 2000-2005, they actually decreased slightly after inflation was taken into consideration.

[9] Consumer Price Index—Urban Wage Earners and Clerical Workers—Current Series, South Region, 1982-1984 = 100.

Step 3—Calculate Performance Measures Cleansed of Inflation

Now, use these de-inflated costs for calculating such performance measures as cost/vehicle hour, or cost/passenger trip.

Appendix 4: Customer Survey Sampling

When doing customer surveys, the use of sampling techniques should be considered in order to reduce the time and cost involved in doing such surveys. It is not necessary to survey everyone in order to obtain reliable information, only a large enough sample to be representative of the whole. The following table gives a general idea of the size of the sample needed to give a reasonable approximation for an entire group. Note that as the size of the population increases, the required sample size as a percentage of the population declines rapidly. Also, at the larger population sizes, there is only a small increase in the sample size required. Sample accuracy would therefore increase only slightly by going to a bigger sample.

Required Sample Sizes at a Confidence Level of 95%

	Confidence Interval			
	+ or - 3%		**+ or - 5%**	
Population Size	**Sample Size**	**Sample %**	**Sample Size**	**Sample %**
1,000	516	51.6%	278	27.8%
10,000	964	9.6%	370	3.7%
50,000	1,045	2.1%	381	0.8%
100,000	1,056	1.1%	383	0.1%

Definitions:

- *Population*: the number of people in the "population" or group that you want to represent with the sample. The larger the population, the smaller the percentage of that population that needs to be sampled in order to accurately reflect the whole.
- *Confidence level*: an indication of how sure you can be about a statistic from the sample. For example, a confidence level of 95% indicates that you can be 95% confident that the sample data reflects the entire population. 95% is the most commonly used confidence level; however, 99% is sometimes used.
- *Confidence interval*: the plus or minus percentage figure often used in media reports, e.g. "based on the survey, 35% of respondents, plus or minus 3%, oppose the death penalty." This means, for example, that you can be 95% sure that if you had asked that question of the entire population, between 32% and 38% of them would have picked the same answer as the sample did. (This statistic is sometimes referred to as the "estimation error" or "precision level.")

An underlying assumption in statistical sampling is that the sample is selected randomly and is chosen in a way that the entire population is represented. If this is not the case, survey results can be very misleading. For example, if you survey riders on a particular bus route on a weekday, you cannot expect the survey results to accurately reflect your entire ridership. It may be that the weekday riders on that bus route are primarily male workers going to work at a particular industrial location. Other types of riders making other kinds of trips, at other times of the day or week, would not be represented.

An easy to use sample size calculator is available at:

www.surveysystem.com/sscalc.htm.

All you have to do is enter the level of confidence you want to have about the results (95% or 99%), the confidence interval desired (plus or minus x %—a typical range is 3% or 5%), and the size of the population you are sampling (e.g. the number of individual riders on your system on a given day). The calculator will then give you the size of the sample required. (Conversely, the same webpage allows you to calculate the confidence interval for a given sample size and population.)

Note: if it is expected that analysis of the data will include "cross tabs" (e.g. determining the response of male vs. female riders that answer a question in a particular way, or the number of female riders who are making a work trip), then the sample size must be increased to reflect the smaller number of individuals in each sub-group. Otherwise, the confidence interval could widen considerably. However, this gets into issues of survey "stratification" and sampling methodology that are beyond the scope of this Guidebook.

For more information about on-board transit survey techniques, there is an excellent new report on the topic available from the Transit Cooperative Research Program—*On-Board and Intercept Transit Survey Techniques*.[10]

[10] TCRP Synthesis 63, *On-Board and Intercept Transit Survey Techniques: A Synthesis of Transit Practice*, Transportation Research Board, Wash. D.C., 2005.

Appendix 5: Selected Statistics for North Carolina Community Transportation System Peer Groups

		PEER GROUPS OF NORTH CAROLINA RURAL TRANSIT AGENCIES								
Peer Group	Counties	Number of Vehicles	Grantee (1)	Annual Passengers	Annual Service Miles	Annual Service Hours	Total Expenses (2)	Rural Population	Rural Area	Population Density
PEER GROUP I Small System Size, Low Density	Alleghany	11	CC	22,205	273,220	10,436	$260,100	10,677	236	45
	Bladen	16	CC	39,568	187,542	16,347	$289,367	32,278	887	36
	Gates	9	CC	31,771	360,222	13,780	$272,316	10,516	346	30
	Graham	14	CC	12,500	128,101	7,866	$169,848	7,993	302	26
	Hyde	6	NP	18,793	167,619	5,834	$176,583	5,826	613	10
	Madison	13	CC	57,738	259,220	14,489	$328,554	19,635	452	43
	Swain	17	NP	71,799	219,749	26,104	$240,716	12,968	541	24
	Washington	8	CC	17,617	130,532	9,880	$186,056	13,723	424	32
	Average	**12**		**33,999**	**215,776**	**13,092**	**$240,443**	**14,202**	**475**	**31**
PEER GROUP II Small System Size, Medium Density	Avery	12	CC	59,714	186,416	17,134	$291,680	17,167	247	69
	Beaufort	14	NP	47,995	253,497	8,928	$355,625	44,958	828	54
	Caswell	11	CC	19,017	235,096	8,927	$265,225	23,501	428	55
	Macon	25	CC	38,568	260,922	15,854	$424,756	29,811	519	57
	Jackson	14	CC	26,973	188,380	9,242	$334,708	33,121	495	67
	Mitchell	10	CC	49,178	188,147	9,666	$262,047	15,687	222	71
	Yancey	11	CC	36,459	124,314	8,232	$201,158	17,774	313	57
	Average	**14**		**39,701**	**205,253**	**11,140**	**$305,028**	**26,003**	**436**	**61**
PEER GROUP III Small System Size, High Density	Alexander	9	CC	23,875	152,452	13,608	$198,064	33,603	260	129
	Cumberland (3)	0	CC	34,969	194,539	4,444	$255,956	172,201	589	292
	Dare	7	CC	13,155	254,005	9,856	$189,226	29,967	384	78
	Greene	7	CC	21,357	217,654	7,269	$240,643	18,974	266	71
	Lee	17	CC	61,433	230,899	29,698	$372,406	49,040	257	191
	Richmond	11	NP	94,646	191,753	13,640	$335,145	46,564	474	98
	Scotland	13	CC	54,486	159,245	7,720	$300,013	35,998	319	113
	Transylvania	11	NP	48,943	221,694	13,871	$251,068	29,334	378	78
	Average	**9**		**44,108**	**202,780**	**12,513**	**$267,815**	**51,960**	**366**	**131**
PEER GROUP IV Medium System Size, Low Density	Anson	12	CC	44,725	366,369	17,046	$365,100	25,275	537	47
	Ashe	19	NP	48,032	414,281	23,465	$431,963	24,384	427	57
	Cherokee	19	CC	42,487	281,251	21,637	$261,017	24,298	467	52
	Clay	12	CC	36,256	376,418	19,509	$338,401	8,775	221	40
	Martin	17	CC	54,709	368,262	18,698	$388,763	25,593	461	56
	Davidson	22	CC	84,372	369,853	30,320	$700,962	7,246	567	13
	Columbus	17	CC	42,930	459,672	20,962	$416,152	54,749	954	57
	Average	**17**		**50,502**	**376,587**	**21,662**	**$414,623**	**24,331**	**519**	**46**
PEER GROUP V Medium System Size, Medium Density	Rutherford	33	CC	55,991	454,287	27,331	$456,054	62,899	566	111
	Carteret	17	CC	54,045	406,699	20,402	$539,765	59,383	520	114
	Brunswick	26	NP	43,177	279,041	12,503	$340,937	73,143	855	86
	Haywood	25	NP	66,921	378,750	27,050	$674,551	54,033	555	97
	Hoke	19	CC	53,082	387,528	19,351	$427,295	33,646	392	86
	Person	14	CC	62,159	330,767	23,565	$414,664	35,623	404	88
	Polk	13	CC	43,679	232,213	11,351	$411,323	18,324	239	77
	Average	**21**		**54,151**	**352,755**	**20,222**	**$466,370**	**48,150**	**504**	**94**
PEER GROUP VI Medium System Size, High Density	Caldwell	15	NP	47,784	291,328	13,763	$456,608	77,415	474	163
	Henderson	34	NP	153,700	407,514	52,110	$808,236	89,173	375	238
	Iredell	28	CC	86,174	654,862	38,496	$376,703	122,660	597	205
	Lenoir	11	CC	56,851	311,873	19,954	$467,815	59,648	402	148
	Pitt (3)	0	NP	43,049	411,696	23,547	$554,355	72,832	626	116
	Stanly	21	CC	75,931	341,963	22,877	$528,580	58,100	404	144
	Wilson	14	CC	52,085	365,288	18,732	$435,885	73,814	374	197
	Average	**18**		**73,653**	**397,789**	**27,068**	**$518,312**	**79,092**	**465**	**173**
PEER GROUP VII Large System Size, Low Density	Chatham	26	NP	99,675	505,747	23,795	$618,118	49,329	709	72
	Duplin	22	CC	82,149	589,356	27,987	$648,085	49,063	819	60
	Harnett	24	CC	70,209	816,877	30,568	$660,025	91,025	601	151
	Johnston	30	NP	71,900	1,203,517	64,450	$975,284	121,965	796	153
	Moore	30	CC	69,248	722,410	33,638	$719,413	74,769	706	106
	Robeson	20	A	85,318	491,470	23,453	$851,185	123,339	951	130
	Sampson	30	CC	77,117	505,776	19,424	$512,188	60,161	947	64
	Wilkes	25	NP	36,746	360,919	33,942	$621,825	65,632	760	86
	Average	**26**		**74,045**	**649,509**	**32,157**	**$700,765**	**79,410**	**786**	**103**
PEER GROUP VIII Large System Size, Medium Density	Burke	22	NP	52,124	534,348	24,755	$699,158	89,148	515	173
	Cleveland	24	NP	96,079	703,011	35,301	$844,987	96,287	469	205
	Durham	22	CC	48,813	563,560	21,877	$822,815	44,314	205	216
	Onslow	18	NP	50,558	485,663	18,634	$744,326	150,355	767	196
	Orange	29	CC	114,385	411,642	26,853	$906,519	65,787	376	175
	Rockingham	21	NP	66,396	508,871	28,631	$736,031	91,928	572	161
	Average	**23**		**71,393**	**534,516**	**26,009**	**$792,306**	**89,637**	**484**	**188**
PEER GROUP IX Large System Size, High Density	Alamance	30	A	72,465	647,524	57,760	$1,056,164	130,800	435	301
	Buncombe	36	CC	129,785	978,980	65,817	$1,662,484	137,441	617	223
	Cabarrus	23	CC	98,200	785,654	28,500	$1,192,728	131,063	365	359
	Gaston	27	CC	119,500	948,605	86,346	$1,456,289	112,365	364	309
	Guilford	45	CC	227,527	1,727,470	94,032	$1,132,036	137,048	514	267
	Mecklenburg (4)	39	CC	461,382	3,192,918	80,661	$6,153,938	154,626	284	544
	Rowan	29	CC	73,408	454,743	32,229	$703,024	130,340	524	249
	Wake	55	CC	100,283	1,522,130	63,771	$2,795,607	316,793	732	433
	Average	**36**		**160,319**	**1,282,253**	**63,640**	**$2,019,034**	**156,310**	**479**	**335**

Source: 2003 OPSTATS, NCDOT

(1) Grantee designations are as follows: Nonprofit-**NP**, County/City-**CC**, Authority or Other Public Body-**A**

(2) Total Expenses includes Administrative and Operating costs

(3) Cumberland and Pitt Counties contract their transit service to private providers. While data is reported to the NCDOT/PTD, the number of vehicles used is not.

