Transit System Performance Evaluation Methodology For Washington State

WA-RD 57.2

RECEIVED
AUG 2 1994
TRANSPORTATION
LIBRARY

Washington State Department of Transportation

12/90/2
TRAN

22165

WA STATE DOT LIBRARY
3 3166 0000 2636 9

TRANSIT SYSTEM PERFORMANCE EVALUATION METHODOLOGY FOR WASHINGTON STATE

SUMMARY

WA-RD 57.2

Prepared for

Washington State Transportation Commission

Department of Transportation

and in cooperation with

U.S. Department of Transportation

Federal Highway Administration

Prepared by

William J. Kelley

G. Scott Rutherford

Washington State Transportation Center
University of Washington

December, 1983

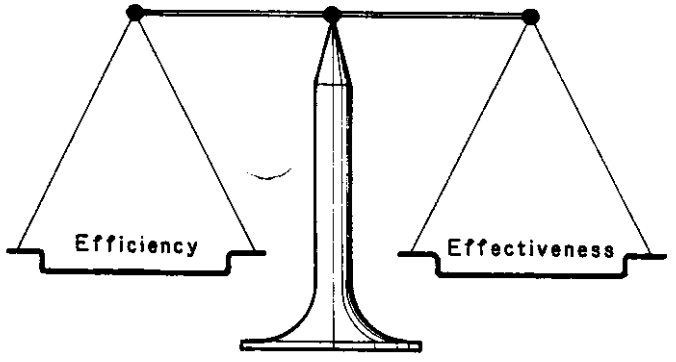
The contents of this report reflect the views of the authors who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Washington State Department of Transportation. This report does not constitute a standard, specification, or regulation.

Study Purpose

During the past eight years of substantial growth in the transit service throughout Washington State, there have been major improvements in transit effectiveness as measured by increased ridership and breadth of service. However, transit efficiency has declined as measured by a 40% (constant dollar) increase in operating cost per vehicle mile. Increases in costs of service, supplying service in areas of marginal demand, and local policies of maintaining minimum fares have necessitated greater public expenditures.

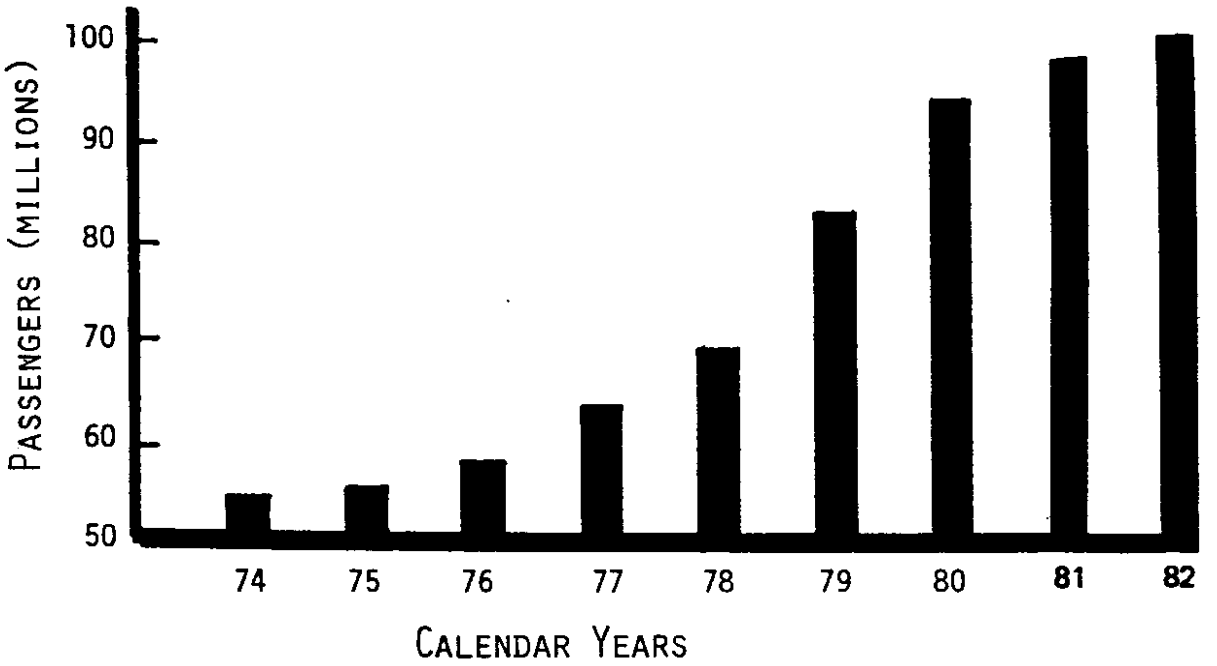
The purpose of this study was to identify major concepts of transit performance evaluation and suggest procedures and guidelines for local and external evaluation in Washington State. Study objectives were:

