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ABSTRACT

TRANSIT PRODUCTIVITY ANALYSIS IN HETEROGENEOUS CONDITIONS USING DATA ENVELOPMENT ANALYSIS WITH AN APPLICATION TO RAIL TRANSIT

by Manuel J. Martínez

This dissertation extends transit productivity analysis by developing a new method of Data Envelopment Analysis (DEA), the linear programming approach to productivity analysis. The new model analyzes productivity of transit working under heterogeneous operating conditions. It is named Two-Farrell DEA for it applies DEA in two stages, DEA(1), that calculates the productivity frontiers at given operating conditions and DEA(2), that uses inputs adjusted by multipliers calculated in DEA(1). The model Two-Farrell DEA calculated productivity benchmarks for each rail transit agency and estimated its potential for higher revenue or lower expense improvement. Additionally, the results identify two production techniques of rail transit, the sources of increasing returns to scale, the degree of flexibility to changes in the shadow prices of the inputs, and a method to prioritize investment for expansion of operations. Its indirect contribution to transit operations planning consists of checking the consistency and feasibility of new rail projects. Moreover, this dissertation includes the first correlation analysis made between productivity and operating conditions related to network form, factor analysis of transit operating conditions, the comparison of results between the new model to four other methods, and the evaluation of the empirical accuracy of methods with cluster analysis.

TRANSIT PRODUCTIVITY ANALYSIS IN HETEROGENEOUS CONDITIONS USING DATA ENVELOPMENT ANALYSIS WITH AN APPLICATION TO RAIL TRANSIT

by Manuel J. Martínez

A Dissertation Submitted to the Faculty of New Jersey Institute of Technology In Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in Transportation

Interdisciplinary Program in Transportation

May 2001



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APPROVAL PAGE

TRANSIT PRODUCTIVITY ANALYSIS IN HETEROGENEOUS CONDITIONS USING DATA ENVELOPMENT ANALYSIS WITH AN APPLICATION TO RAIL TRANSIT

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This dissertation is dedicated to my parents and to my family.

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TABLE OF CONTENTS

Cha	pter	I	Page
1.	INT	RODUCTION	1
	1.1	Objective and Significance of the Dissertation	1
	1.2	Scope of the Dissertation	1
	1.3	Definition of Terms	3
	1.4	Outline of Research Procedures and Organization of the Dissertation	4
2	THE	E PROBLEM OF TRANSIT PRODUCTIVITY ANALYSIS	5
	2.1	Transit Productivity Analysis	5
	2.2	Contribution to Transit Operations Planning	8
	2.3	Heterogeneous Conditions of Transit	10
	2.4	Effect of Operating Conditions over Transit Productivity	11
	2.5	Conventional Productivity Analysis in Heterogeneous Conditions	14
	2.6	Transit Productivity Analysis and Heterogeneous Conditions	16
	2.7	Working Hypothesis	18
3	LIT	ERATURE REVIEW	19
	3.1	Partial Productivity Analysis	19
		3.1.1 Basic Features of Partial Productivity Analysis	19
		3.1.2 Partial Productivity Analysis in Heterogeneous Conditions	19
		3.1.3 Conclusions on Partial Productivity Analysis	21
	3.2	Stochastic Frontier Analysis	21
		3.2.1 Basic Features of Stochastic Frontier Analysis	22
		3.2.2 Stochastic Frontier Analysis in Heterogeneous Conditions	25
		3.2.3 Conclusions on Stochastic Frontier Analysis	28
	3.3	Data Envelopment Analysis (DEA)	29
		3.3.1 Basic Features of DEA	29
		3.3.2 DEA in Heterogeneous Conditions	34

TABLE OF CONTENTS (Continued)

Chaj	pter	P	Page
		3.3.3 Conclusions on DEA	39
	3.4	Conclusions of the Literature Review	40
4	THE	NEW MODEL	41
	4.1	Objectives and Assumptions of the New Model	41
		4.1.1 Objectives of the New Model	41
		4.1.2 Assumptions of the New Model	41
	4.2	Formulation of the New Model	45
		4.2.1 Selection of Operating Conditions	45
		4.2.2 Data Envelopment Analysis Number One—DEA(1)	45
		4.2.3 Data Envelopment Analysis Number Two-DEA(2)	48
		4.2.4 The Multiple Factor Industry	51
		4.2.5 The Name of the New Model	56
	4.3	Algorithm of 2F-DEA	56
	4.4	Conclusions on the New Model	56
5	THE	RESULTS	57
	5.1	Data and Software	57
		5.1.1 National Transit Database	57
		5.1.2 National Transportation Atlas and Census Tracts Data	57
		5.1.3 The State of the Nation's Cities	60
		5.1.4 Annual Urban Mobility Study	60
		5.1.5 Absent Connectivity Data	61
		5.1.6 Selection of Data Points	61
		5.1.7 Software, Degrees of Freedom, and Algorithm	61
	5.2	Results of 2F-DEA	62
		5.2.1 Rail Transit Systems	62
		5.2.2 Inputs, Outputs, and Operating Conditions	63

TABLE OF CONTENTS (Continued)

Chapte	r		Page
	5.2.3	Results of DEA(1)	69
	5.2.4	Results of DEA(2)	76
	5.2.5	Efficiency in Absolute Figures	77
5.	3 Comp	parison of 2F-DEA to Other Methods	79
	5.3.1	Accuracy of Cluster Analysis	79
	5.3.2	Comparison of DEA-C (Conventional) to 2F-DEA	83
	5.3.3	Comparison of DEA-CL (Cluster Analysis) to 2F-DEA	84
	5.3.4	Comparison of DEA-ND (Non-Discretionary Factors) to 2F-DEA	85
	5.3.5	Comparison of DEA-2S (Two-Step) to 2F-DEA	87
5.	4 Appl	ication of 2F-DEA to Productivity Analysis	88
	5.4.1	Returns to the Consumption of One Input	88
	5.4.2	Returns to Scale	90
	5.4.3	Substitutability, Technical Ratios, and Scale of Production	92
	5.4.4	Piecewise Linear Production Function	96
5.	5 Appli	cation of 2F-DEA to Transit Operations Planning (Scheduling)	101
	5.5.1	Ratios Related with the Planning of Transit Demand	102
	5.5.2	Ratios Related with Route Design (Routing)	104
	5.5.3	Ratios Related with Fleet Size Planning (Blocking)	108
	5.5.4	Ratios Related with Labor Force Design (Runcutting)	111
5.	6 Appli	cation of 2F-DEA to New Rail Projects	116
	5.6.1	Hudson-Bergen Light Rail	116
	5.6.2	San Juan Heavy Rail	. 119
5.	7 Conc	lusions on the Results	. 120
6 C	ONCLU	SIONS AND SUGGESTIONS FOR FURTHER RESEARCH	. 123

TABLE OF CONTENTS (Continued)

Chapter	Page
APPENDIX A MODIFICATIONS TO THE RAIL TRANSIT NETWORKS OF THE NATIONAL TRANSPORTATION ATLAS	128
APPENDIX B ABBREVIATIONS FOR VARIABLES, AGENCIES, AND MODELS	130
APPENDIX C PLANNED PRODUCTIVITY OF NEW RAIL PROJECTS	132
APPENDIX D DATABASE OF RAIL TRANSIT PRODUCTIVITY ANALYSIS	134
REFERENCES	161