(4) Mecklenburg County population data taken from the 2000 Census Quick Facts

Appendix 6: Using the Florida Transit Information System and National Transit Database

Florida Transit Information System

Introduction

The Florida Transit Information System (FTIS) was designed to allow users to manipulate and analyze data submitted to the National Transit Database (NTD) and the Federal Transit Administration. Among other things, the program allows quick and easy retrieval of data for multiple transit systems for multiple years for trend analyses, peer comparisons, and general data queries. It was developed by the Lehman Center for Transportation Research for use by the Public Transit Office of the Florida DOT in 2001.

The program has been updated annually and is now available to the public. The FTIS is particularly useful for users who are interested in developing national and/or state peer groups. Currently, the NTD website contains data from fiscal years 1996 to 2003. (Because the program utilizes data submitted to the NTD, data is only available for transit systems in urbanized areas of 50,000 or more. Therefore, for FY 2002, data are not available for Cary, Concord/Kannapolis, Henderson, Jacksonville, Gastonia, Greenville, Salisbury, and Wilson.)

Transit agencies rely on various sources of data to help plan, manage, and improve the services they deliver. Although these data are available for use by transit agencies, they are not easily accessible or usable by general users. FTIS improves the accessibility of these data by integrating the different data components into a common program and providing user-friendly functions for easy data retrieval and analysis.

The program is very rich in features and it is worth spending some time exploring it.

Installing FTIS

The 2004 version of FTIS is currently available to the public. The FTIS program operates on a standard Windows platform and is compatible with Microsoft Word and Excel. It is accessible at the Lehman Center for Transportation Research website. The URL is:

http://lctr.eng.fiu.edu/ftis/Version2004.htm

From this link, you can download and install the latest version of the FTIS program. Downloading the program requires registering with the Lehman Center for Transportation Research. A link to the registration site is available upon downloading the program. After you have registered with the Center, a confirmation email will be sent and must be acknowledged by entering the code given in the email.

The current program offered on the Internet is divided into three components. Two of these features apply only to Florida transit systems and have no application in developing peer groups on a national and state level. For this reason, there is only one component that is needed. This file is **FTIS.ZIP**.

Using FTIS to Generate Peer Groups

After installing the FTIS software, you will be able to run the program on your own computer. The first screen you see will be the Main Menu. From this screen you will be able to access all the applications available through the FTIS program.

For the purpose of forming a peer group or selecting individual transit agencies for analysis, you will need to click the **INTDAS** (Integrated National Transit Database Analysis System) button on the upper right portion of the Main Menu.

There are two simple ways that peer groups can be generated:

1. One method allows users to select a system of interest (e.g. your own system) and then generate a single group of peers from a specific region or collection of states.
2. Alternatively, there is a "Quick Reports" feature that allows quick peer group formation based on certain default settings of the program (this option therefore lacks the level of user manipulation of option 1).

The two methods are described below.

To Identify a Single Peer Group for a System

In the latest version of FTIS, INTDAS implements a new procedure for you to quickly find any number of systems that are considered to be similar to your chosen system. This process is very helpful when you wish to create a single peer group. The process is similar to the "wizard" style application found in many Windows compatible programs. This means that at any point during the process, users are able to back up or move forward without having to save any changes they have made. The procedure is illustrated in the following example:

1. Click **Peer** in the menu toolbar at the top of your INTDAS window.
2. Click **Find My Peer Systems.** A new window will pop-up.
3. At this menu, select your state from the pull-down menu. For this example, select **NC**.
4. You will be shown a list of the transit agencies in the state that reported to the NTD. Select the system for which you are creating a peer group. For this example, select **Asheville Transit Authority.** Click **Next.**
5. On a new window, you will be shown a map of the United States. The state in which your transit system operates will be shown in purple, and the default selected states will be shown in red. The states in red are the ones in which the FTIS program will look for peers. You can change the states the program looks at for matches by either selecting or de-selecting them with your mouse on the map, or by changing the distance the program searches for peer group matches. For this example, select **South Carolina, Virginia, Tennessee, Kentucky, Georgia, and Florida.** *Note: You can do this by deselecting the states you don't want, but it's easier to do it by clearing the menu bar to the left, then entering the states you do want. However, you must make sure that North Carolina is highlighted on the list or transit systems in North Carolina will not automatically be entered into the peer group.* Click **Next**.
6. You will now be given the opportunity to select what **year of NTD data, the mode of transit, and the service type** you will be using to form your peer group. For this

example, select **2002** as your reporting year, **Motorbus** as your mode, and **Directly Operated** as the service type. *Note: Other options are available at this step. For example, the Mode Code drop-down menu allows users to look for individual modes operated by the transit system. These could be demand response, trolley buses, ferries, monorails, etc. Users are also able to look at the transit system on an aggregate level--another drop-down menu lets users examine the system by systemwide total, fixed-route total, rail total and non-rail total. Another menu allows users to take into account that not all transit agencies are directly operated--the radio buttons on this menu allow users to include systems that are directly operated, that purchase transportation, or both.* Click **Next**.

7. The next menu shown to you will allow you to select the variables you would like to use to form your peer group. Some variables come directly from the data forms given to the NTD, others were developed later by a research team for whom the original FTIS program was designed. You are also able to change the number of peers you would like to generate. For this example, select the following variables: **Revenue Miles, Passenger Trips, and Total Operating Expense** *(Note: Instead of scrolling through all the variables listed, it is easier to type a keyword in the box above the variable list, e.g. "Operating" for Operating Expense)*. Then select **10** peer groups to be formed. Click **Next**.
8. You will now be given a peer group from the variables you have selected throughout this example. If you are unsatisfied with the results, you are able to click **Back** to make changes. This can be done at any time during the peer group generation. If you are satisfied with the peer group, you are now able to save it for later use. Click the **Save** button to do this.
9. Once you have saved a group, you are able to create a number of customized tables, charts or reports regarding that group. As an example, click on the **Group** tab and select the group you have saved. Then select Systemwide Total under the Mode Aggregate box. Next, select the variables you are interested in. (The Florida (FSV) variables are the easiest to work with.) For this example, select Vehicle Miles and Total Operating Expense. Click on the **Table** option at the bottom and a table will be produced showing this data for each of the peer group members. Clicking on **Chart** instead will result in bar charts of the data. Clicking on Report will. In contrast, clicking on **Report** will produce a detailed report showing performance indicators for each system. Various reports can be selected by using the options presented in the boxes at the top of the reports.

<u>The Peer Group "Quick Reports" Feature</u>

A helpful feature found on the FTIS program is the Quick Reports feature. Using the Quick Reports option allows users to quickly identify peer groups from a user-selected area based on predetermined variables. The default settings are all in place for this feature.

The program will search for systems within states that are within the default range (300 miles) from your home state (the state where your transit system is found). The program automatically selects the peer group using the Florida Peer Variables (Average Speed, Passenger Trips, Revenue Miles, Revenue Hours, Service Area Population Density, Service Area Population, Total Operating Expense, and Vehicles Operated During Maximum Service). *Note: The variables used by the Quick Reports application can be changed at any time, by selecting the*

Options *button at the bottom of the window, and selecting or de-selecting the appropriate variables.*

1. At the INTDAS menu, click the **Quick Report** button on the toolbar. Select **Peer Report**.
2. A new window will allow you to select the state and the system within that state for which you would like to generate a peer group. You are also able at this window to select the year, mode, and service type of the data. For this example, select **North Carolina** from the drop-down menu.
3. A list of transit agencies reporting to the NTD will appear. For this example, select the **Winston-Salem Transit Authority**. Click **Next**.
4. A map of the United States will appear in a new window. From this screen you are able to select the states from which the program will look for peers. For this example, select **Virginia, South Carolina** and **Georgia**. Once selected, these states will become red. Click **Next**.
5. The program will now generate a group of peers with pre-selected variables in table form. Unfortunately, the data produced can not be saved for later use and must be printed immediately.

Obtaining Data Directly from the FTIS

Individual transit system data sheets are available using the FTIS. These sheets are simply electronic versions of the forms sent into the National Transit Database. However, by using the FTIS program users are able to scroll through multiple years and multiple agencies.

To access this data, follow these steps:

1. At the INTDAS screen, select the state(s), system(s), mode(s), service type(s), and year(s) you wish to see an NTD chart for.
2. For the purpose of this example, select **North Carolina, Wilmington Transit Authority, Motorbus, Fixed Route Total, Directly Operated and Purchased Transportation, and 1997-2002.**
3. Click **Form.**
4. Navigating through the forms can seem confusing at first, however with a little practice they are quite easy to understand. The tabs along the top of the form represent pages of the NTD form. The Right-Left arrows along the right margin allow you to cycle through years in which NTD forms were submitted. The Up-Down arrows allow users to move between transit systems. However, because you only selected one system for this exercise, these arrows will lead you to the first and last year of the selected system.

National Transit Database

Obtaining Data Directly From the National Transit Database

There are instances when you will need to refer to the National Transit Database (NTD) instead of operating the FTIS program. Occasionally there are gaps or errors in data that will require you to repair that data without generating an entirely new report with FTIS. Another example of when you would refer to the NTD could be if you simply wish to see a single page profile of a particular transit system. To do this, follow the steps below.

1. You can access the National Transit Database online by going to the following address: http://www.ntdprogram.com
2. From here, click **Publications.**
3. Place the cursor over the menu option **Profiles**. On the right side of the screen a list of all the recent data from the National Transit Database will appear. There are two options for searching the database; the entire list or the top 50 agencies for that year. Searching the entire list is often the best option when you are unsure if the agency you are interested in is in the Top 50 or not.
4. On any year, click **All Agencies**.
5. You will be taken to a page that allows you to either browse through all the agencies, or to enter a NTD ID number, a word or a phrase in the agency's title in order to search for a specific system. Clicking on the .pdf or .htm profile will access the profile of that particular agency which you are then able to print or save for later.