- Identify performance measures
- Develop local and external evaluation methods
- Develop peer groups

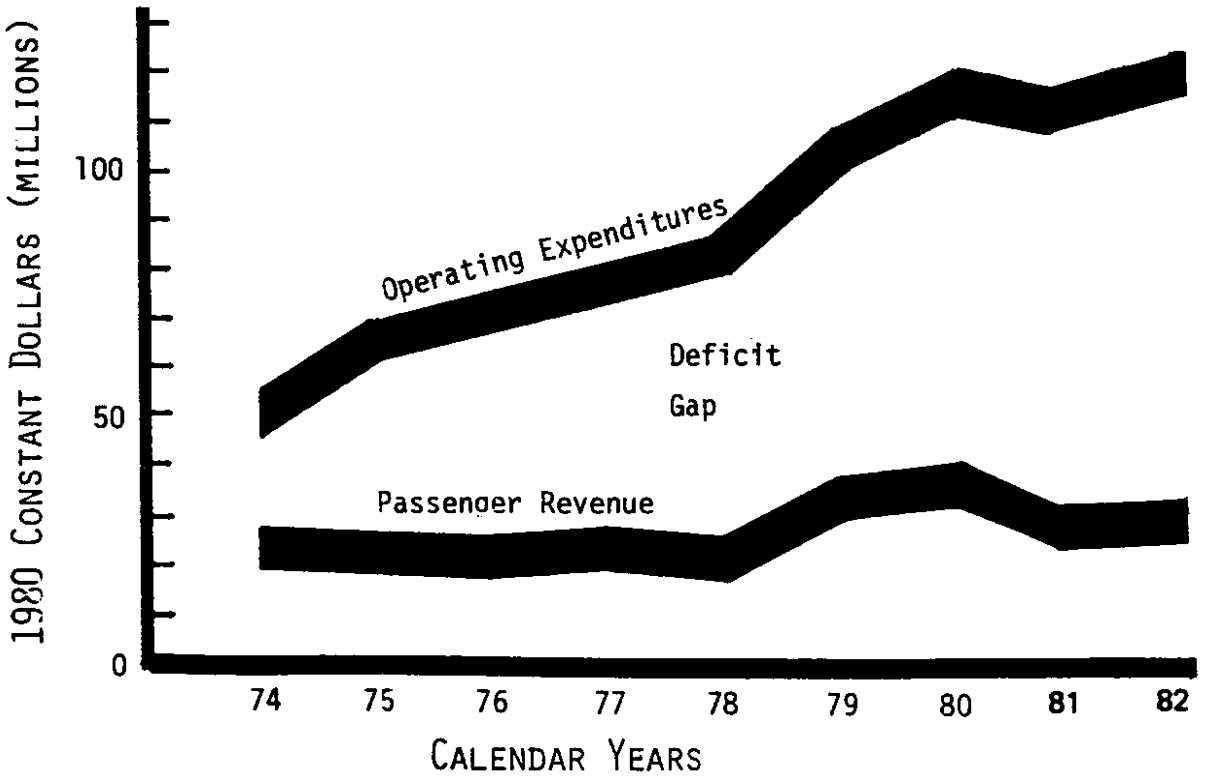


Efficiency = Inputs ÷ Outputs

Effectiveness = Achieving System Objectives



Statewide Public Transit Use



Gap Between Revenue and Cost (Statewide)