LIST OF TABLES

Tab	le	Page
1	Variables of Productivity Analysis	. 7
2	Ratios to Check Consistency of Transit Operations Planning	. 10
3	Heterogeneous Operating Conditions – Bus Transit	. 10
4	Heterogeneous Operating Conditions – Rail Transit – Urban Form	. 11
5	Heterogeneous Operating Conditions – Rail Transit – Network Form	. 11
6	Functional Forms of Production Functions	. 23
7	Selected Methods to Estimate Stochastic Frontiers	. 25
8	Non-selected Data Points	. 61
9	Population and Ridership - Light Rail	. 62
10	Population and Ridership - Heavy Rail	. 63
11	Inputs and Outputs	. 63
12	Correlation between Operating Conditions and Productivity - Light Rail	. 64
13	Factor Analysis of Operating Conditions - Light Rail	. 65
14	Selected Operating Conditions - Light Rail	. 65
15	Estimation Plan for DEA(1) - Light Rail	. 66
16	Correlation between Operating Conditions and Productivity - Heavy Rail	. 67
17	Factor Analysis of Operating Conditions - Heavy Rail	. 68
18	Selected Operating Conditions - Heavy Rail	. 68
19	Estimation Plan for DEA(1) - Heavy Rail	. 69
20	Productivity Benchmarks for VRM – 1997 - Light Rail	. 70
21	Productivity Benchmarks for TRIPS – 1997 - Light Rail	. 70
22	Advantage Factor of Operating Conditions - Light Rail	. 72
23	Productivity Benchmarks for VRM – 1997 - Heavy Rail	. 74
24	Productivity Benchmarks for TRIPS- 1997 - Heavy Rail	. 75
25	Advantage Factor of Operating Conditions - Heavy Rail	. 75

LIST OF TABLES (Continued)

Tab	ole	Page
26	Efficiency Level – 1997 - Light Rail	. 76
27	Efficiency Level – 1997 - Heavy Rail	. 77
28	Potential for Improvement – Light Rail	. 78
29	Potential for Improvement – Heavy Rail	. 79
30	Typology of Light Rail	. 80
31	Typology of Heavy Rail	. 80
32	Trends of Productivity versus Operating Conditions within Selected Clusters	. 81
33	Productivity Difference due to Operating Conditions within Selected Clusters	. 81
34	Correlation of DEA Efficiency Scores versus Operating Conditions within Selected Clusters	. 82
35	Trends of DEA Efficiency Score versus Operating Conditions within Selected Clusters	. 82
36	Efficiency Difference due to Heterogeneous Conditions in Selected Clusters	. 82
37	2F-DEA versus DEA-C (Conventional) - Light Rail	. 83
38	2F-DEA versus DEA-C (Conventional) - Heavy Rail	. 84
39	2F-DEA versus DEA-CL (Cluster Analysis) - Light Rail	. 84
40	2F-DEA versus DEA-CL (Cluster Analysis) - Heavy Rail	. 85
41	2F-DEA versus DEA-ND (Non-Discretionary Factors) - Light Rail	. 86
42	2F-DEA versus DEA-ND (Non-Discretionary Factors) - Heavy Rail	. 86
43	2F-DEA versus DEA-2S (Two-Step) - Light Rail	. 87
44	2F-DEA versus DEA-2S (Two-Step) - Heavy Rail	. 88
45	Returns to Quantity of a Single Input – Light Rail	. 89
46	Returns to Quantity of a Single Input – Heavy Rail	. 89
47	Technical Groups for Light Rail	. 93
48	Proportional Difference of Technical Ratios between Traditional and Newer Light Rails	93
49	Trends of Technical Ratio versus Scale – Light Rail	94
50	Elasticity of Substitution (Allowing for Varying Size) – Light Rail	94

LIST OF TABLES (Continued)

Tab	le	Page
51	Technical Groups for Heavy Rail	. 94
52	Proportional Difference of Technical Ratios between Traditional and Newer Heavy Rails	. 95
53	Trends of Technical Ratio versus Scale – Heavy Rail	. 95
54	Elasticity of Substitution (Allowing for Varying Size) – Heavy Rail	. 96
55	Marginal Production of Trips per Unit Increase of Input – Light Rail	. 97
56	Cost Effectiveness in Trips per Additional Dollar Spent in Inputs – Light Rail	. 98
57	Priority of Investment for Expansion Using Cost Effectiveness – Light Rail	. 99
58	Marginal Production of Trips per Unit Increase of Input – Heavy Rail	. 99
59	Cost Effectiveness in Trips per Additional Dollar Spent in Inputs – Heavy Rail	. 100
60	Priority of Investment for Expansion Using Cost Effectiveness – Heavy Rail	. 101
61	Hudson-Bergen Light Rail - Feasibility by using Results of DEA(1)	. 118
62	Hudson-Bergen Light Rail – Advantage Factor of Operating Conditions	. 119
63	Hudson-Bergen Light Rail - Efficiency by using DEA(2)	. 119
64	San Juan Heavy Rail – Feasibility by using Results of DEA(1)	. 120
65	San Juan Heavy Rail – Advantage Factor of Operating Conditions	. 120
66	San Juan Heavy Rail - Efficiency by using DEA(2)	. 120

LIST OF FIGURES

Fig	ure	Page
1	Efficiency versus Growth in Productivity Analysis	15
2	Heterogeneous Operating Conditions Produce Multiple Frontiers	. 16
3	Stochastic Frontier and Distribution Function of Efficiency	22
4	Decision Variables of DEA	30
5	Optimal Hyperplane of DEA	31
6	Orientation of DEA	. 31
7	Scale and Operating Conditions	44
8	Productivity Frontier versus Operating Condition	51
9	Heavy Rail Network of Chicago-CTA	. 58
10	Ascending Profile of Benchmarks by DEA(1) VRM/loper (maximum=100%) - Light Rail	. 71
11	Consequences of the Approximation of δ_{ij} in the Multiple Output Case - Light Rail	. 73
12	Graphic Determination of Optimal Size – Light Rail	. 91
13	Graphic Determination of Optimal Size – Heavy Rail	. 92
14	Density of Demand versus Density of Service – Light Rail	. 103
15	Transit Trips versus Employment Served around Stops – Light Rail	. 103
16	Trips per Household versus Autos per Household – Light Rail	. 105
17	Density of Demand versus Density of Service – Heavy Rail	. 105
18	Demand versus Population of the Served Area (0.3 miles around stations) – Heavy Rail	. 106
19	Ratio Stops per Track Mile versus Track Length – Light Rail	. 106
20	Density of Demand versus Track Length – Light Rail	. 107
21	Density of Demand versus Number of Stops – Light Rail	. 107
22	Ratio Stations per Track Mile versus Track Length – Heavy Rail	. 109
23	Density of Demand versus Number of Stations – Heavy Rail	. 109
24	Effectiveness (Trips per VRM) versus Fleet Size – Light Rail	. 110
25	Intensity of Use of Vehicles versus Fleet Size - Light Rail	. 110

LIST OF FIGURES (Continued)

Figu	igure P	
26	Ratio Vehicles per Track Mile versus Track Length – Light Rail	. 112
27	Intensity of Use of Vehicles versus the Ratio Stops per Track Mile – Light Rail	. 112
28	Effectiveness versus Fleet Size – Heavy Rail	. 113
29	Intensity of Use of Vehicles versus Fleet Size – Heavy Rail	. 113
30	Ratio Vehicles per Station versus Number of Stations – Heavy Rail	. 114
31	Intensity of Use of Labor in Operations versus Fleet Size – Light Rail	. 114
32	Trips per Labor Hour in Operations versus Fleet Size – Light Rail	. 115
33	Ratio Labor in Operations per Vehicle versus Fleet Size – Light Rail	. 115
34	Intensity of Use of Labor in Operations versus Fleet Size – Heavy Rail	. 117
35	Trips per Labor Hour in Operations versus Fleet Size – Heavy Rail	. 117
36	Ratio of Labor in Operations per Vehicle versus Fleet Size – Heavy Rail	. 118