Appendix 7: Charlotte Peer Group Proposal

The Charlotte Area Transit System (CATS) is relatively unique in North Carolina due to its large size. For example, it operates almost four times as many vehicles as the next largest system (Chapel Hill), and carries about four times as many passengers. This basically precludes creating a peer group for Charlotte within the state. Instead, the creation of a national peer group was pursued.

To do this, two studies that included Charlotte in peer groups developed by each study were examined. These studies were *Benchmark Rankings of Transit Systems in the United States,* a 2004 study by the Florida Department of Transportation, and the *Texas Performance Review of Capital Metro* (Austin TX) performed by TransTech Enterprises in 1998. In addition, a tool developed by the Florida Department of Transportation, the Florida Transit Information System (FTIS) was used by ITRE to develop a third peer group.

Table 11 lists the peers found in the three efforts. Those systems found in at least two of the lists are underlined. Those found in all three lists are shown in **bold**.

Table 16: Common Peers Found in Three Peer Groups Examined

Florida 2004 Study (common systems listed)*	Texas Performance Review	FTIS Peer Group Formation
Albany, NY	**Albany, NY**	**Albany, NY**
Austin, TX	Albuquerque, NM	**Austin, TX**
Buffalo, NY	**Austin, TX**	Buffalo, NY
Charlotte, NC	**Charlotte, NC**	**Charlotte, NC**
Hartford, CT	Cincinnati, OH	Columbus, OH
Indianapolis, IN	Columbus, OH	Hampton, VA
Memphis, TN	Fort Worth, TX	Hartford, CT
Richmond, VA	Indianapolis, IN	Houston, TX
Rochester, NY	Kansas City, MO/KS	Kansas City, MO
Rockville, MD	Louisville, KY	Long Beach, CA
San Antonio, TX	Madison, WI	Louisville, KY
San Carlos, CA	**Memphis, TN**	**Memphis, TN**
	Providence, RI	Oceanside, CA
	Richmond, VA	Providence, RI
	Salt Lake City, UT	Rochester, NY
	San Antonio, TX	Rockville, MD
	Syracuse, NY	Sacramento, CA
	Tampa, FL	San Bernardino, CA
	Tucson, AZ	San Carlos, CA
		Tacoma, WA
		Tucson, AZ

*Due to the regional methodology used in the Florida study, which produced 9-18 peers within each major geographic region (about 59 peers in total), only the systems that are included in at least one of the other columns are listed.

The way that each peer group was created is explained in more detail below.

Benchmark Rankings of Transit Systems in the United States; Florida Department of Transportation; December 2004.

This study was performed to develop a benchmarking system for urban transit systems throughout the United States. In order to reduce the influence of climate and geographic variables, the study first placed all the states into five geographic groups: Southeast, Southwest, Midwest, Northeast, and Northwest. After arranging the transit systems into geographic groups, the following variables were used to determine means and standard deviations.[11]

- Service area population
- Service area population density
- Total operating expense
- Vehicles operated in maximum service
- Annual total vehicle miles

A score was given to each system for each variable based on its standard deviation from the mean. A composite score was then determined for each system. Another mean and standard deviation of the composite scores was then calculated in order to determine "break points" for the peer groups. In some cases, one outlying variable skewed the peer group. This was taken into account in the study and these systems were moved into the next appropriate peer group.

Texas Performance Review: Capital Metro, Window on State Government; Texas Comptroller of Public Accounts; TransTech Enterprises; 1998.

This study, done by TransTech Enterprises of Corpus Christi, used an alternative method of peer group selection. The company considered such factors as transit characteristics, population size, and presence of major governmental or academic institutions as the basis for selection. Data from the 1995 National Transit Database (NTD) was used to form averages and compare those with the performance of Austin's transit system. Eighteen transit systems similar to Austin's were then chosen based on a combination of objective data and subjective judgment. Charlotte was one of the systems selected.

FTIS Peer Group Generation.

A software program designed by the Lehman Center for Transportation Research at Florida International University for the Public Transit Office of the Florida DOT is another method for generating peer groups. FTIS uses data from the NTD. Users can specify certain criteria to use to develop a peer group of a desired size. For this peer group, data from the year 2002 was used. By selecting the variables of (1) operating costs, (2) service area miles, and, (3) passengers, a

[11] A standard deviation is a statistical measure of how close a set of data is to the average (mean) of the data. In a normal distribution of data (bell curve), approximately 67 percent of the data will fall within one standard deviation of the mean.

peer group was developed from a national sample. A group of 20 peers was selected as an appropriate number for this initial comparison.

Based on the three groups shown in the table below, an initial peer group for Charlotte was developed based on those systems that were found in at least two of the lists. That peer group is shown in the table below.

Table 17: Initial Charlotte Peer Group

Initial Peer Group
1. Albany, NY
2. Austin, TX
3. Buffalo, NY
4. Charlotte, NC
5. Columbus, OH
6. Hartford, CT
7. Indianapolis, IN
8. Kansas City, MO
9. Louisville, KY
10. Memphis, TN
11. Providence, RI
12. Richmond, VA
13. Rockville, MD
14. Rochester, NY
15. San Antonio, TX
16. San Carlos, CA
17. Tucson, AZ

In order to reduce this list to a more manageable number, a table was developed that showed the following data for each system (this data is provided in the table at the end of this Appendix):

- Annual passengers
- Annual vehicle miles
- Annual operating expenses
- Number of vehicles operated
- Service area population
- Service area (sq. miles)
- Population density

Next, the number of passengers, vehicle miles and operating expenses were summed. Based on this sum, an average (mean) and standard deviation from the mean was developed. Then, systems were identified that fell within one standard deviation of the mean, and one-half standard deviation from the mean. Finally, the service area size and service area population density of these systems were analyzed. Those systems with unusually large or small service areas and unusually high or low population densities were eliminated (Capital District Transportation Authority, Albany, NY; San Mateo County Transit District, San Carlos, CA; and Niagara Frontier Transportation Authority, Buffalo, NY). This resulted in the following proposed group of 10 peers for Charlotte.

Within one standard deviation:

1. City of Tucson
2. Memphis Area Transit Authority
3. Rochester Genesee Regional Transportation Authority
4. Connecticut Transit, Hartford Division
5. Transit Authority of River City (Louisville KY)
6. Kansas City Area Transportation Authority
7. Rhode Island Public Transportation (Providence)
8. Ride On Montgomery County (Rockville MD)
9. Central Ohio Transit Authority (Columbus OH)
10. Capital Metropolitan Transportation Authority (Austin TX)

If a smaller peer group is desired, the following five systems are within one-half standard deviation:

1. Connecticut Transit, Hartford Division
2. Transit Authority of River City (Louisville KY)
3. Kansas City Area Transportation Authority
4. Rhode Island Public Transportation (Providence)
5. Ride On Montgomery County (Rockville MD)

Potential Charlotte Peers

System Name	City	State	Passenger Trips	Vehicle Miles	Total Operating Expense	TOTAL (Trips, Miles & $)	Number of Vehicles in Fleet	Service Area Population	Service Area Size (square miles)	Service Area Population Density
Indianapolis Public Transportation Corporation	Indianapolis	IN	9,654,299	6,467,796	$25,785,166	41,907,261	112	1,218,919	553	2,204
Greater Richmond Transit Company	Richmond	VA	13,664,384	5,297,128	$25,157,783	44,119,295	148	818,836	469	1,746
Capital District Transportation Authority	Albany	NY	11,918,780	7,194,482	$35,078,554	54,191,816	187	678,394	1,760	385
City of Tucson	Tucson	AZ	15,245,374	7,537,753	$31,617,964	54,401,091	147	720,425	291	2,476
Memphis Area Transit Authority	Memphis	TN	10,675,294	7,781,671	$36,863,981	55,320,946	164	972,091	400	2,430
Rochester Genesee Regional Transp. Auth.	Rochester	NY	12,517,422	6,663,618	$37,394,078	56,575,118	205	694,396	295	2,354
Connecticut Transit-Hartford Division	Hartford	CT	17,166,448	7,166,371	$36,966,132	61,298,951	184	851,535	664	1,282
Transit Authority of River City	Louisville	KY	14,584,259	7,961,973	$39,642,706	62,188,938	200	754,756	283	2,667
Charlotte Area Transit System	Charlotte	NC	15,799,977	8,697,906	$39,844,750	64,342,633	207	681,310	452	1,507
Kansas City Area Transportation Authority	Kansas City	MO	14,309,125	9,172,162	$47,029,098	70,510,385	211	756,557	396	1,911
San Mateo County Transit District	San Carlos	CA	12,528,231	7,509,876	$55,010,827	75,048,934	214	737,100	97	7,599
Rhode Island Public Transit Authority	Providence	RI	14,092,820	8,512,965	$52,504,053	75,109,838	184	920,310	504	1,826
Ride-On Montgomery County Government	Rockville	MD	19,510,800	9,527,935	$50,716,977	79,755,712	198	850,000	495	1,717
Niagara Frontier Transportation Authority	Buffalo	NY	18,661,006	9,472,947	$60,770,259	88,904,212	271	1,182,165	1,575	751
Central Ohio Transit Authority	Columbus	OH	16,193,336	10,841,703	$62,876,709	89,911,748	250	1,133,193	398	2,847
Capital Metropolitan Transportation Authority	Austin	TX	22,839,783	11,794,161	$58,079,286	92,713,230	277	901,920	572	1,577
VIA Metropolitan Transit	San Antonio	TX	44,142,618	21,312,381	$76,003,092	141,458,091	402	1,445,120	1,231	1,174

Notes:

- Motor Bus mode only.
- Population and service area are for the entire transit system.
- Data is from the National Transit Database (2002)
- The shaded portion shows those systems that fall with one standard deviation of the mean for the TOTAL column. The more darkly shaded portion in the middle shows those systems within one-half standard deviation.

Appendix 8: Comparison of NC Urban Systems with their National Peers

Following are comparisons of North Carolina urban transit systems with their national peers. The data used for these comparisons was from the 2002 National Transit Database—the latest complete information available at the time of this report. Three categories of North Carolina systems are compared with their peers:

1. Medium-sized systems—Asheville, Fayetteville, High Point and Wilmington
2. Large-sized systems—Chapel Hill, Durham, Greensboro, Raleigh and Winston-Salem
3. Charlotte

For each group, there are three tables of performance data:

1. For the North Carolina system(s)
2. For their national peers
3. A comparison between the two

The data is for fixed-route service only. NC transit systems that did not report data to the National Transit Database in 2002 were excluded (Gastonia, Greenville, Salisbury, and Wilson).