Transit Performance Measures

Transit performance measures are values representing production, consumption and quality variables associated with the operation and financial characteristics of transit service. The measures are generally quantifiable and can be expressed as whole numbers, percentages, or ratios.

Most often these performance measures are expressed as ratios. As an example, the measure "passengers per vehicle hour" expressed in ratio form captures the relationship between service output (vehicle hours) and units of consumption (passengers).

Performance measures are a major instrument of evaluation and are used to assess whether or not transit service is achieving intended objectives.

The major purposes for using performance measurement are to allow transit management to make more rational choices regarding resource allocations and to provide a means of communicating service policies to the general public.

Information Needs

- FINANCIAL CHARACTERISTICS
- OPERATIONAL CHARACTERISTICS
- PASSENGER PROFILES
- ROUTE ANALYSIS
- SERVICE CONSUMPTION
- FUNCTIONAL AREA PRODUCTIVITY
- USER SATISFACTION

EXAMPLE

Transit Performance Measures

- Passengers per Vehicle Mile or Hour
- Operating Cost per Vehicle Mile or Hour
- Revenue per Passenger
- Operating Ratio (Passenger Revenue ÷ Operating Costs)
- Peak Load Factor (# of Seats ÷ # of Passengers)
- Road Calls per 100,000 Miles
- Passengers per Service Area Population

Local Evaluation Process

The suggested local process can be applied in assessing system-wide performance, individual route analysis or functional area (operations, maintenance, planning and marketing, and general administration) evaluation.

There are three basic elements or phases for local performance evaluation:

Phase I - conduct baseline inventory

Phase II - develop evaluation plan

Phase III - institute continuous monitoring and evaluation program

Within each phase, there are two major areas of concern, the transit service and the management of that service.

Phase I - For the transit service, a basic inventory of activities by time of day for all routes is necessary. The data collected would include passenger loadings, running times, revenues, origin/destination, and passenger characteristics.