•

LIST OF MATHEMATICAL EXPRESSIONS

For	mula	Page
1	Gamma Index (Connectivity Index)	. 13
2	Alpha Index (Circuitry Availability)	. 13
3	Connectivity Values and Network Form	. 13
4	Access Density	. 13
5	Comprehensive Accessibility	. 14
6	Circuitry Index	. 14
7	Partial Productivity Ratio	. 19
8	Production Function	. 22
9	Cost Function	. 22
10	Ordinary Least Squares	. 23
11	Maximum Likelihood Estimator	. 24
12	Model of Charnes, Cooper, and Rhodes (1978)	. 29
13	Model of Banker, Charnes, and Cooper (1984)	. 33
14	DEA-ND (Non-Discretionary Factors)	. 36
15	DEA-CL (Cluster Analysis using Categorical Variables)	. 37
16	Observed Production Function	. 41
17	Two Components of Efficient Output	. 42
18	Equivalency of Observed Output at Operating Conditions "Base"	. 42
19	Relation between Transforming Multiplier and Operating Conditions "Base"	. 42
20	Observed Outputs at Different Scale	. 43
21	Hypothetical Effect of Scale on Transforming Multiplier	. 43
22	Linear Production Frontiers at Different Operating Conditions	. 43
23	DEA(1) Model	. 45
24	Three Components of Observed Output	. 48
25	DEA(1) that Includes Operating Conditions Effect	. 48

LIST OF MATHEMATICAL EXPRESSIONS (Continued)

Formula	a	Page
26	DEA(2) Model	. 49
27	Transforming Multiplier δ_{ij} and the Components of Output	. 49
28	Transforming Multiplier δ_{ij} and Productivity Frontiers	. 50
29	Uniqueness of Frontier of Productivity versus Operating Conditions	. 50
30	Multiplier δ_{ij} as a Ratio of Productivity Values at the Frontier	. 50
31 to 34	Multiplier δ_{ij} for Multiple Inputs	. 51 to 52
35 to 38	Multiplier δ_{ij} for Multiple Inputs and Outputs	52 to 53
39 to 40	Approximate Solution of Multiplier δ_{ij} for Multiple Inputs and Outputs	53
41	New Model	. 54
42 to 43	New Model in Matrix Formulation	55
44	Transforming Multiplier δ_{ij} as a Separable Matrix of DEA	. 56

CHAPTER 1

INTRODUCTION

1.1 Objective and Significance of the Dissertation

This dissertation presents a fairer and more accurate method of transit productivity analysis (Two-Farrell DEA) under heterogeneous conditions that improves the basis for policy decisions like public ownership, privatization, public-private partnerships, subsidy allocation, or expansion of transit operations. Transit productivity analysis studies the productive structure of the industry in order to design policies consistent with the transit goals. For example, Pucher, Markstedt, and Hirschman (1983) found evidence that subsidy increases are associated with productivity reductions. This raised concerns in States subsidizing transit. and California. New York, Michigan, and Pennsylvania linked performance to subsidy allocation to improve the use of their resources (Fielding 1987). In other examples, transit productivity analysis calculated the effect of subsidies on transit performance and estimated the impact of privatization and deregulation on transit efficiency (Chang and Kao 1992; Gómez-Ibáñez and Meyer 1990; Sakano, Azam. and Obeng 1997). Productivity analysis provides the raw materials to major decision-making processes.

Productivity analysis can contribute indirectly to transit operations planning by evaluating the consistency and feasibility of new projects. A more direct contribution to operations planning uses a route-by-route level like in the proposed redistribution of resources from less to more utilized routes of (Pucher and Brail 1984). This dissertation presents examples of consistency and feasibility evaluation of new projects but leaves route-by-route analysis to further research.

1.2 Scope of the Dissertation

Transit productivity analysis is a branch of transit performance evaluation. Transit productivity analysis measures productivity efficiency based on the theory of the firm consistently with the maximization of output subject to technological and budget constraints. Instead, performance is a more general concept that includes such variables as on-time performance, regularity, maintenance efficiency, safety and security, speed, frequency, trip length, daily service hours, air conditioning, vehicle load, etc. Frequently, transit evaluation involves the use of productivity ratios within a broader pool of measures of performance. Baker, Dornan, and Schwager (1979) presented a general measure of performance that could be decomposed into

twelve performance-ratios to pinpoint sources of inefficiencies. A method to select the right indicators from a broad pool of variables was developed by (Fielding and Anderson 1983; Fielding, Babitsky, and Brenner 1985). With the proper adjustments, the new model developed by this dissertation can be extended from transit productivity analysis to transit performance evaluation in further research.

This dissertation covers some sections of productivity analysis but leaves others for further research. First, productivity analysis studies productivity efficiency and productivity growth but this dissertation is limited to the estimation of efficiency and leaves growth to further research. Second, allocation efficiency calculates the degree of success in the use of inputs relative to their prices but this dissertation is limited to the estimation of technical efficiency and leaves allocation efficiency to further research. Third, public funds for operating and capital expenditures have an impact on decisions about the scale of production while controlled fares and regulated wages have an impact on decisions about costs and direct revenues. This dissertation assumes that the transit agency maximizes outputs subject to the quantity of available resources. However, it is worthy to note that in the same scenario other authors have been preferring to assume that the transit agency minimizes cost subject to its technological constraints (Berechman 1993, Chapters 3 and 4).

In theory, productivity analysis should include social goals to evaluate the achievement of governmental funding. In the 1960's transit was thought to alleviate congestion, improve safety, and promote urban renewal. In the 1970's transit was thought to save energy, mitigate air pollution, and improve mobility of the poor, minority groups, the elderly, and the handicapped (Altshuler, Womack and Pucher 1979; Smerk 1991). However, to be completely effective transit needs to be part of comprehensive policies of urban planning beyond the control of transit managers (Berechman 1993; US-DOL-BLS 1998). Therefore, this dissertation considers that transit managers control transit service but they do not completely control the beneficial social externalities of transit.

The transit industry operates in many differentiated modes like bus transit, rail transit, and demand responsive services. This dissertation applies the new model to heavy and light rail transit because both modes attracted most of the new transit trips of the recent years and because there is electronic data available on geographic location of tracks and stations. This dissertation does not include institutional factors like subsidies or ownership nor attributes of the rail technology like signal systems, automation, right of way, train capabilities, trip length, etc. The analysis of attributes, institutional factors, and the remaining modes is left to further research.

Finally, this dissertation analyzes the three most common frontier methods; partial productivity analysis, stochastic frontier analysis, and data envelopment analysis. Other methods were excluded because they have very few applications; Free Disposal Hull (FDH), Artificial Neural Networks (ANN), and Multicriteria Goal Programming. Some other methods were excluded because they do not consider frontiers; Total Factor Productivity (TFP), Linear Discriminant Analysis, and conventional cost functions.

1.3 Definition of Terms

Productivity analysis uses a limited number of inputs and outputs relevant to transit. Inputs are the physical resources consumed by the productive process of transit and consist primarily of labor, energy, and vehicles. Rail transit also uses tracks and stations. Transit produces a single output expressed in passenger miles. However, since passenger miles are counted using periodical surveys this dissertation chooses a pair of measures of the same output that are counted in the whole population; vehicle revenue miles (VRM) (service supplied) and unlinked passenger trips (TRIPS) (service consumed).

This dissertation uses a broad definition of operating conditions. They are those factors that are out of the control of the agency and that affect its productivity. Operating conditions include a variety of factors; (1) Socioeconomic, like personal income and population density. (2) Institutional, like union presence and ownership type. (3) Operating characteristics, like peak-to-base ratio and average speed. (4) Regulation, like fixed prices and subsidy funds. (5) Attributes like network size and fleet age. (6) Management-related factors, like autonomy and organization. (7) Firm specific conditions. Notwithstanding their variety, all operating conditions share three characteristics, they are exogenous, heterogeneous, and affect productivity.

This dissertation applies the new model to heavy and light rail transit. Heavy rail is characterized by high-speed and rapid acceleration with passenger rail cars operating singly or in multiple car trains on fixed electric rails, with separate rights-of-way from which all other traffic is excluded, with sophisticated signaling, high platform boarding and a heavy passenger volume. In 1998 there were 14 heavy rails in the US. Light rail is an electrical railway, with a lighter passenger volume, with passenger cars operating singly or in two-car trains on fixed rails in shared or exclusive right-of-way, and stops accessible through a low or

high platform. The vehicle's power is drawn from an overhead electric rail. In 1998 there were 20 light rail systems in the US (US-DOT-FTA 1985-2000).