Medium-sized—Asheville, Fayetteville, and High Point

Indicators	Asheville	Fayetteville	High Point
Passengers Per Revenue Mile	1.5	1.6	1.7
Passengers Per Revenue Hour	20.0	20.2	22.9
Operating Expense Per Passenger	$2.58	$2.46	$1.92
Operating Expense Per Revenue Mile	$3.79	$3.83	$3.19
Operating Expense Per Revenue Hour	$51.56	$49.65	$44.01
Farebox Recovery (%)	19.7	18.1	26.0
Passenger Trips Per FTE	24,285	22,526	25,072
Vehicle Miles Per Total Vehicle	43,297	45,445	35,767
Revenue Miles Between Failures (1)	13,998	7,633	2,920

Indicators	Lynchburg	Charlottesville	Fairfax	Jackson	Augusta	Columbus	Bradenton	Lakeland	Athens	Macon
Psgr Per Rev. Mile	1.1	1.3	1.9	0.9	1.6	1.1	1.1	1.1	1.2	1.3
Psgr Per Rev. Hour	16.0	15.9	22.1	14.2	19.5	16.5	16.6	18.6	16.6	16.4
Op. Exp. Per Passenger	$2.75	$2.46	$2.21	$4.15	$2.60	$2.42	$3.16	$2.20	$2.91	$2.13
Op. Exp. Per Revenue Mile	$2.94	$3.21	$4.14	$3.68	$4.08	$2.75	$3.53	$2.51	$3.52	$2.75
Op. Exp. Per Revenue Hour	$43.99	$39.04	$48.79	$58.78	$50.57	$39.84	$52.57	$41.02	$48.30	$35.01
Farebox Recovery (%)	(2)	14.6	9.8	10.7	22.9	26.4	11.1	15.6	31.5	27.5
Psgr Trips Per FTE	17,166	20,481	29,171	12,480	17,109	17,199	22,331	17,559	19,002	26,920
Veh. Miles Per Total Veh.	61,311	41,798	42,787	37,877	32,089	52,003	61,161	53,034	35,339	59,044
Rev. Miles Between Failures	2,843	55,759	54,487	2,824	3,367	3,656	3,327	6,542	9,030	2,021

(2) NTD reports the Lynchburg transit system as having a farebox recovery ratio of .7%. This seems to be an error and this value was therefore excluded.

Indicators	NC Average	Out-of-State Average	Difference	Percent	NC Better or Worse
Passengers Per Revenue Mile	1.6	1.3	0.5	41%	Better
Passengers Per Revenue Hour	21.0	17.2	6.4	37%	Better
Operating Exp. Per Passenger	$2.32	$2.70	-$0.59	-22%	Better
Op. Exp. Per Revenue Mile	$3.60	$3.31	$0.30	9%	Worse
Op. Exp. Per Revenue Hour	$48.41	$45.79	$2.24	5%	Worse
Farebox Recovery (%)	21.3%	18.9%	1.1%	6%	Better
Passenger Trips Per FTE	23,961	19,942	8,357	42%	Better
Vehicle Miles Per Total Vehicle	41,503	47,644	-5,749	-12%	Worse
Rev. Miles Between Failures	8,183	14,386	-7,532	-52%	Worse

Large-sized—Chapel Hill, Durham, Greensboro, Raleigh, and Winston-Salem

Indicators	Raleigh	Winston-Salem	Chapel Hill	Durham	Greensboro
Psgr Per Rev. Mile	1.7	1.8	2.3	2.2	1.5
Psgr Per Rev. Hour	22.8	22.8	29.3	29.7	20.2
Op. Exp. Per Passenger	$2.67	$2.26	$1.96	$1.78	$3.12
Op. Exp. Per Revenue Mile	$4.55	$4.09	$4.53	$3.81	$4.53
Op. Exp. Per Revenue Hour	$60.77	$51.42	$57.37	$52.73	$63.10
Farebox Recovery (%)	22.3	34.0	(1)	21.7	16.5
Psgr Trips Per FTE Employee	26,027	10,219	32,759	(2)	(2)
Veh. Miles Per Total Veh.	42,005	43,881	22,973	65,371	61,009
Rev. Miles Between Failures (3)	4,346	6,431	8,527	(2)	(2)

(1) Chapel Hill offers a free transit program that reduces the farebox recovery ratio of that system substantially.

(2) Durham and Greensboro systems purchase transportation from independent providers; data is therefore limited.

(3) Failure is described as both minor and major mechanical failures that may or may not require additional personel f

Indicators	Alexandria	Lexington	Savannah	Gainesville	South Daytona	Tallahassee	Birmingham	Columbia	Marietta	Charleston
Psgr Per Rev. Mile	2.5	2.0	1.5	3.4	1.2	2.4	1.4	1.4	1.4	1.5
Psgr Per Rev. Hour	26.6	25.8	20.7	38.0	18.0	28.7	16.7	18.6	23.4	20.8
Op. Exp. Per Passenger	$2.02	$2.06	$2.42	$1.32	$2.78	$2.12	$3.83	$2.04	$2.68	$2.60
Op. Exp. Per Revenue Mile	$5.05	$4.16	$3.64	$4.41	$3.38	$5.15	$5.23	$2.80	$3.76	$4.00
Op. Exp. Per Revenue Hour	$53.88	$53.12	$50.14	$50.08	$50.11	$60.75	$63.87	$38.01	$62.68	$54.09
Farebox Recovery (%)	29.2	22.3	29.9	7.6	16.0	31.2	17.7	(4)	30.8	24.6
Psgr Trips Per FTE Employee	31,617	33,118	25,334	41,721	20,085	29,199	(5)	(4)	(5)	(5)
Veh. Miles Per Total Veh.	34,736	44,824	48,980	32,398	61,653	36,746	27,686	50,833	50,846	51,308
Rev. Miles Between Failures	4,723	1,836	2,768	4,082	(6)	18,271	(5)	(4)	(5)	(5)

(4) The transit system in Columbia was maintained by the South Carolina Electric and Gas Company. It did not report farebox, employee, or mechanical failure data. The system closed in 2002.

(5) Birmingham, Columbia, Marietta, and Charleston systems purchase transportation from independent providers, therefore the published data is limited

(6) There appears to be an error in this data from 2002, therefore this value has been excluded from the dataset.

NC Large-Sized Systems

Indicators	NC Average	Out-of-State Average	Difference	Percent	NC Better or Worse
Passengers Per Revenue Mile	1.89	1.87	0.02	0.8%	Better
Passengers Per Revenue Hour	24.9	23.7	1.21	5.1%	Better
Op. Exp. Per Passenger	$2.36	$2.39	-$0.03	-1.2%	Better
Op. Exp. Per Revenue Mile	$4.30	$4.16	$0.14	3.5%	Worse
Op. Exp. Per Revenue Hour	$57.08	$53.67	$3.40	6.3%	Worse
Farebox Recovery (%)	24.0%	23.0%	1.0%	4.3%	Better
Psgr Trips Per FTE Employee	39,077	30,179	8,898	29.5%	Better
Vehicle Miles Per Total Vehicle	47,048	44,001	3,047	6.9%	Better
Rev. Miles Between Failures	6,435	6,336	99	1.6%	Better

Charlotte

Indicators	Charlotte
Passengers Per Vehicle Mile	1.8
Passengers Per Vehicle Hour	25.0
Operating Expense Per Passenger	$2.52
Operating Expense Per Vehicle Mile	$4.58
Operating Expense Per Vehicle Hour	$63.00
Farebox Recovery (%)	19.8
Passenger Trips Per FTE Employee	26,170
Vehicle Miles Per Total Vehicle	42,019
Revenue Miles Between Failures (1)	1,773

(1) Failure is described as both minor and major mechanical failures that may or may not require additional personnel for maintenance.

Indicators	Austin	Columbus	Hartford	Kansas City	Louisville	Memphis	Providence	Rochester	Rockville	Tucson
Psgr Per Veh. Mile	1.9	1.5	2.4	1.6	1.8	1.4	1.7	1.9	2.1	2.0
Psgr Per Veh. Hour	24.9	20.8	32.6	24.9	24.1	21.9	22.9	23.2	28.0	27.5
Op. Exp. Per Passenger	$2.54	$3.88	$2.15	$3.29	$2.72	$3.45	$3.73	$2.99	$2.60	$2.07
Op. Exp. Per Revenue Mile	$4.92	$5.80	$5.16	$5.13	$4.98	$4.74	$6.17	$5.61	$5.32	$4.19
Op. Exp. Per Veh Hour	$63.00	$81.00	$70.00	$82.00	$65.00	$76.00	$85.00	$69.00	$73.00	$57.00
Farebox Recovery (%)	5.4	20.8	28.6	15.4	13.5	24.9	20.0	35.0	22.0	21.4
Psgr Trips Per FTE Employee	28,930	21,809	32,193	22,412	24,950	18,566	24,222	25,767	35,647	33,618
Veh. Miles Per Total Veh.	42,578	43,367	38,948	43,470	39,810	47,449	46,266	32,505	48,121	51,277
Rev. Miles Btw Failures	6,308	3,713	2,184	4,550	2,682	1,655	2,060	10,905	7,809	1,061

Indicators	Charlotte	Out-of-State Average	Difference	Percent	NC Better or Worse
Passengers Per Revenue Mile	1.8	1.8	0.00	0.0%	SAME
Passengers Per Revenue Hour	25.04	25.09	-0.05	-0.2%	WORSE
Operating Expense Per Passenger	$2.52	$2.94	-0.42	-14.3%	BETTER
Operating Expense Per Revenue Mile	$4.58	$5.20	-0.62	-11.9%	BETTER
Operating Expense Per Revenue Hour	$63.00	$72.00	-9.00	-12.5%	BETTER
Farebox Recovery (%)	19.8%	20.7%	-0.9%	-4.3%	WORSE
Passenger Trips Per FTE Employee	26,170	26,811	-641	-2.4%	WORSE
Vehicle Miles Per Total Vehicle	42,019	43,379	-1,360	-3.1%	WORSE
Revenue Miles Between Failures	1,773	4,293	-2,520	-58.7%	WORSE

Appendix 9: Selecting National Peers for Rural and Small Urban Transit Systems

This Appendix describes the methodology that was used to select peers for North Carolina rural and small urban transit systems, and then provides information on transit systems operating in each of the 15 states for which operating statistics data was available on the Internet (as of December 2005) in order to further explain the selection process.