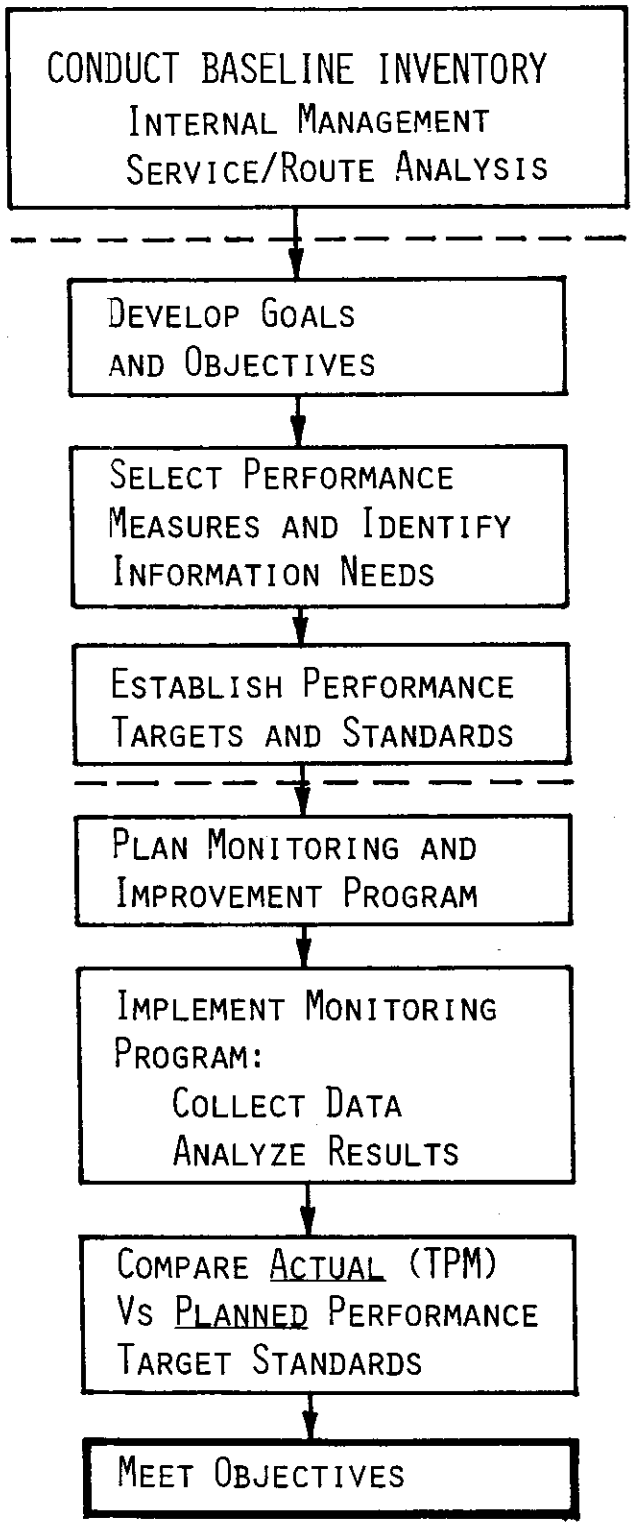
For inventorying management, a comprehensive audit of functional tasks, procedures, and productivity of all operational and support divisions is conducted. Items of interest include governance, management and organization, planning and marketing, transportation and safety, maintenance, purchasing and inventorying, finance and accounting, and personnel and labor relations.

Phase II - Developing a service and management performance evaluation plan requires analyzing the results of the inventory/audit, identifying problem areas, and developing strategies for improvement. Specifically it requires establishing goals and objectives, identifying activities to accomplish objectives, defining performance measures to monitor achievement, and allocating resources to monitor and evaluate programs.

Phase III - The performance monitoring program should aid the transit system in meeting established objectives. The program should identify activities proposed, personnel and equipment required, and state as explicitly as possible how the program will be implemented.

A budget should be prepared estimating the cost for achieving the objectives and assessing whether resources are available to carry out the program. Information required for performance monitoring should be carefully defined and collected on a routine and systematic basis.

Throughout the year (minimally on a quarterly basis), actual performance objectives should be compared to planned objectives to determine if performance is on target. If it appears objectives are being met, no action is required. However, if objectives are not met, action should be initiated.



Implementation Steps

External Evaluation Process

The purpose of the external evalution is to assist WSDOT, or others, in providing appropriate managerial and technical assistance to local systems and to assure state decision makers, e.g., the legislature, that public transportation service is being provided efficiently and effectively.

The external process is divided into two phases. Phase I consists of assessing statewide and peer group performance, while Phase II entails a more detailed analysis of individual systems.

Phase I - Diagnostic Review

The objectives of the diagnostic review are to:

Determine what basic information (transit area, socio-economics, population) is most relevant in assessing characteristics that influence transit performance

Develop selected set of performance measures for external evaluation

Develop a methodology for classifying transit systems in the state into appropriate peer groups of similar size and scale of operation

Using current data, analyze performance of each peer group to include the average values of selected performance measures, the range and standard deviation of values for each measure, and an analysis of variables affecting performance

Compare performance of each individual system to itself over time (3-4 year period)

Compare performance of individual system with respective peer group

Identify performance measures within each system that appear to be outliers (greater or less than one standard deviation from the peer group mean)

Document assessment of peer group performance in a summary report comparing each individual system to itself over time and to its relative peer group.