1.4 Outline of Research Procedures and Organization of the Dissertation

This dissertation makes a critical review of the literature to determine the approach and the assumptions of the new model. Chapter 2 formulates the working hypothesis after finding that transit works in heterogeneous conditions, that operating conditions affect transit productivity, and that conventional methods fail to measure efficiency in heterogeneous conditions. Chapter 3 explains three methods of transit productivity analysis to analyze heterogeneous conditions; partial productivity analysis, stochastic frontier analysis, and data envelopment analysis finding that a new method is necessary to deal with the specific reality of transit that works under heterogeneity of several operating conditions.

Chapter 4 develops the new model by explaining its assumptions, by maintaining algebraic coherence, and by interpreting the meaning of the new information. The adequacy of the new model is based on the acceptance of its assumptions and on its internal coherence. Chapter 5 applies the new model to rail transit and checks the expected signs of the results. The evaluation of empirical accuracy goes beyond the scope of this dissertation because Monte Carlo tests presume that the analyst knows the level of efficiency before its estimation and this is possible only with simulated data. Chapter 5 presents the results of transit productivity analysis, its consequences for policy making, and the consistency and feasibility of the planned figures of new projects. Finally, Chapter 6 concludes the dissertation and suggests further research.

CHAPTER 2

THE PROBLEM OF TRANSIT PRODUCTIVITY ANALYSIS

2.1 Transit Productivity Analysis

According to the theory of the firm, transit productivity analysis estimates the production function as the maximum output attainable at a given combination of inputs. The firm may maximize output subject to a budgetary constraint, or it may minimize total cost subject to a technological constraint (Intriligator 1978: Henderson and Quandt 1971). Once the production function is estimated, the distance from the observed output to the frontier indicates inefficiency as a proportion of the observed output.

The estimation of efficiency is a byproduct of the theory of duality that says that cost minimization is the dual formulation of output maximization. Shephard (1953) proved the theory of duality by using the distance function as a ratio of two distances from the origin of the output space, one distance to the observed output and the other distance to its radial projection on the production frontier. The inverse distance function applies as a ratio of two distances from the origin of the input space, one distance to the observed input and the other distance to its radial projection on the isoquant. The movement of the observed output toward the production frontier coincided with the movement of the observed input toward the production frontier coincided with the movement of the observed input toward the isoquant, arriving simultaneously when both functions—distance and inverse of distance—took the value of 1.00 (Fuss and McFadden 1978; Berechman 1993).

Besides efficiency, there are other variables calculated by productivity analysis. The returns to the quantity of a single input are the derivative on the marginal production of the input. If the industry always faces increasing returns in one or two inputs, the industry may have a tendency to natural monopoly and it would need regulations to prevent artificially higher prices. Returns to scale are the proportional augmentation of output with respect to a given augmentation of inputs. If the agency works under increasing returns to scale it is desirable to merge or to expand. If the agency works under decreasing returns to scale it is desirable to split in more than one unit or to downsize. Elasticity of substitution estimates the proportional change of technical ratios with changes of the ratio of input prices. Inputs can be substitutable or complementary depending of the sign of the elasticity. If many inputs are complementary to each other the impact of price increase of one input will be more intense than if many inputs are substitutes to each other. Finally, the linear production frontier calculates increases in transit outputs caused

by increases in transit inputs showing the most cost-effective ways to expand transit operations (Fuss and McFadden 1978; Intriligator 1978; Baumol, Panzar and Willig 1982; Berechman 1993).

Of all the aforementioned variables, efficiency scores affect transit policy in the sensitive point of the allocation of public resources to alternative ends. Latin American governments privatized their public bus and rail transit agencies because they consumed resources in productive inefficiency. In the United States, transit policy aims to alleviate externalities produced by the characteristics of the consumption of urban transportation. Externalities are costs produced by private activities that are not internalized in the price or in the cost of the service. Examples include the following, 1) Congestion caused by the common use of free public roads. 2) Pollution produced by private transportation. 3) Energy crises caused by foreign conflicts. 4) Destruction of urban neighborhoods associated with urban expressways. 5) National security concerns caused by excessive self-reliance in private automobiles. 6) Equity concerns on accessibility and mobility of large groups of the society. The support for transit to alleviate externalities does not find important opposition against its current form, which includes public ownership of most of transit agencies, minimum service, fixed fares, labor protection, safety rules, and subsidies from all governmental levels. A common approach to productivity analysis has been to leave externalities out because of the difficulties to measure the external benefits caused by transit activities. However, the most sensitive point of transit policy is productive efficiency because, in principle, the theory of the firm expects a level of inefficiency out of regulation and of public ownership. So, if the cost of inefficiency exceeds the benefits of alleviating externalities, transit policy should be modified (Altshuler, Womack and Pucher 1979; Heilbrum 1987; Berechman 1993; Naciones Unidas-CEPAL 1992).

Not all agencies are technically efficient in the use of inputs. Some agencies do not work at the frontier but at the interior of the frontier. The seminal work of Farrell in 1957 used the distance function to measure the percentage of efficiency of the observations in relation to the production possibility frontier. Other variables related to efficiency include the following. 1) The improvement path, that is the reduction of inputs and increase of outputs to reach the frontier. 2) The scale efficiency, that is the percentage of efficiency due to operations near or far from the optimal point. 3) The efficient peers, or efficient agencies technically nearer to the evaluated agency (technical nearness is understood as similar ratios between inputs and outputs). 4) Sources of inefficiency, which can be internal or external. 5) Productivity benchmarks, that

indicate the efficiency goals in productivity. On the other hand, transit policies to improve overall efficiency include the following. 1) Promoting privatization and public-private partnerships. 2) Contracting out. 3) Ensuring free-entry markets. 4) Changes in the scale of production. 5) Attacking external sources of inefficiency with regulation. 6) Campaigns to emulate the efficient peers that work on the best practice frontier (Lovell 1993; Kumbhakar and Lovell 2000; Coelli, Rao and Battese 1998; Ali and Seiford 1993; Shephard 1953; Intriligator 1978). Table 1 presents the variables calculated by productivity analysis.

Table 1	Variables	of Productivity	Analysis
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Variable	Consequences
Returns to quantity of a single input	Detection of sources of returns to scale
Returns to scale and scale efficiency	Supports decisions to merge or to breakdown agencies and regulation to prevent natural monopoly
Elasticity of substitution between inputs	Detect vulnerability of agencies due to input price increases
Efficiency, sources of inefficiency, improvement path, and efficient peers	Major decisions on ownership, subsidies, and regulation. Major managerial strategies of re-engineering, downsizing, expansion of operations, etc.
Production function and productivity benchmarks	Determines quantity and direction of expansion or reduction of operations by using cost effectiveness.

If efficiency is the sensitive point of transit productivity analysis, operating conditions are the difficult points of efficiency estimation. Fuss and McFadden in 1978 considered operating conditions as determinants of the production function mentioning the following examples, imperfect information, legal restrictions (patent agreements, pollution control regulations, and safety), non-transferable commodities (managerial capacity, climate, and environmental factors), and restrictions on contracts on inputs, outputs, quotas, and rationing. Therefore, a set of values of any of the mentioned variables produces a family of frontiers of production. In the transit industry some operating conditions frequently mentioned as causing productivity differentials are urban density, stop spacing, pedestrian accessibility, traffic congestion, and peaking of the demand (Pushkarev and Zupan 1977).

2.2 Contribution to Transit Operations Planning

The contribution of productivity analysis to operations planning uses coincidental data for crossexamination. The theory of the firm and productivity analysis offers indirect ways to check consistency and feasibility of new projects. On the other hand, methods of operations planning for fixed-route transit operations involves four steps; estimation of transit demand, planning of rail network and stations, fleet size design, and labor force design.