Methodology

The methodology used for finding potential peers for rural and small urban transit systems involves the following steps, each of which is subsequently described in greater detail:

1. *Gather data*—conduct an Internet search of state departments of transportation to determine which state DOT websites contain operating statistics and other data for rural and small urban transit systems.
2. *Compile the available data*—use Excel or another spreadsheet software to compile the data in tabular format for each of the various categories of transit systems—human service, tribal, single-county rural, multi-county rural, city/county, small urban, and some medium-sized urban.
3. *Filter the data*—delete from further consideration transit systems whose operations are not similar—include only those transit systems with characteristics similar to those of the North Carolina transit system(s) to be compared.
4. *Determine the peers' size*—calculate the combined total of annual passenger trips, service miles, and operating expenses (similar to the calculation described earlier for North Carolina transit systems).
5. *Find the closest matches*—select those national transit systems that have statistical values that are closest to the North Carolina transit system(s) to be compared.
6. (Optional) *Refine the search according to population density*—if a closer similarity among transit systems is desired, determine the population density of the potential national peers.
7. *Make the final selection*—select as peers those national systems that most closely match the size (as determined by the sum of passenger trips, service miles, and operating expenses) and the operating area characteristics (using population density).

<u>*Gather Data*</u>: In order to determine potential national peers, it is necessary to gather and compile data on transit systems in other states, to be able to determine which systems are most similar from a statistical perspective. The Internet is a tool to easily and quickly determine the availability of, and to gather that kind of data. Therefore, an Internet search was conducted in the fall of 2005 to determine the availability of operating statistics data on state department of transportation websites. This search revealed that the fifteen states listed below had operating statistics available on their websites.

State DOT Websites with Operating Statistics Data

Arkansas	Indiana	Ohio
Colorado	Michigan	Pennsylvania
Connecticut	Minnesota	Tennessee
Florida	New Mexico	Texas
Georgia	New York	Washington

In addition, the following state DOT websites had partial operating statistics data available:

- Arizona—vehicle and passenger trip information available, but service miles and operating expense information not available.
- Delaware—one transit agency operating statewide service, incomplete total statistics only (not broken out by type of service, e.g., fixed route, demand-response, etc.).
- Rhode Island—one transit agency operating statewide service, incomplete total statistics only.
- Virginia—selected statistics available from DOT; some additional statistics available elsewhere.

The remaining state DOTs listed in the table below did not have operating statistics data available on their website:

State DOT Websites Lacking Operating Statistics Data

Alabama	Maryland	Oklahoma
Alaska	Massachusetts	Oregon
California	Mississippi	South Carolina
Hawaii	Missouri	South Dakota
Idaho	Montana	Utah
Illinois	Nebraska	Vermont
Iowa	Nevada	West Virginia
Kansas	New Hampshire	Wisconsin
Kentucky	New Jersey	Wyoming
Louisiana	North Carolina	
Maine	North Dakota	

Compile the available data: Data for rural and small urban transit systems in the 15 states that had data available on the Internet were compiled in an Excel™ spreadsheet according to each of the various categories of rural and small urban transit systems—human service, tribal, single-county rural, multi-county rural, city/county, small urban, and some medium-sized urban.

Filter the data: A review of the compiled data showed that on the basis of operating statistics, some transit systems in other states were not similar to North Carolina transit systems. Those transit systems were removed from further consideration as peers for North Carolina transit systems. For example, rural systems receiving FTA Section 5311 funding in some states operate fixed route service in addition to, or instead of, demand-response service. Those systems were excluded from further consideration. Alternatively, some Section 5311 systems in other states

operate substantial portions of their service through volunteer drivers, or operate full-size buses rather than vans. Again, those systems were excluded from further consideration, in an attempt to provide the best potential matches for most North Carolina rural transit systems.

Determine the peers' size: Similar to the methodology described previously to group North Carolina single-county rural transit systems according to size, the combined totals of annual passenger trips, service miles, and operating expenses were calculated for potential peer systems. The results of these calculations for human service, tribal, single-county, multi-county, city/county, small urban, and some medium-sized urban systems are in the tables at the end of this Appendix. These tables were developed for use as a starting point for North Carolina transit systems to determine appropriate national peers. Given the wide variation in system size and the number of single-county transit systems operating in North Carolina, the research team could not perform further calculations for single-county North Carolina transit systems.

Find the closest matches: Check the numbers to select those national transit systems that have statistical values closest to your transit system's values (refer to Tables 7-10 and Appendix 5 of this report for North Carolina transit system statistics). A two-step process is recommended. First, check the figures for combined totals of annual passengers, service miles, and operating expenses to select about a dozen national systems that have similar values. (Note: some North Carolina systems may not have that many systems available as potential peers.) Second, check the figures for each of the variables—annual passenger trips, service miles, and operating expenses—to determine which of these systems most closely match your figures. Use the 5-10 systems that most closely match your system's values for each of these measures.

(Optional) Refine the search according to population density: If you want to make a closer match to your transit system among the potential national peers, determine the population density of the potential national peers. Unfortunately, this data is available on the websites for transit systems in only Arkansas, Ohio, and Tennessee. Florida, Indiana, and Michigan provide only service area population. For states that do not provide service area size and population, that data is available from the U.S. Census Bureau. Go to the *American Fact Finder* page on the Census website, http://factfinder.census.gov/home/saff/main.html?_lang=en.

Then click on the "Population Finder" tab. Select the state from the drop down menu, for which you want to find the population density, and click on the "Go" button. Then click on the appropriate year under "Map of persons per square mile, __(state)__ by county:" to display a map showing all counties within the state. Click on the county to activate a pop-up window that will provide the population density for that county (Note: this will not work for all counties). Repeat this process for each county for which you want to obtain population density data.

Make the final selection: After developing a list of peers based on operating statistics data (and population density, if desired), make your final selection of about 5-6 peer transit systems from among national possibilities. You can then enter the data for your system as well as peer systems in an Excel™ spreadsheet, and calculate the various performance measures for each of the systems.

State-by-State Information on Potential National Peers for North Carolina Rural and Small Urban Transit Systems:

1. **Arkansas**
   http://www.ahtd.state.ar.us/planning/F%20&%20E/PT%20Directory%202005.pdf

There are eight urban public transportation systems, seven FTA Section 5311 transportation systems, and approximately 250 recipients of FTA Section 5310 funding in Arkansas. Operating statistics data is available only for the urban transportation systems and the Section 5311 transportation systems, not the Section 5310 recipients. Of the 15 transit systems for which operating statistics information is available, the following appeared to be most appropriate for consideration as peers for North Carolina transit systems. Note that the "Arkansas Public Transportation Directory; October 2005" does not state the year for which data are provided.

2. **Colorado**
   http://www.dot.state.co.us/CommuterChoice/Transit/trandirpt.pdf

Information is available through the "Colorado Transit Resource Directory" published by the Colorado Association of Transit Agencies (CASTA) and the Colorado Department of Transportation. Many transportation providers are included in the directory, including some taxicab companies, private transportation providers, and intercity operators, such as Greyhound Lines. The tables below list, by type of transportation systems, potential peers. This information should serve only as a starting point for further investigation of additional characteristics, such as system size (using a similar definition to that used for North Carolina systems—i.e., the combined total of annual passengers, service miles, and total expenses) and population density to help determine appropriate peers. Note: Data is from FY 2001.

3. **Connecticut**
   http://www.ct.gov/dot/lib/dot/documents/dpt/cdotbienniumf.pdf

Transit services in Connecticut are organized following municipal, rather than county boundaries. Also, the average population density throughout most of the state is higher than that of North Carolina. In addition, most of the transit systems in Connecticut operate fixed route service, even in more rural areas of the state. For those reasons, there do not appear to be close peers to North Carolina human service, community transportation, or small urban systems.

4. **Florida**
   http://www.dot.state.fl.us/ctd/APR/2004/PDF/2004%20layoutONE.pdf

Fifty Community Transportation Coordinators operate transportation in Florida's 67 counties. Of those 50 coordinators, 26 are private non-profit organizations, 3 are private-for-profit organizations, 17 are county governments, three are public transit authorities, and one is a city government (the City of Tallahassee, in Leon County). In terms of operation, 10 coordinators are sole source transportation providers, 31 conduct partial brokerages, and 9 conduct full brokerages.

There are two instances in which a transit provider operates in both a city and its surrounding county/counties—Miami-Dade Transit, in the City of Miami and in Miami-Dade County, and LYNX, in the City of Orlando and in Orange, Osceola, and Seminole Counties. Both of those transit systems and the population of their urban areas are much larger than city/county transit systems in North Carolina. Therefore, they are not comparable peers, and no information is provided for them.

5. **Georgia**
   http://www.dot.state.ga.us/dot/plan-prog/intermodal/transit/assets/pdf/2004%20Fact%20Book.pdf

The "Georgia Transit Programs Fact Book" is available on the Georgia Department of Transportation's website. The 2004 Edition contains FY 2003 data for the 13 urban, and nine rural public transportation systems in Georgia. Unfortunately, data for rural public transportation programs is provided only at the statewide level, not for individual transportation systems.

Hall Area Transit, serving Gainesville and Hall County is a potential peer for North Carolina city/county transit systems.

6. **Indiana**
   http://www.ai.org/dot/modetrans/bus/pdf/INDOT_2004.pdf

The Indiana Department of Transportation, Public Transportation Section categorizes the 53 public transportation systems operating in the state into four peer groups (plus the Northern Indiana Commuter Transportation District) for performance comparisons. The four peer groups include:

- Large Fixed Route Systems (8 systems, each with > 1.5 million annual passengers; > 1 million vehicle miles)
- Small Fixed Route Systems (9 systems, each with < 400,000 annual passengers; < 1 million vehicle miles)
- Urban Demand Response Systems (5 systems, each operating demand response and/or deviated fixed route service in urbanized areas with populations > 50,000)
- Rural Demand Response Systems (30 systems—including 14 single county, six multi-county, one city/county and 8 small urban; each operating demand response and/or deviated fixed route service in urban areas with populations less than 50,000 and rural countywide and multi-county systems with varying population sizes)

Indiana does not operate systems comparable to North Carolina's Human Service Transportation Systems. FTA Section 5310 funds may be distributed to multiple transportation providers within one county.

7. **Michigan**
   http://www.michigan.gov/mdot/0,1607,7-151-9625_21607-31837--,00.html

A total of 79 public transit agencies operate in Michigan. Key statistics from potential peer systems (FY 2004 data) are provided in the tables at the end of this appendix.

8. **Minnesota**
   http://www.dot.state.mn.us/transit/treport/index.html

Minnesota is not unlike North Carolina in having one large metropolitan center, several smaller metropolitan centers, and a significant rural area. However, the Minneapolis-St. Paul metropolitan area consumed over $240 million of the state's $300.9 million total transit operating costs in Fiscal Year 2003.

9. **New Mexico**
   http://nmshtd.state.nm.us/main.asp?secid=11206

There are 82 urban, rural, and specialized transit providers operating in New Mexico. Information provided in the summary tables is from Fiscal Year 2003.