This baseline of trends and cross-sectional information should be maintained and updated annually by WSDOT.

Phase II - Detailed Evaluation

The purpose of Phase II is to provide an opportunity for more detailed evaluation of performance as identified in the diagnostic review. The initial step in Phase II would be to review and comment on the comparative analysis. It is envisioned that other participants (e.g., local managers and decision makers) would take part in the review.

Future steps in Phase II represent a continuing process involving local and state decision makers, transit managers, and WSDOT. There are two approaches that can be taken in implementing the detailed evaluation process: self-assessment and on-site visits by an evaluation team. The objectives of both approaches are the same:

To identify specific areas of transit service that represent superior performance and/or areas warranting improvements

External Evaluation Process

PHASE 1

1. SELECT EVALUATION PROCEDURES
2. COLLECT AND ANALYZE PERFORMANCE DATA
   - TIME SERIES ASSESSMENT
   - PEER GROUP ANALYSIS
   - FACTORS INFLUENCING PERFORMANCE
3. DOCUMENT FINDINGS
4. REVIEW WITH AFFECTED PARTIES

PHASE 2

1. COMMUNICATE FINDINGS
2. DEVELOP AND MAKE AVAILABLE SELF-ASSESSMENT MANUAL
3. ON REQUEST, CONDUCT ON-SITE VISITS
   - IDENTIFY PROBLEM AREAS
   - SUGGEST IMPROVEMENT STRATEGIES
4. REVIEW WITH TRANSIT MANAGEMENT

To assist local transit agencies in developing and improving services with a minimum of state interference

Self-Assessment Self-assessment would entail distributing materials prepared in the diagnostic review phase to each system. The materials would include the following:

A summary report evaluating the efficiency and effectiveness of the system in comparison to its respective peer group and to itself over time. The comparative evaluation would be directed to that system alone.

A self-assessment manual (if the system did not have its own local evaluation program) that would provide background on performance evaluation, a general framework outlining procedures for conducting internal evaluation, a candidate list of transit performance measures (including definitions and explanations), and examples (mini case studies) of how transit performance evaluations can be used to improve service.

On-site Visits The on-site visit approach is considered to be optional and by request only from an individual system. It is envisioned that the interview would take place with the General Manager and staff over a one- or two-day period and would be followed by an informal but structured discussion focusing on the review of data and the system's evaluation program.

Key Principles of Performance Evaluation

1. WHAT GETS MEASURED - GETS IMPROVED
2. MEASURES MUST BE BASED ON SYSTEM VALUE
3. PEOPLE, NOT PROCEDURES, IMPROVE PERFORMANCE OF A SERVICE
4. ALL PROBLEMS CAN NOT BE SOLVED AT THE SAME TIME
5. EVALUATION MUST BE POSITIVE, NOT PUNITIVE