Transportation demand is the result of a two-way relationship between land use and transportation networks. The land use pattern depends on the character of the transportation network and the viability of the transportation network depends on the land use pattern (Heilbrum 1987). The activities of the individual can be modeled by the choice he or she makes at several decision levels; life-style aspirations, desired activity patterns (income, employment), locational choices (employment, neighborhood), and travel choices (short run decision). All choices are influenced by the socioeconomic characteristics of the individual and by the attributes of the transportation networks—time, cost, safety, convenience, security, etc. (Manheim 1980; Heilbrum 1987).

There are two major approaches to estimate transit demand. The first approach uses data of aggregated zones and estimates transit demand in four stages. Trip generation finds the number of trips, produced by or attracted in one zone, depending on land use, socioeconomic, and demographic characteristics. Trip distribution determines to what zones the trips are going, given travel time and distance. Modal split determines what mode of transport will be used from each zone based on trip type, characteristics of the trip maker, and levels of service. Traffic assignment assigns trips to individual transportation facilities based on travel times of the transit and highway modes of the network. So, two stages of the process include socioeconomic and demographic characteristics, while three of the stages include network attributes of time and distance (Wright and Ashford 1989; Manheim 1980; Stopher and Meyburg 1975).

The second approach uses data of individuals and applies discrete choice models to find the probability that individuals make decisions through a sequence of stages. The decision stages include work and residential location, vehicle ownership, trip versus no-trip choice, destination, time of day, and mode choice. They are embedded in a nested multinomial logit model as a function of transportation attributes and socioeconomic characteristics of the travelers (Domencich and Mcfadden 1975). Consequently, both

approaches for demand models use operating conditions to determine transit demand. Since operating conditions are directly related to the number of transit trips, this dissertation proposes ratios to check consistency of the planned figures under efficient transit operations like transit trips per capita.

The second step of operations planning is routing. It designs the route and the location of stations (stops) (Pine, Niemeyer and Chisholm 1998). Consequently, a set of ratios can check consistency of the number of trips with the length of the transit network and with the number of stops. Productivity ratios include trips per route mile, and trips per station. The technical ratio stops per route mile can check the consistency of the chosen production technique.

The third step of operations planning is blocking. It designs the fleet size to supply the service. First, the demand at the maximum load point of the route is divided by the capacity of the vehicle (including the policy of load rate of passengers per vehicle) to obtain the number of vehicles desired per period. After that, the cycle times—round trip travel time plus layover/recovery time—are divided by the desired headway to set the total number of vehicles (Pine, Niemeyer and Chisholm 1998). Therefore, a set of ratios can check consistency of the planned number of trips and vehicle revenue miles with the planned fleet size. Productivity ratios include trips per vehicle. Effectiveness is the ratio of trips per vehicle revenue mile. Intensity ratios include vehicle revenue miles per unit of input. Technical ratios can check consistency of fleet size related to network length.

The fourth step of operations planning is runcutting. It calculates the number of runs or daily operators. Runcutting consists of the assignment of operators to the assignment of vehicles. It minimizes platform times and split runs (runs with long periods of idle time in the middle) given the work rules and policy of the agency (Pine, Niemeyer and Chisholm 1998). Therefore, a set of ratios can check consistency of the planned number of labor hours with the planned trips, vehicle revenue miles, network length, and fleet size of the agency. The technical ratio labor hours per vehicle is usually taken as a ratio of efficiency with productivity of trips per labor hours and intensity of use of vehicle revenue miles per labor hour. Additional procedures could check consistency of labor hours in maintenance and energy, both being a derived demand of the scale of operations, but no further examination of these inputs is considered. Table 2 presents some ratios that check the consistency of planned new rail projects at current efficiency levels.

Variables	Ratios (*)	Consequences
Transit demand	Trips/operating conditions	Consistency of planned demand
Routing	Trips/route mile Trips/station stop route mile/station	Consistency of density of transit demand
Blocking	Trips/vehicles Trips/VRM VRM/vehicle VRM/route miles VRM/station	Checks technical ratios and intensity of use of inputs
Runcutting	Labor operator hours/vehicle VRM/labor operator hours	Checks labor technical ratio and intensity of use

Table 2 Ratios to Check Consistency of Transit Operations Planning

(*) VRM = vehicle revenue miles

2.3 Heterogeneous Conditions of Transit

This section presents evidence of the degree of heterogeneity of the operating conditions of transit. In bus transit, Fielding, Brenner, and Faust (1985) chose three operating conditions for cluster analysis; size, peak-to-base ratio, and speed, because they affected transit performance. Table 3 illustrates the high variability of the chosen variables, all of them affecting bus transit performance. Moreover, the three variables have low correlation coefficients—0.15 to 0.26—indicating at least three dimensions of heterogeneity in operating conditions. Bus transit works in very heterogeneous operating conditions.

	Size (ve	chicles)	Speed (peed (mph) Peak-to-base (ratio) (o-base (ratio) (*)
Minimum	2		7.7		0.71	
Maximum	3246		34.1		7.33	
Average	122		14		1.59	
Standard deviation	280		2.9		0.72	
Group 1 (%, range)	14%	0-10	3%	0-10	18%	0-10
Group 2 (%, range)	57%	10-100	72%	10-15	37%	1.0-1.5
Group 3 (%, range)	27%	100-1000	22%	15-20	27%	1.5-2.0
Group 4 (%, range)	2%	1000+	3%	20+	16%	2.0+

Table 3 Heterogeneous Conditions – Bus Transit

(*) Ratio of peak period number of vehicles to base period number of vehicles (US-DOT-FTA 1985-2000, Tables 26 and 28 of 1997)

Table 4 illustrates the differences in the urban form of selected heavy as well as light rail operations. Population density in New York is thirteen times higher than in Atlanta and income per capita in PATH is four times higher than in Miami. Light rail also operates in heterogeneous urban forms; population density in San Francisco is six times higher than in St. Louis while income per capita in Cleveland is three times

higher than in Los Angeles.

Mode	Population D	ensity(*)		Income per C	apita (\$)	
	Value	Ratio	Agency	Value	Ratio	Agency
Heavy rail			c ·			
Minimum	3,532	1	Atlanta-MARTA	9,279	1	Miami-CDTA
Maximum	47,492	13	New York-NYCT	32,639	4	New York-PATH
Light rail						
Minimum	3,047	1	St. Louis-BSDA	8,301	1	Los Angeles-LACMTA
Maximum	17,576	6	San Francisco-MUNI	22,898	3	Cleveland-GCRTA

Table 4 Heterogeneous Operating Conditions - Rail Transit - Urban Form

(*) Persons per square mile at the served area = within 0.3 miles around stations National Transportation Atlas, and Bureau of Census (US-DOC-BOC 1992; US-DOT-BTS 2000)

Table 5 shows that rail transit operates in heterogeneous network forms. In heavy rail, San Francisco has five times longer stop spacing than New York while, in light rail, Los Angeles has eight times longer stop spacing than Philadelphia. Moreover, heavy rail density of service in New York is twelve times greater than that of Cleveland while light rail density of service in Boston is three times greater than that of Cleveland.

Table 5 Held	erogeneous Ope	rating C	OHUILIOHS = Kall Hallsh = N	CLWOIK FOIIII		
Mode	Stop Spacing(*)			Density of Ser	vice(**)	
	Value	Ratio	Agency	Value	Ratio	Agency
Heavy rail						
Minimum	0.48	1	New York-NYCT	108	1	Cleveland-GCRTA
Maximum	2.24	5	San Francisco-BART	1,254	12	New York-NYCT
Light rail						
Minimum	0.15	1	Philadelphia-SEPTA	71	1	Cleveland-GCRTA
Maximum	1.16	8	Los Angeles-LACMTA	236	3	Boston-MBTA
		-				410 D OT DT0

Table 5 Heterogeneous Operating Conditions - Rail Transit - Network Form

(*) Miles. (**) Annual vehicle revenue miles per line mile. National Transportation Atlas (US-DOT-BTS 2000), and National Transit Database (US-DOT-FTA 1985-2000)

2.4 Effect of Operating Conditions over Transit Productivity

This section describes the effect of operating conditions on transit productivity made by diverse authors considered as conventional wisdom of transportation research. Meyer, Kain, and Wohl (1965) considered that station spacing, speed, and frequency affected transit costs and that residential density explained variations of the construction costs of facilities. Miller (1970) estimated a bus operating cost function that

included indicators of the city setting as explanatory variables. Miller found that schedule speed, density of service, and city age were relevant to explain cost per bus mile. Pushkarev and Zupan (1977) found a positive relation between higher residential density and higher vehicle productivity in regular bus service. Later, Parsons Brinckerhoff Quade & Douglas (1996) found similar relations for light rail and commuter rail. Giuliano (1981) estimated that operating characteristics were relevant to explain productivity. Size of the agency, age of firm, peak-to-base ratio, and size of the city affected vehicle revenue hours per employee while size of the city and population density affected vehicle revenue hours per vehicle. Bladikas and Papadimitriou (1985; 1986) estimated that the unproductive labor factor, defined as the ratio of total time to platform time (operating time) was affected by the peak-to-base ratio and that the number of vehicle maintenance employees correlated to vehicle size, agency size, and speed.