10. **New York**
    http://www.dot.state.ny.us/pubtrans/annual03/2003annual.html

The New York State Department of Transportation, Passenger Transportation Division publishes the "Annual Report on Public Transportation Assistance Programs in New York State" that provides some operating statistics data. However, data is included only for FTA Section 5307 (urban fixed route) systems the state classifies as major transit systems, not for transit systems receiving FTA Section 5311 funds. In general, New York's Section 5307 systems are of a larger size (more annual passengers, service miles, operating expenses than urban transit systems in North Carolina. Summary operating statistics with FY 2002-03 data for urban systems that could be considered as peers are presented in the summary tables.

11. **Ohio**
    http://www.dot.state.oh.us/ptrans/PDF_FILES/2005%20SOT.pdf

The Ohio Department of Transportation provides operating and capital funding to 60 public transit systems, including 24 urban systems and 36 rural systems. The annual "Status of Public Transit in Ohio" provides the most comprehensive information available from any state, including service area populations and land areas.

12. **Pennsylvania**
    ftp://ftp.dot.state.pa.us/public/Bureaus/PublicTransportation/Urban/UrbanStatReport2004.pdf
    ftp://ftp.dot.state.pa.us/public/bureaus/PublicTransportation/Urban/02-03%20Rural%20Stat%20Report.pdf

The Pennsylvania Section 5311 program includes 21 transit systems that receive operating assistance. A review of those systems showed that they do not appear to possess strong similarities to North Carolina rural transit systems. Pennsylvania rural transit systems operate fixed route rather than demand-response service. The PennDOT "Pennsylvania Operating

Assistance Programs Statistical Report: Rural and Small Urban Program; Intercity Bus; Intercity Rail; Fiscal Years 2001-02 and 2002-03" does not include information other than statistics, that could be used to help determine transit systems' appropriateness for use as peers. A check of transit systems' websites revealed that they did not provide sufficient additional information to make a determination as to their appropriateness as peers for North Carolina transit systems. Finally, the operating statistics for rural systems include information only on the number of peak service buses, not the total number of buses, adding to the difficulty of determining appropriate peers. For those reasons, no Pennsylvania rural transit systems are listed as potential peers.

The small urban systems for which data is presented have potential as peers for North Carolina small urban systems. Data is from FY 2003-04.

13. **Tennessee**
    http://www.tdot.state.tn.us/Chief_Engineer/assistant_engineer_Planning/publictrans/annualreport.pdf

The Tennessee Department of Transportation, Office of Public Transportation provides funding to 25 transit systems serving all counties in the state. This includes 14 urban transportation systems and 11 rural transit providers. Of those systems, those listed in the tables below appear to be most appropriate for use as peers for North Carolina rural and small urban transit systems. Tennessee also provides information on land area and population of the service areas.

14. **Texas**
    http://www.dot.state.tx.us/PTN/documents/stat2001.pdf

The Texas Department of Transportation provided funding to 28 transit systems in urbanized areas and to 41 Section 5311 transit systems in FY 2001. Texas does not operate systems equivalent to North Carolina's Human Service Transportation Systems. Summary statistics from FY 2001 for potential peer systems are provided in the tables.

15. **Washington**
    http://www.wsdot.wa.gov/transit/library/2004_summary/2004_summary.cfm

A review of operating statistics for transit systems in Washington State revealed only one potential peer for North Carolina small urban transit systems. No potential peers were evident for rural transit systems, as most Washington rural transit systems operate fixed route service utilizing 30' transit buses in addition to demand-response service. Information for the Cowlitz Transit Authority is provided in the summary tables.

(Note: Washington State may have one potential peer for TTA/PART—Ben Franklin Transit, based in Richland, Washington. Ben Franklin Transit serves several cities and parts of two counties, operating fixed route, paratransit, and vanpool services.)

List of Potential National Peer Transit Systems

This section provides tables with summary information for potential national peers for North Carolina rural and small urban transit systems.

Human Service Transportation Systems

State	Name	Service Type(s)	Vehicles	Passengers	Miles	Operating Expenses	Pass. + Miles + Expenses
Colorado	Adams County Community Development	Demand-response	4	13,508	39,014	$393,969	446,491
	CMC Sr. and Disabled Transportation (Garfield Co.)	Demand-response	7	21,487	66,231	$158,392	246,110
	Delta County Council on Aging	Demand-response	6	19,124	27,634	$23,292	70,050
Florida	Franklin	Demand-response	19	37,485	415,328	$578,799	1,031,612
	Indian River	Demand-response	22	66,245	525,924	$1,241,181	1,833,350
	Levy	Demand-response	18	23,772	645,560	$885,205	1,554,537
	Liberty	Demand-response	18	32,786	273,196	$289,100	595,082
	Nassau	Demand-response	16	58,003	546,682	$740,475	1,345,160
	Union	Demand-response	10	29,839	256,222	$300,220	586,281

Tribal Transportation Systems

State	Name	Service Type(s)	Vehicles	Passengers	Miles	Operating Expenses	Pass. + Miles + Expenses
Minnesota	Red Lake Transit	Demand-response	3	5,765	59,906	$151,937	217,608
New Mexico	Pueblo of Laguna Shaa'srk'a Transit	Demand-response	3	11,280	136,394	$37,789	185,463

Single-County Community Transportation Systems

State	Name	Service Type(s)	Vehicles	Passengers	Miles	Operating Expenses	Pass. + Miles + Expenses
Colorado	Prairie Dog Express	Demand-response	4	17,670	37,893	$154,447	210,010
Florida	Calhoun	Demand-response	21	35,663	444,127	$644,207	1,123,997
	Citrus	Demand-response	54	135,128	856,355	$1,837,200	2,828,683
	Flagler	Demand-response	17	27,024	212,721	$294,583	534,328
	Gulf	Demand-response	16	15,425	296,166	$416,372	727,963
	Hernando	Demand-response	43	112,701	1,405,212	$1,666,224	3,184,137
	Martin	Demand-response	37	151,854	747,256	$2,104,857	3,003,967
	Wakulla	Demand-response	10	35,774	324,060	$390,578	750,412
Indiana	Fayette County Transit	Demand-response	7	19,460	101,298	$156,796	277,554
	Franklin County Public Transportation	Demand-response	18	48,114	391,229	$469,502	908,845
	Fulton County Transpo	Demand-response	7	22,029	112,916	$196,029	330,974
	LINK Hendricks County	Demand-response	14	36,954	203,674	$241,110	481,738
	Huntington Area Transportation	Demand-response	9	28,583	162,615	$314,074	505,272
	Van-Go (Knox County)	Demand-response	12	69,946	203,725	$376,693	650,364
	Kosciusko Area Bus Service	Demand-response	12	66,463	168,355	$296,709	531,527
	Transportation for Rural Areas of Madison	Demand-response	6	11,429	136,781	$195,935	344,145
	Miami Co. YMCA	Demand-response	8	24,330	115,032	$232,461	371,823
	Noble Transit System	Demand-response	11	16,224	138,411	$315,601	470,236
	Orange County Transit Services	Demand-response	18	27,275	192,765	$298,260	518,300
	Union County Transit Service	Demand-response	10	22,590	203,954	$257,522	484,066
	Wabash County Transit	Demand-response	9	24,713	120,159	$242,287	387,159

Single-County Community Transportation Systems (continued)

State	Name	Service Type(s)	Vehicles	Passengers	Miles	Operating Expenses	Pass. + Miles + Expenses
Michigan	Altran Transit Authority	Demand-response	14	74,471	487,367	$668,871	1,230,709
	Antrim County Transportation	Demand-response	15	49,179	272,935	$747,026	1,069,140
	Branch Area Transit Authority	Demand-response	11	90,062	291,168	$953,803	1,335,033
	Charlevoix County Public Transit	Demand-response	17	106,303	403,318	$1,212,593	1,722,214
	Clare County Transit Corporation	Demand-response	22	140,436	582,203	$1,056,819	1,779,458
	Crawford County Transportation Authority	Demand-response	18	94,852	487,726	$1,196,811	1,779,389
	Delta Area Transit Authority	Demand-response	15	94,830	294,921	$714,754	1,104,505
	Eaton County Transportation Authority	Demand-response	26	183,728	933,411	$2,363,981	3,481,120
	Gogebic County Public Transit	Demand-response	6	31,147	102,773	$385,523	519,443
	Iosco Transit Corporation	Demand-response	7	24,539	156,580	$298,691	479,810
	Manistee County Transportation	Demand-response	25	109,594	389,887	$1,242,322	1,741,803
	Midland County Connection	Demand-response	19	68,921	793,459	$1,454,828	2,317,208
	Ogemaw County Public Transportation	Demand-response	7	52,565	186,175	$482,560	721,300
	Ontonagon County Public Transit	Demand-response	7	32,843	154,768	$427,985	615,596
	Otsego County Bus System	Demand-response	24	121,925	468,093	$1,476,033	2,066,051
	Roscommon County Transportation Authority	Demand-response	19	138,990	657,038	$1,512,713	2,308,741
	Sanilac Transportation Corporation	Demand-response	12	84,235	432,252	$866,672	1,383,159
	Schoolcraft County Public Transportation	Demand-response	8	39,058	174,749	$463,900	677,707
	St. Joseph County Transportation Authority	Demand-response	18	61,578	467,707	$713,038	1,242,323
	Van Buren Public Transit	Demand-response	14	53,588	363,215	$691,631	1,108,434
Minnesota	Brown County Heartland Express	Demand-response	7	60,649	136,828	$414,962	612,439
	Martin County Express	Demand-response	6	78,612	249,826	$323,869.91	652,308
New Mexico	City of Farmington/ Presbyterian Medical Services	Demand-response	5	28,011	121,836	$132,507	282,354

Single-County Community Transportation Systems (continued)

State	Name	Service Type(s)	Vehicles	Passengers	Miles	Operating Expenses	Pass. + Miles + Expenses
Ohio	Clermont Transportation Connection	Demand-response	19	75,941	903,813	$1,729,867	2,709,621
	Greene County Transit Board	Demand-response	27	110,509	950,265	$2,041,264	3,102,038
	Miami County Transit System	Demand-response	17	52,669	418,960	$803,851	1,275,480
	Ashtabula County Transportation System	Demand-response	13	99,201	314,921	$1,196,970	1,611,092
	Carroll County Transit	Demand-response	5	18,862	164,767	$201,709	385,338
	Champaign Transit System	Demand-response	11	37,364	213,086	$340,216	590,666
	Crawford County Transportation Program	Demand-response	10	26,126	163,261	$327,896	517,283
	Fayette County Transportation Program	Demand-response	9	21,290	273,666	$433,185	728,141
	Geauga County Transit	Demand-response	24	69,101	434,669	$1,094,467	1,598,237
	Hancock Area Transportation Services	Demand-response	14	37,893	243,810	$565,213	846,916
	Pike County/ Community Action Transit System	Demand-response	10	30,221	203,435	$392,919	626,575
	Scioto County/ Access Scioto County	Demand-response	11	61,867	303,653	$742,731	1,108,251
	Seneca County Agency Transportation	Demand-response	13	39,664	290,330	$388,984	718,978
	Warren County Transit Service	Demand-response	19	56,514	540,731	$1,146,403	1,743,648
Texas	Services Program for Aging Needs (Denton)	Demand-response	15	55,820	439,311	$583,643	1,078,774
	Webb County Community Action Agency (Laredo)	Demand-response	21	155,371	440,243	$602,588	1,198,202