PEER GROUP DEVELOPMENT

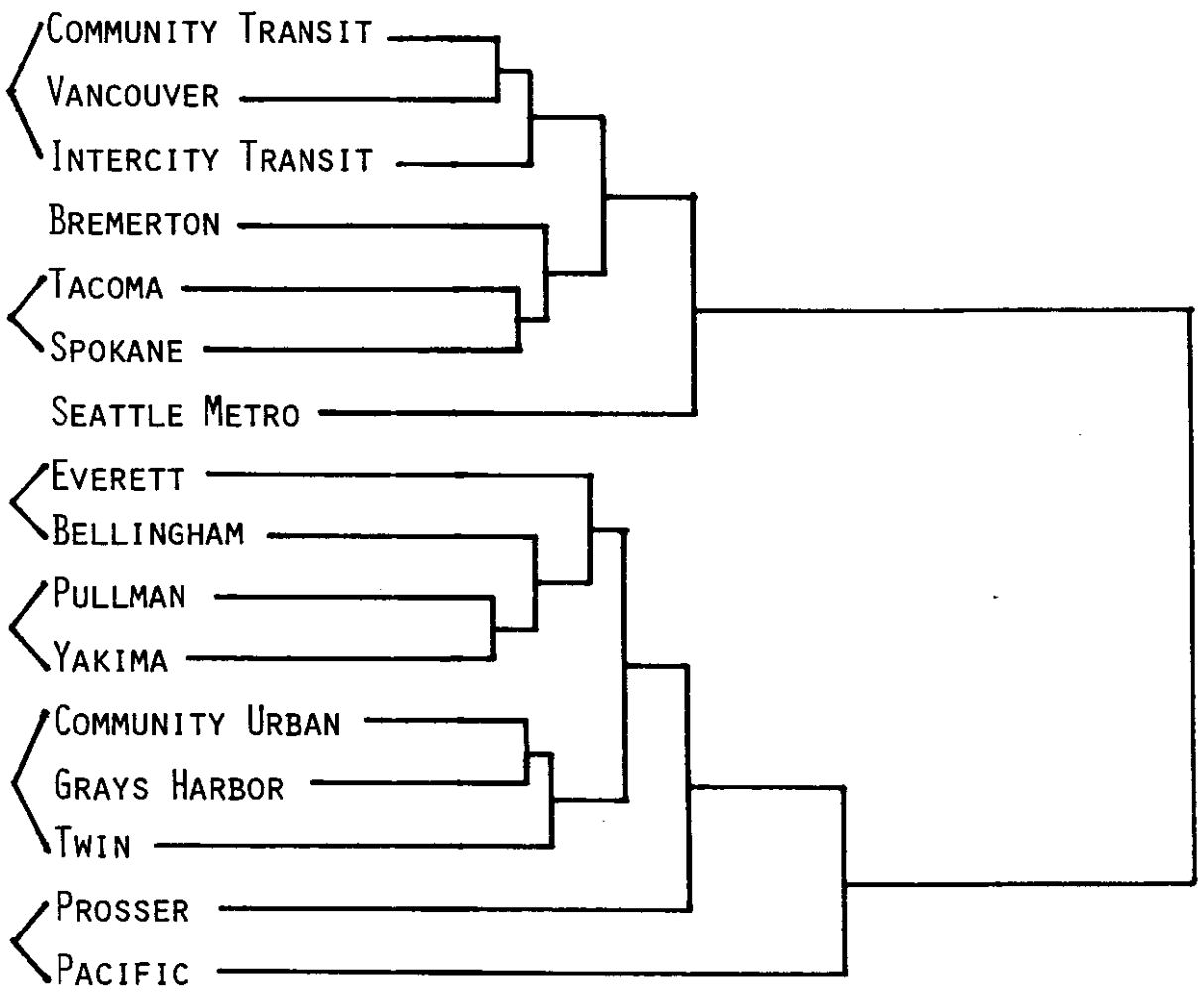
Comparability

A major constraint to developing a statewide evaluation program has been the issue of comparability between individual systems being examined. Transit operators are concerned that evaluation programs have not sufficiently accounted for differences in size and scale of operation or environmental conditions. Acknowledging this problem, research directed at developing a peer group classification scheme was conducted.

Methods

Using statistical methods, three alternative data sets were examined. Results from the analysis of one data set (79-80 Section 15 Report) were not satisfactory due to extreme variability on certain measures. Distinct groupings were derived, however, using two of these sets of data. Preliminary results were tested using alternative verification techniques. Seven peer group classes for 16 systems (1980) were defined for use in Washington State. The figure depicts the cluster for these groups.

These groups in the figure are only for illustration. Proper peer groups would be developed using transit systems from several other states. Once peer groups were developed, performance measures would be developed for each group. Individual systems could then be compared to their peer groups such as discussed earlier.