Operating conditions also affect the capacity of rail transit. Demery (1994) observed that tolerance of the public for maximum vehicle capacity varies between cities and even within the same city, depending of the time of the day, congestion, parking, and automobile costs. Vehicles carrying relatively small numbers of standees (15-20) may be "overcrowded" from the passenger perspective. Demery also observed the association between the number of standing passengers and dwell times with the consequent delays that affect schedule adherence.

The impact of the network form on transit productivity has not yet been estimated except for stop spacing and density of service. One of the most extended concepts is connectivity. It describes the extent of available routes between two nodes indicating facility of movement and the degree of continuity of flow in spite of local stoppages (Hay 1961; Schumer 1964). The connectivity index also estimates the degree of connection between all vertices and it is considered the most important structural property of a network (Taaffe and Gauthier 1973). Connectivity can tell the degree of branching of the network—used to maximize areal coverage—and the form of the network—ability of radial, diametral, or grid network to match the demand (Vuchic 1975; Fox 1978; Musso and Vuchic 1988). Connectivity is a graph theory-index used by Garrison, Berry, Marble, Nystuen, and Morrill (1959) to describe the topology (form) of a network without distance nor direction (Nystuen 1968). Two indices can describe transportation networks, the gamma index and the alpha index (Taaffe and Gauthier 1973). The gamma index of the network is the ratio of the observed number of edges to the maximum possible number of edges in a given network.

$$\gamma = \frac{actual_edges}{maximum_edges} = \frac{e}{3(v-2)}$$
(1)

In formula (1), γ is the gamma index, e the number of edges, and v the number of vertices. The alpha index—called circuitry availability—is the ratio of the number of actual circuits to the maximum number possible in a given network. The alpha index estimates the degree of alternative paths between nodes in the network. The number of alternative paths is the number of linkages added to a minimally connected network. The alpha index is defined as:

$$\alpha = \frac{actual_circuits}{maximum_circuits} = \frac{e - v + 1}{2v - 5}$$
(2)

The values of both indices, gamma and alpha, can describe the form of a network as indicated in the following expressions (3).

Gamma Alpha
spinal network :
$$\frac{1}{3} \le \gamma \le \frac{1}{2}, v \ge 4$$
 $\alpha = 0, v = e + 1$
grid network : $\frac{1}{2} < \gamma < \frac{2}{3}, v \ge 4$ $0 < \alpha < 0.5, v \ge 3$

delta network : $\frac{2}{3} \le \gamma \le 1.0, v \ge 3$ $0.5 \le \alpha \le 1, v \ge 3$

(3)

Besides the gamma and alpha indices, Morlok (1967) gathered additional network indicators that may explain performance of transportation networks. He classified network indicators in five types; access, comprehensiveness, circuitry, link length, and density of service. Access density is the number of terminals or access points of the systems per area unit as in equation (4).

$$N' = \frac{N}{A} \tag{4}$$

In equation (4), N' is the access density, N the number of access points, and A the area of the region served by the system. The comprehensive accessibility of formula (5) is a dimensionless number that indicates the fraction of the area a system serves.

$$Z = \frac{A_t}{A} \tag{5}$$

In formula (5), Z is the index of comprehensive accessibility, A_t the area around the access points of the network that can be easily reached, and A the area of the region served by the network. The circuitry index of formula (6) measures the difference between the airline distance and the network distance between nodes.

$$C^{*} = \frac{\sum_{i,j} L_{ij}}{\sum_{i,j} L_{ij}^{*}}$$
(6)

In formula (6), C* is the circuitry index, L_{ij} the network distance between nodes i and j, and L_{ij}^{*} the airline distance between nodes i and j. Additional indicators proposed by (Morlok 1967) of the network structure are the average link length also called stop spacing, and density of service—average flow of traffic through each vertex per unit of time. Tomazinis (1975) classified descriptors of urban transportation networks in areal coverage–access density and comprehensiveness—and serviceability and flexibility–gamma and alpha indices. Finally, (Musso and Vuchic 1988) included network complexity or the ratio of inter-station spacings to the number of stations, to describe the rail network.

2.5 Conventional Productivity Analysis in Heterogeneous Conditions

Productivity growth is the productivity shift produced by technological changes while productivity efficiency is the ratio of achieved to achievable production that is equal or smaller than 1.00. Figure 1 describes productivity growth and productivity efficiency. Let the axes be the production of outputs y_1 and y_2 per unit of a common input x. Curve P_1 is the piecewise-linear envelope of the maximum production of y_1/x and y_2/x during period 1. Two agencies A and B show their position relative to P_1 . B is in the position of efficiency because it operates at the frontier. A is in a position of inefficiency because some observed agencies produce higher levels of outputs A' > A. The radial distance function OA'/OA > 1 (larger than one) measures the efficiency of agency A. The radial distance function is the common proportional augmentation of outputs achievable by A. Notice that y_1/x and y_2/x increase in the same proportion along the OA radius to A'. In agency B efficiency is OB'/OB = 1 (equal to one) because B is located at the

frontier. In period 2 let there be a general increase in the maximum observed productivity of the industry to the new frontier P_2 . Productivity growth is the average distance between both curves P_1 and P_2 .

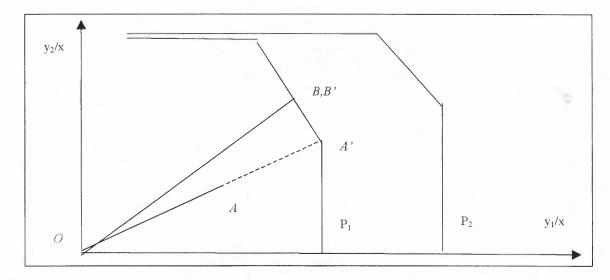


Figure 1 Efficiency versus Growth in Productivity Analysis

In Figure 2 let P_B be the production frontier operating under different conditions than P_A . That is, P_B represents operating conditions B. P_B represents agencies at better operating conditions than agencies represented by P_A . Let A work under operating conditions P_A and let B work under operating conditions P_B . The agency B is not efficient because more output is expected from B since P_B permits higher productivity. Thus, B is indeed inefficient with efficiency score OB"/OB > 1. If each agency has particular values of operating conditions, there are as many frontiers P_j as agencies and therefore heterogeneous conditions produce multiple frontiers. Moreover, Figure 2 shows that the frontier of reference for all agencies is P_B and as such it produces underestimated efficiency for A and for the industry. In Figure 2 $\frac{A''}{A} > \frac{A'}{A}$ because

A refers to the farthest frontier P_B instead of P_A and A has an efficiency score overestimated by $\frac{A''}{A} - \frac{A'}{A}$,

and therefore conventional methods underestimate the efficiency of A by $\frac{A}{A'} - \frac{A}{A''}$ and underestimate the

efficiency of the industry by $\frac{1}{2}\left(\frac{A}{A'}-\frac{A}{A''}\right)$, in this case that the industry has only two systems. Any

conventional method of transit productivity analysis underestimates efficiency in the presence of heterogeneous conditions being unfair to agencies like A because they operate in operating conditions less advantageous for transit service.