Multi-County Community Transportation Systems

State	Name	Service Type(s)	Vehicles	Passengers	Miles	Operating Expenses	Pass. + Miles + Expenses
Arkansas	Black River Area Development (3 counties)	Demand-response	14	22,038	1,890	$437,379	461,307
	Ozark Regional Transit (4 counties)	Demand-response	6	20,118	104,835	$287,063	412,016
Colorado	East Central COG – Outback Express (Cheyenne, Elbert, Lincoln, Kit Carson Co.'s)	Demand-response	19	51,340	132,351	$207,000	390,691
	NE Colorado Assoc. of Local Gov'ts. (Morgan, Philips, Sedgwick, Washington, Yuma Counties)	Demand-response	47	79,133	465,164	$861,133	1,405,430
	Seniors' Resource Ctr. (Adams, Denver, Jefferson, Clear Creek, Gilpin, Park Counties)	Demand-response	19	62,457	430,136	$337,041	829,634
	South Central COG (Las Animas, Huerfano Counties)	Demand-response	7	46,586	97,205	$252,607	396,398
Indiana	The New Interurban Public Transit System (Delaware, Jay, Randolph Counties)	Demand-response	24	86,551	535,138	$829,181	1,450,870
	Arrowhead Country Public Transportation (Jasper, Newton, Pulaski, Starke, White Counties)	Demand-response	49	146,166	610,957	$1,268,393	2,025,516
	Ride Solution (Daviess, Greene, Martin, Pike, Sullivan Counties)	Demand-response	67	82,570	1,070,887	$859,419	2,012,876
	Catch-A-Ride (Dearborn, Ripley, Jefferson, Ohio, Switzerland Co.'s)	Demand Response	28	153,102	862,452	$1,066,284	2,081,838
Minnesota	Chisago-Isanti County Heartland Express	Demand-response	10	63,084	426,522	$569,680.83	1,059,287
Tennessee	Delta Human Resource Agency (4 counties)	Demand Response	37	65,199	1,008,098	$1,050,562	2,123,859
	First Tennessee Human Resource Agency (7 counties)	Demand-response	66	110,213	1,694,127	$1,661,502	3,465,842
	Southwest Human Resource Agency	Demand-response	78	110,724	1,714,545	$2,099,799	3,925,068
Texas	Bee Community Action Agency (5 counties)	Demand-response	27	89,307	499,243	$530,006	1,118,556
	Community Services Inc. (Corsicana) (2 counties)	Demand-response	20	115,174	459,600	$641,439	1,216,213
	Heart of Texas Council of Governments (6 counties)	Demand-response	36	93,528	714,988	$715,424	1,523,940

City/County Transit Systems

State	Name	Service Type(s)	Vehicles	Passengers	Miles	Operating Expenses	Pass. + Miles + Expenses
Colorado	Durango LIFT (La Plata County)	Fixed route & Route dev., Paratransit	11	224,930 Total 214,505 F.R. 10,415 D.R.	392,532 Total 332,440 F.R. 60,092 D.R.	$1,244,917 Total $615,733 F.R. $629,184 D.R.	1,862,379 Total 1,162,678 F.R. 700,501 D.R.
	Transfort/Dial-A-Ride (Fort Collins + Larimer Co.)	Fixed route, Demand-response	43 Total 24 coach 14 body on chassis 5 van	1,766,012 Total 1,691,212 F.R. 74,800 D.R.	1,714,408 Total 1,266,164 F.R. 448,244 D.R.	$5,884,856 Total $4,348,969 F.R. $1,535,887 D.R.	9,365,276 Total 7,306,345 F.R. 2,058,931 D.R.
Georgia	Hall Area Transit (Gainesville + Hall County)	Fixed route, Demand-response	5	41,239	134,004	$331,521	506,764
Indiana	Cass Area Transit (Cass County + Logansport)	Demand-response	17	152,965	537,776	$849,745	1,540,486
Michigan	Adrian Dial-A-Ride	Demand-response	7	93,796	168,296	$415,217	677,309
	Cadillac Wexford Transit Authority	Demand-response	19	95,588	385,141	$1,314,223	1,794,952
	Greater Lapeer Transportation Authority	Demand-response	20	178,859	594,564	$1,540,542	2,313,965
Minnesota	Brainerd/Crow Wing County Transit	Deviated F.R., Demand-response	9	82,079	241,927	$687,770	1,011,776
New York	Chemung County Transit	Fixed route, Demand-response	39 Total 20 bus 9 paratransit 10 rural service	659,342 Total 512,898 F.R. 76,039 para. 79,405 rural	1,620,095 Total 1,001,204 F.R. 267,500 para. 351,391 rural	$4,625,073 Total	6,904,510 Total
Ohio	South East Area Transit (Zanesville + 2 counties)	Fixed route, Demand-response	35	242,694 Total 214,290 F.R. 28,404 D.R.	752,426 Total 533,893 F.R. 219,533 D.R.	$2,254,876 Total $1,619,223 F.R. $635,653 D.R.	3,249,996 Total 2,367,406 F.R. 883,590 D.R.

Small Urban Systems

State	Name	Service Type(s)	Vehicles	Passengers	Miles	Operating Expenses	Pass. + Miles + Expenses
Arkansas	Pine Bluff City Transit	Fixed route, Demand-response	10	65,914	260,373	$837,020	1,163,307
Michigan	Livingston Essential Transportation Service	Fixed route	17	63,066	524,975	$1,476,350	2,064,391
New Mexico	City of Carlsbad Municipal Transit System	Demand response	6	15,268	80,259	$292,531	388,058
	City of Clovis Area Transit System	Demand-response	9	57,949	143,239	$188,257	389,445
	City of Hobbs Express	Demand-response	3	13,924	63,415	$79,205	156,544
Ohio	Steel Valley Regional Transit Authority	Fixed route, Demand-response	11	78,753	184,205	$795,493	1,058,451
Tennessee	Bristol Tennessee Transit System	Fixed route, Demand-response	10 Total 4 bus 6 van	65,035 Total 40,396 F.R. 24,639 D.R.	215,217 Total 112,808 F.R. 102,409 D.R.	$481,717 Total $290,364 F.R. $191,353 D.R.	761,969 Total 443,568 F.R 318,401 D.R.
	Kingsport Area Transit Service	Fixed route, Demand-response	18 Total 8 bus 10 van	99,783 Total 81,905 F.R. 17,878 D.R.	244,151 Total 149,442 F.R. 94,709 D.R.	$577,624 Total $322,748 F.R. $254,876 D.R.	921,558 Total 554,095 F.R. 367,463 D.R.

Small Medium-Sized Urban Systems

State	Name	Service Type(s)	Vehicles	Passengers	Miles	Operating Expenses	Pass. + Miles + Expenses
Arkansas	Fort Smith Transit	Fixed route, Demand-response	18	224,227	562,009	$1,873,699	2,659,935
	Hot Springs Intracity Transit	Fixed route, Demand-response	14	188,371	307,710	$1,208,235	1,704,316
Indiana	City of Anderson Transit System	Fixed route, Demand-response	16	217,509	487,662	$1,634,289 F.R. $542,659 D.R.	2,882,119
	Columbus Transit	Fixed route, Demand-response	9	148,854	257,760	$656,738 F.R. $249,673 D.R.	1,313,025
	East Chicago Public Transit	Fixed route, Demand-response	8	276,662	196,491	$1,096,517 F.R. $107,444 D.R.	1,677,114
	Hammond Transit System	Fixed route, Demand-response	15	388,270	482,458	$1,996,970 F.R. $79,570 D.R.	2,947,268
	Marion Transportation System	Fixed route	11	148,775	197,754	$659,680	1,006,209
	Michigan City Municipal Coach Service	Fixed route, Demand-response	9	179,648	229,691	$611,716 F.R. $305,855 D.R.	1,326,910
	Rose View Transit & Paratransit System	Fixed route, Demand-response	18	309,637	361,931	$677,171 F.R. $293,521 D.R.	1,642,260
	Transit Utility for the City of Terre Haute	Fixed route, Demand-response	14	166,128	282,498	$788,750 F.R. $645,341 D.R.	1,882,717
Michigan	Battle Creek Transit	Fixed route,	28	502,882	681,047	$3,259,710	4,443,639
	Benton Harbor/Twin Cities Area Transportation Authority	Fixed route	21	145,368	392,786	$1,346,615	1,884,769
	Macatawa Area Express (Holland)	Fixed route, Demand-response	20	173,789	643,344	$2,210,555	3,027,688
	Muskegon Area Transit System	Fixed route	21	424,217	570,726	$2,052,232	3,047,175
Minnesota	Moorhead Metropolitan Area Transit	Fixed route	12	287,554	334,857	$969,399	1,591,810
New Mexico	City of Roswell Pecos Trails Transit	Fixed route	16 Total 12 bus 4 van	165,593	387,949	$461,165	1,014,707
New York	Greater Glens Falls Transit	Fixed route	14 Total 6-30' bus 6 trolley 2 van	287,230	288,434	$931,225	1,506,889
Pennsylvania	Pottstown Urban Transit	Fixed route	10	275,374	253,976	$1,263,106	1,792,456
	Shenango Valley Shuttle Service	Fixed route	6	121,798	110,706	$645,115	877,619
Texas	Denton	Fixed route	15	206,863	377,770	$820,839	1,405,472
	Port Arthur	Fixed route	16	179,014	321,500	$1,271,266	1,771,780
	Tyler	Fixed route	8	163,615	310,410	$1,213,291	1,687,316
Washington	Cowlitz Transit Authority	Fixed route	16 Total 7 bus 9 minibus (paratransit)	336,517	216,429	$1,838,602	2,391,548

Appendix 10: Performance Measure Information for North Carolina Rural Systems

Human Service Transportation Systems

Name	Service Type(s)	Pass. / Vehicle Mile	Pass. / Vehicle Hour	Cost / Trip	Cost / Mile	Cost / Hour	Miles / Vehicle	Accidents / 100k Miles
McDowell	Demand-response	0.42	7.80	N.A.	N.A.	N.A.	9,662	0
Pender	Demand-response	0.11	1.71	$9.20	$0.98	$15.70	28,997	0.29
Tyrrell	Demand-response	0.38	6.83	$3.40	$1.29	$23.23	18,332	0
Union	Demand-response	0.10	2.02	$10.57	$1.08	$21.33	28,496	0
Average		0.25	4.59	$7.72	$1.11	$20.08	21,372	0.07

Note: Averages for Expenses and for Total of Passengers, Miles, plus Admin. and Operating Expenses are calculated only for Pender, Tyrrell, and Union Counties due to lack of financial data for McDowell County.