Cluster Dendogram of 1980 WSDOT Data

APPENDIX

TRAC TPM's Used in Peer Group Assessment

CONCEPT MEASURED	TRANSIT PERFORMANCE MEASURE
Service Cost Efficiency	Operating Expense/Total Vehicle Hours Operating Expense/total Vehicle Miles
Vehicle Efficiency	Total Vehicle Miles/Total vehicles Total Vehicle Hours/Total Vehicles
Service Cost Effectiveness	Operating Expense/Miles of Line Operating Expense/Total Passengers Total Revenue/Total Passengers Total Revenue/Operating Expense Passenger Revenue/Operating Expense
Effectiveness of Service Consumption	Total Passengers/Miles of Line Total Passengers/Total Vehicle Miles Total Passengers/Total Vehicle Hours Total Passengers/Total Vehicles
Effectiveness of Service Design and Distribution	Total Passengers/Service Area Population Total Vehicle Miles/Service Area Population Total Vehicle Hours/Service Area Population Total Vehicle Miles/Miles of Line Total Vehicle Hours/Miles of Line Service Area Population/Miles of Line
Effectiveness of Revenue Generation	Passenger Revenue/Total Passengers Passenger Revenue/Total Vehicle Miles Passenger Revenue/Total Vehicle Hours
Effectiveness of Public Assistance	Total Vehicle Miles/Local Tax Assistance Total Passengers/Local Tax Assistance Total Vehicle Miles/Motor Vehicle Excise Tax Total Passengers/Motor Vehicle Excise Tax Total Vehicle Miles/Operating Assistance Total Vehicle Hours/Operating Assistance Total Passengers/Total Operating Assistance Service Area Population/Total Operating Assistance

Peer Group Clusters Based on Service Distribution/Design Characteristics

	PEER GROUPS* (1980)						
TPM/ Central Tendency Category	Metro	Large Urban	Midsize Regional	Midsize Municipal	Small City Regional	Small City Municipal	Rural Transit
System	Seattle Metro	City of Spokane, City of Tacoma	Intercity Transit, Community Transit, Vancouver	Bellingham Everett	Grays Harbor, Twin, Community Urban	Pullman, Yakima	Pacific, Prosser
POP/LM							
range	1200-2500	700-1200	500-1000	400-600	300-900	500-600	50-300
mean	2142	991	738	498	611	561	172
SD	519	285	242	57	376	17	108
PASS/LM							
range	50-75,000	30-50,000	10-20,000	15-25,000	4-8,000	10-15,000	200-2,000
mean	72,368	40,235	11,735	18,139	4,796	12,899	760
SD	18,238	11,893	6,696	5,852	2,424	2,642	843
VM/LM							
range	20-30,000	15-20,000	5-10,000	6-8,000	4-7,000	5-7,000	500-2,000
mean	25,874	15,766	7,668	6,844	5,678	6,662	2,413
SD	7,953	3,559	1,822	670	3,080	715	2,043
VH/LM							
range	1500-2000	900-1300	400-700	500-1000	250-500	500-700	50-250
mean	1889	1188	507	833	399	561	151
SD	766	221	160	447	203	18	128
VH/POP							
range	1.5-2.0	1.0-1.5	0.7-0.8	1.0-1.25	0.3-0.7	0.6-0.7	0.5-0.75
mean	1.74	1.21	0.72	1.09	0.49	0.715	0.75
SD	0.34	0.13	0.03	0.12	0.26	0.02	0.32
VM/POP							
range	15-25	15-20	10-15	10-15	5-10	8-10	10-15
mean	23.17	16.05	10.74	12.38	6.9	8.5	12.4
SD	7.39	1.0	2.67	2.38	3.89	.86	3.88
PASS/POP							
range	40-60	30-40	10-20	25-35	5-10	15-20	5-10
mean	56.70	40.55	15.15	32.67	7.43	16.48	6.46
SD	15.79	0.34	3.6	7.85	1.22	3.27	4.76

*Metropolitan characteristics developed based on metropolitan transit data from Section 15.

Note: Bremerton could not be assigned to a peer group due to uniqueness of operational and service area characteristics.