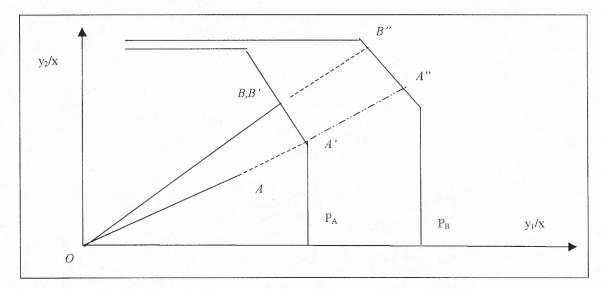


Figure 2 Heterogeneous Operating Conditions Produce Multiple Frontiers

2.6 Transit Productivity Analysis and Heterogeneous Conditions

This section shows evidence that five methods have been applied by transit productivity analysis under heterogeneous conditions, three of them refer to the frontier and are further explained in Chapter 3. The first method estimates empirical equations of productivity ratios versus operating conditions. Giuliano (1981) defined operating conditions as a group of environmental and institutional factors that can affect the supply or the demand side of transit operations. Anderson (1983) included subsidy and ownership. Systems of empirical equations permitted the analysis of operating conditions like peak-to-base-ratio, speed, and agency size that affect productivity components of bus operations and maintenance (Bladikas and Papadimitrou 1985; 1986).

The second method estimates conventional cost functions. Miller (1970) showed that scheduled speed, city age, and density of service were relevant in the estimation of the unit cost of US bus service. Wilson (1977) included subsidy source, ownership type, and weather in the estimation of cost functions of US bus agencies with the objective to forecast cost for new bus transit operations. A simpler way to estimate the

effect of operating conditions was to assign a group-specific dummy as applied in (Pozdena and Merewitz 1978) for US rail transit. The firm-specific term also helps to gather the effect of all operating conditions and to isolate the effect of a single operating condition over costs like in (Karlaftis and Sinha 1997) that estimated the effect of federal subsidies in the performance of demand responsive systems. More recently, assets attributes have been included in the cost function like bus size and multi-modal operations to calculate their influence on costs per bus-kilometer in Norway (Jorgensen, Pedersen, and Solvoll 1995; Oum, Tretheway and Waters 1992). Wunsch (1996) estimated returns to operating conditions for speed, vehicle capacity, vehicle age, and peak-to-base ratio of European transit agencies.

The third method estimates frontier cost functions. Hensher (1987) included the union presence to estimate a cost frontier of bus operations, while Viton (1993) included a firm-specific dummy in the cost function to account for the operating conditions of rail transit. Gathon (1989) used the same technique in two steps in which the second one considered operating conditions as sources of inefficiency of European bus operations. More recently, (Sakano, Obeng and Azam 1997) estimated the effect of subsidies on allocative efficiency.

The fourth method estimates the total factor productivity growth. For example (Benjamin and Obeng 1990) calculated the effect of subsidies and local conditions on productivity growth for a sample of US bus agencies. With the same method, Appelbaum and Berechman (1991) included special constraints to the cost function to account for regulations (fares and minimum service) and for demand conditions (population density and income). Hensher (1992) included an additional firm-specific term in the productivity growth estimation of Australian bus transit operations.

The fifth method is data envelopment analysis (DEA). Chu, Fielding, and Lamar (1992) estimated efficiency and effectiveness of bus agencies. Estimation of effectiveness included variables as if they were additional inputs in DEA like population density, car-less household proportion, and subsidy per passenger. Furthermore, the sample used by Chu, Fielding, and Lamar came from within clusters of US bus agencies formed on the basis of peak-to-base ratio, speed, and agency size (Fielding, Brenner, and Faust 1985). More recently, Kerstens (1996) considered ownership, subsidy source, stop spacing, population density, and speed as determinants of efficiency level. Kerstens applied DEA to French bus systems and estimated a regression of the efficiency scores versus operating conditions to identify the sources of productivity

inefficiency. Similarly, Nolan (1996) applied DEA for US bus agencies including some internal sources of inefficiency like the spare ratio and the share of maintenance employees. In summary, five methods have included operating conditions and therefore the transportation literature recognizes that the operating conditions are necessary for performance evaluation.

2.7 Working Hypothesis

The working hypothesis is that current methods of transit productivity analysis would not be adequate because they include a portion of the productivity difference caused by heterogeneous conditions and their results tend to favor those agencies working in more advantageous operating conditions. As a consequence, it would be necessary to develop a new method for measuring transit efficiency. Chapter 3 analyzes the adequacy of current methods to estimate efficiency scores in heterogeneous conditions, Chapter 4 develops the new model, and Chapter 5 applies the new model to productivity analysis of rail transit.

CHAPTER 3

LITERATURE REVIEW

3.1 Partial Productivity Analysis

3.1.1 Basic Features of Partial Productivity Analysis

Partial productivity is the ratio of a single output to a single input as presented in formula (7) where p is productivity, x is the quantity of input, and y is the quantity of output (Stevenson 1999).

$$p = \frac{y}{x} \tag{7}$$

3.1.2 Partial Productivity Analysis in Heterogeneous Conditions

The following text evaluates the current methods of productivity analysis in heterogeneous conditions.

3.1.2.1 Conventional Partial Productivity Analysis. Users of conventional partial productivity analysis have found that changes in productivity of the transit industry occurred because of changes in operating conditions such as population density, auto ownership, personal income, etc. Meyer and Gomez-Ibañez (1977) found that productivity in vehicle revenue miles grew by 1.05 percent per year but that productivity in revenue passengers decreased by 0.75 per year between 1948 and 1970 because of changes in operating conditions. Similarly, US-DOT-UMTA (1976) found increases in vehicle revenue miles and decreases in revenue passengers between 1974 and 1975. The Comptroller General (1981) found that, during 1973-1978, labor productivity decreased by 6 percent with respect to vehicle miles and by 4 percent with respect to passenger trips. He observed that subsidies encouraged transit expansion to less dense areas that are more costly to serve. Consistently, Pickrell (1983) traced 14 percent of the bus operating deficits to declining passenger miles per seat mile between 1960 and 1980. More recently, US-DOL-BLS (1998) found that, during 1967-1992, labor productivity declined four times faster in terms of passenger trips than in terms of vehicle revenue miles, and that expansion of service coincided with the period of expansion of public ownership and subsidies. Lyons (1995) calculated correlation coefficients between operating conditions and productivity, and found that labor and vehicle productivity in vehicle hours are significantly correlated with speed and with vehicle load in bus transit.

3.1.2.2 Cluster Analysis. Since conventional methods have had limited use to evaluate individual agencies, some States decided to use clusters to monitor performance of recipients of operating subsidies. Barbour and Zerrillo (1982) explained the way New York State Department of Transportation classified agencies by mode and by size. Simultaneously, Fielding, Mundle, and Misner (1982) proposed a cluster system on behalf of the Los Angeles County Transportation Commission to classify agencies by type of service; local/express service, fixed headway, etc. However, some clusters were too small, so that, some authors proposed nation-wide clusters to help to evaluate similar agencies by using the technique of cluster analysis.

Cluster analysis is a group of multivariate techniques whose purpose is to classify objects so that the resulting clusters maximize internal homogeneity and external heterogeneity. Cluster analysis consists of choosing the relevant variables that differentiate the groups, selecting a function to measure the distance between observations, and using an algorithm that maximizes the distance between clusters while minimizes the distance within clusters (Hair, Anderson, Tatham, and Black 1987).