Multi-County Community Transportation Systems

Name	Service Type(s)	Pass. / Vehicle Mile	Pass. / Vehicle Hour	Cost / Trip	Cost / Mile	Cost / Hour	Miles / Vehicle	Accidents / 100k Miles
CARTS	Demand-response	0.14	3.38	$6.53	$0.89	$22.08	24,696	0
CPTA	Demand-response	0.17	5.03	$6.10	$1.05	$30.71	22,256	0
ICPTA	Demand-response	0.13	2.59	$10.01	$1.33	$25.91	29,423	0.65
KATA	Demand-response	0.10	2.74	$7.34	$0.76	$20.07	35,329	0
YVEDDI	Demand-response	0.13	2.62	$10.09	$1.34	$26.43	24,675	0
Average		0.14	3.27	$8.01	$1.08	$25.04	27,276	0

CARTS (Craven Area Rural Transportation System), CPTA (Choanoke Public Transportation Authority), ICPTA (Inter-County Public Transportation System), KATA (Kerr Area Transportation Authority), and YVEDDI (Yadkin Valley Economic Development District, Inc.)

City / County Transportation Systems

Name	Service Type(s)	Pass. / Vehicle Mile	Pass. / Vehicle Hour	Cost / Trip	Cost / Mile	Cost / Hour	Miles / Vehicle	Accidents / 100k Miles
AppalCART (Boone-Wautaga)	Fixed route,							
	Demand-response							
	TOTAL	1.32	17.86	$2.16	$2.85	$38.58	18,365	0.42
Goldsboro / Wayne County	Fixed route,	0.40	6.05	$3.93	$1.59	$23.76	46,724	
	Demand-response	0.19	2.47	$7.77	$1.46	$19.17	22,568	0.00
	TOTAL	0.25	3.39	$6.01	$1.50	$20.35	26,433	
Hickory / Catawba County	Fixed route,	0.73	11.42	$5.95	$4.33	$67.92	45,652	
	Demand-response	0.16	1.82	$25.69	$4.01	$46.67	5,022	0.00
	TOTAL	0.52	7.33	$8.03	$4.22	$58.88	11,794	
Tar River Transit (Rocky Mount-Nash-Edgecombe)	Fixed route,	0.96	15.93	$2.81	$2.69	$44.78	49,359	
	Demand-response	0.09	1.87	$12.06	$1.04	$22.53	26,438	0.00
	TOTAL	0.29	5.92	$4.89	$1.43	$28.94	29,713	
Wilmington / New Hanover County	Fixed route,	2.43	31.05	$1.58	$3.84	$48.92	43,305	
	Demand-response	0.13	2.06	$22.58	$2.95	$46.54	16,810	0.00
	TOTAL	1.49	20.64	$2.33	$3.47	$48.06	26,321	
Average (Totals)		0.78	11.03	$4.68	$2.69	$38.96	22,525	0.08

Single-County Transportation Systems

Peer Group	Counties	Grantee (♠)	Passengers Per Mile	Passengers Per Hour	Cost per Passenger	Cost per Veh Mile	Cost per Veh Hour	Veh Miles Per Veh
PEER GROUP I Small System Size, Low Density	Alleghany	CC	0.08	2.13	$13.22	$1.07	$28.12	24,838
	Bladen	CC	0.21	2.42	$7.40	$1.56	$17.92	11,721
	Cherokee	CC	0.15	1.96	$6.43	$0.97	$12.62	14,803
	Graham	CC	0.10	1.59	$16.42	$1.60	$26.10	9,150
	Hyde	NP	0.11	3.22	$11.53	$1.29	$37.13	27,937
	Madison	CC	0.22	3.98	$7.22	$1.61	$28.76	19,940
	Swain	NP	0.33	2.75	$3.49	$1.14	$9.60	12,926
	Washington	CC	0.13	1.78	$12.48	$1.68	$22.25	16,317
			0.17	2.51	$7.67	$1.32	$19.26	15,839
	Average		**0.17**	**2.51**	**$7.67**	**$1.32**	**$19.26**	**15,839**
PEER GROUP II Small System Size, Medium Density	Avery	CC	0.32	3.49	$4.97	$1.59	$17.32	15,535
	Beaufort	NP	0.19	5.38	$10.64	$2.01	$57.19	18,107
	Caswell	CC	0.08	2.13	$20.72	$1.68	$44.14	21,372
	Greene	CC	0.10	2.94	$11.27	$1.11	$33.11	31,093
	Jackson	CC	0.14	2.92	$14.88	$2.13	$43.44	13,456
	Mitchell	CC	0.26	5.09	$6.57	$1.72	$33.42	18,815
	Yancey	CC	0.29	4.43	$6.94	$2.04	$30.74	11,301
	Average		**0.19**	**3.76**	**$9.28**	**$1.74**	**$34.87**	**17,639**
PEER GROUP III Small System Size, High Density	Alexander	CC	0.16	1.75	$8.30	$1.30	$14.55	16,939
	Brunswick	NP	0.15	3.45	$10.09	$1.56	$34.83	10,732
	Cumberland (*)	CC	0.18	7.87	$7.38	$1.33	$58.05	#DIV/0!
	Dare	CC	0.05	1.33	$16.93	$0.88	$22.60	36,286
	Lee	CC	0.27	2.07	$7.61	$2.03	$15.75	13,582
	Richmond	NP	0.49	6.94	$4.34	$2.14	$30.15	17,432
	Scotland	CC	0.34	7.06	$6.51	$2.23	$45.98	12,250
	Transylvania	NP	0.22	3.53	$5.13	$1.13	$18.10	20,154
	Average		**0.16**	**2.52**	**$8.96**	**$1.42**	**$22.56**	**16,546**
PEER GROUP IV Medium System Size, Low Density	Anson	CC	0.12	2.62	$9.52	$1.16	$24.97	30,531
	Ashe	NP	0.12	2.05	$12.03	$1.39	$24.63	21,804
	Clay	CC	0.10	1.86	$11.14	$1.07	$20.70	31,368
	Gates	CC	0.09	2.31	$12.38	$1.09	$28.54	40,025
	Martin	CC	0.15	2.93	$8.72	$1.30	$25.53	21,662
	Macon	CC	0.15	2.43	$20.77	$3.07	$50.52	10,437
	Columbus	CC	0.09	2.05	$11.37	$1.06	$23.28	27,040
	Average		**0.12**	**2.38**	**$12.87**	**$1.52**	**$30.59**	**21,680**
PEER GROUP V Medium System Size, Medium Density	Rutherford	CC	0.12	2.05	$11.20	$1.38	$22.95	13,766
	Carteret	CC	0.13	2.65	$11.68	$1.55	$30.94	23,923
	Sampson	CC	0.15	3.97	$7.63	$1.16	$30.29	16,859
	Haywood	NP	0.18	2.47	$13.62	$2.41	$33.71	15,150
	Hoke	CC	0.14	2.74	$10.64	$1.46	$29.19	20,396
	Person	CC	0.19	2.64	$7.25	$1.36	$19.12	23,626
	Polk	CC	0.19	3.85	$10.69	$2.01	$41.15	17,863
	Average		**0.15**	**2.78**	**$10.27**	**$1.57**	**$28.57**	**17,854**
PEER GROUP VI Medium System Size, High Density	Caldwell	NP	0.16	3.47	$12.02	$1.97	$41.72	19,422
	Henderson	NP	0.38	2.95	$5.77	$2.17	$17.01	11,986
	Iredell	CC	0.13	2.24	$7.31	$0.96	$16.35	23,388
	Lenoir	CC	0.18	2.85	$10.78	$1.97	$30.71	28,352
	Pitt (*)	NP	0.10	1.83	$20.69	$2.16	$37.82	NA
	Stanly	CC	0.22	3.32	$8.17	$1.81	$27.12	16,284
	Wilson	CC	0.14	2.78	$11.06	$1.58	$30.76	26,092
	Average		**0.17**	**2.81**	**$9.67**	**$1.67**	**$27.15**	**22,214**
PEER GROUP VII Large System Size, Low Density	Chatham	NP	0.20	4.19	$7.42	$1.46	$31.07	19,452
	Davidson	CC	0.23	2.78	$10.48	$2.39	$29.17	16,812
	Duplin	CC	0.14	2.94	$9.16	$1.28	$26.89	26,789
	Harnett	CC	0.09	2.30	$13.23	$1.14	$30.38	34,037
	Johnston	NP	0.06	1.12	$17.38	$1.04	$19.39	40,117
	Moore	CC	0.10	2.06	$11.31	$1.08	$23.28	24,080
	Robeson	A	0.17	3.64	$11.86	$2.06	$43.16	24,574
	Wilkes	NP	0.10	1.08	$25.24	$2.57	$27.33	14,437
	Average		**0.11**	**2.05**	**$13.08**	**$1.44**	**$26.76**	**26,326**
PEER GROUP VIII Large System Size, Medium Density	Burke	NP	0.10	2.11	$16.22	$1.58	$34.16	24,289
	Cleveland	NP	0.14	2.72	$11.15	$1.52	$30.35	29,292
	Durham	CC	0.09	2.23	$18.95	$1.64	$42.27	25,616
	Onslow	NP	0.10	2.71	$16.98	$1.77	$46.08	26,981
	Orange	CC	0.28	4.26	$7.93	$2.20	$33.76	14,195
	Rockingham	NP	0.13	2.32	$13.93	$1.82	$32.31	24,232
	Average		**0.13**	**2.74**	**$12.91**	**$1.72**	**$35.45**	**23,582**
PEER GROUP IX Large System Size, High Density	Alamance	A	0.11	1.25	$20.54	$2.30	$25.77	21,584
	Buncombe	CC	0.13	1.97	$14.91	$1.98	$29.41	27,194
	Cabarrus	CC	0.12	3.45	$16.42	$2.05	$56.59	34,159
	Gaston	CC	0.13	1.38	$14.37	$1.81	$19.89	35,134
	Guilford	CC	0.13	2.42	$5.44	$0.72	$13.15	38,388
	Mecklenburg♦	CC	0.14	5.72	$13.56	$1.96	$77.55	81,870
	Rowan	CC	0.16	2.28	$11.64	$1.88	$26.52	15,681
	Wake	CC	0.07	1.57	$27.88	$1.84	$43.84	27,675
	Average		**0.13**	**2.59**	**$13.73**	**$1.76**	**$35.55**	**32,174**
CT System Averages			0.17	2.96	$11.80	$1.66	$31.07	23,079

Source: FY 2003 OPSTATS, NCDOT.