Vaziri and Deacon (1983) clustered transit agencies in eleven groups by characteristics of city size (area, population, central-city population). However, some clusters were too small and census data was too aggregated. In contrast, Fielding, Brenner, and Faust (1985) opted for the use of the National Transit Database. They clustered bus agencies with four variables; peak vehicles, annual vehicle-miles, average speed, and peak-to-base ratio to describe the adjustment of the agency to its operating conditions. However, after observing Tables 1 and 5 of (Fielding, Brenner, and Faust 1985), only four out of twelve clusters are big enough for standard statistical inferences (clusters 3, 6, 7, and 8). Clusters 3, 6, 7, and 8 registered variations of operating conditions between 19 and 74 percent of the variation of the whole indicating that clusters did not eliminate heterogeneity. Moreover, groups 3, 6, 7, and 8 registered variations of productivity in labor, vehicles, and labor-maintenance between 42 and 94 percent of the variation of the population. Therefore, since operating conditions correlated to productivity ratios, operating conditions caused productivity differences within the clusters.

3.1.2.3 Empirical Equations. Empirical equations assume that the productivity ratio is a function of operating conditions. Giuliano (1981) found that fleet size, fleet age, peak-to-base ratio, and wage rate explained labor productivity while fleet size and population density explained vehicle productivity.

Bladikas and Papadimitriou (1985; 1986) found that the operating labor "unproductive" ratio has significant relations with the peaking of the demand and that personnel productivity of maintenance has significant relations with "slowness" (1/speed) and with fleet size. Pucher, Markstedt, and Hirschman (1983) related subsidies to productivity, finding that labor productivity in revenue vehicle hours has a significant relation with federal operating assistance and fleet size. Similarly, Cervero (1984) estimated regressions of labor efficiency and vehicle efficiency as a function of subsidies and time.

Empirical equations require a theoretical framework to determine the relevant set of variables in the regression (Intriligator 1978). Relevant variables could be excluded from empirical equations and the results would be biased and inconsistent. Irrelevant variables could be included in the empirical equation increasing the significance of the regression while reducing the significance of relevant variables to the point of exclusion. Without a theoretical framework, the membership of the relevant set of explanatory variables is uncertain.

3.1.3 Conclusions on Partial Productivity Analysis

Cluster analysis reduced but did not eliminate the influence of heterogeneous conditions while empirical equations lacked a theoretical framework necessary to know the relevant set of explanatory variables. In addition to its limitations in dealing with heterogeneous conditions, partial productivity analysis is limited to constant returns to scale and to single input and single output analysis (Oum, Tretheway, and Waters 1992).

3.2 Stochastic Frontier Analysis

Stochastic frontier analysis assumes that not all producers use the least possible inputs to produce the outputs they choose, and that some can operate at the interior of the frontier. The frontier is the maximum output that can be produced at a given input plus a random effect making the production frontier a stochastic one (Kumbhakar and Lovell 2000). The upper graph of Figure 3 shows the production y in the vertical axis and the observed inputs x in the horizontal axis. The square dots y_o are the observed outputs, the curve y_d is the deterministic frontier and the rounded dots y_s are the stochastic frontier. The lower graph

shows two probability density functions, the truncated one describes the distribution of efficiency and the symmetric one describes the distribution of random effects.

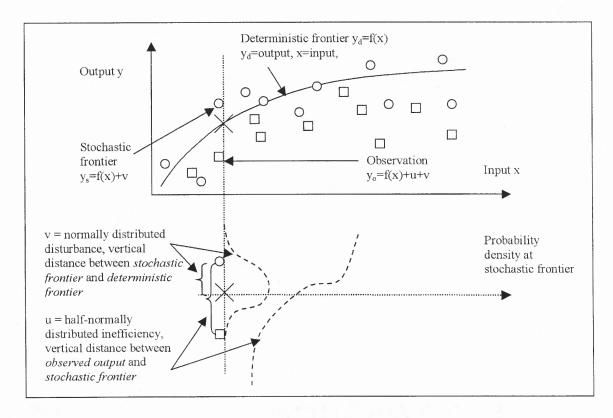


Figure 3 Stochastic Frontier and Distribution Function of Efficiency

3.2.1 Basic Features of Stochastic Frontier Analysis

Production Economics

An agency maximizes output subject to the cost constraint as in the maximization of the objective function (8) subject to constraint (9) for the case of a single output and two inputs (Henderson and Quandt 1971; Intriligator 1978).

$$\max y = f(x_1, x_2)$$
(8)
$$subject \quad to$$

$$C = w_1 x_1 + w_2 x_2$$
(9)

Where y is the output, x_1 , x_2 the inputs, w_1 , w_2 the input prices, and C the total cost. The production function maps the maximum output bundle y by using the input bundle (x_1, x_2) . The determinants of the

production function are the state of technological knowledge, physical laws, and operating conditions. Mathematical conditions ensure that the set of input requirements is convex from below (McFadden 1978).

Functional Forms

Production functions of the general form presented in equation (8) may have a number of functional forms. Table 6 presents three alternatives, the Cobb-Douglas form ensures constant cost shares of factors, the Constant Elasticity of Substitution form ensures constant elasticity of substitution between factors, while Transcendental Logarithmic form is the most flexible.

 Table 6 Functional Forms of Production Functions

Name and Reference	Functional form ($\beta s = parameters$ to be estimated)
Cobb-Douglas - CD (1928) (Fuss and McFadden 1978)	$\ln y = \beta_0 + \sum_{i=1}^n \beta_i \ln x_i \qquad \sum_{i=1}^n \beta_i = 1$
Constant elasticity of substitution – CES (1961) (Fuss and McFadden 1978)	$y^{\rho} = \beta_0 + \sum_{i=1}^n \beta_i x_i^{\rho}$
Trascendental logarithmic – Translog (1973) (Christensen, Jorgenson, and Lau 1973)	$\ln y = \beta_0 + \sum_{i=1}^n \beta_i \ln x_i + \sum_{i=1}^n \sum_{j=1}^n \beta_{ij} \ln x_i \ln x_j$
	$\sum_{i=1}^{n} \beta_i = 1, \sum \beta_{ij} = 0$

Traditional Estimation Methods

Two methods are used traditionally to estimate the production function through the average of the observations. They are the ordinary least squares and the maximum likelihood estimator (Intriligator 1978; Koutsoyiannis 1978). Ordinary least squares apply the formulation of equation (10)

Calculate $\hat{\boldsymbol{\beta}} = (\mathbf{X}' \mathbf{X})^{-1} \mathbf{X}' y$ to estimate parameter vector $\boldsymbol{\beta}$ of equation $y = \mathbf{x}\boldsymbol{\beta} + \varepsilon$ (10)

In equation (10), y is the dependent variable, \mathbf{x} the vector of independent variables, $\boldsymbol{\beta}$ the vector of parameters, $\boldsymbol{\varepsilon}$ the disturbance, and \mathbf{X} the matrix of observations of the independent variables. The maximum likelihood estimator finds the $\boldsymbol{\beta}$ parameter vector, maximizing the probability that the sample represents the population. Hence, the maximum joint probability of production is the solution to its first order conditions.

Maximum Likelihood Estimation is a method described in equations of (11), g is the probability density function (normal) of the output y_i as a function of parameters β and of the variance of the disturbance σ_{ε}^2 . L is the joint probability density of the sample, and the derivatives $\partial \ln L$ are the first-order conditions that equal zero.

$$g(y_i; \boldsymbol{\beta}, \sigma_{\varepsilon}^2) = \frac{1}{\sqrt{2\pi\sigma_{\varepsilon}^2}} \exp\left(-\frac{(y_i - \boldsymbol{\beta}_i \mathbf{x}_i)^2}{2\sigma_{\varepsilon}^2}\right), \text{ probability density function of dependent variable } y_i$$

$$L = \prod_{i=1}^{n} g(y_i; \boldsymbol{\beta}, \sigma_{\varepsilon}^2), \text{ function of the total probability that } \boldsymbol{\beta} \text{ produces } y_i$$

$$\frac{\partial \ln L(\boldsymbol{\beta}, \sigma_{\varepsilon}^{2})}{\partial \boldsymbol{\beta}, \sigma_{\varepsilon}^{2}} = \mathbf{0}, \text{ first order conditions to maximize L}$$
(11)

Frontier Estimation Methods

Stochastic frontier formulations decompose the disturbance ε in two components, a random component "v" and an efficiency component "u" to make $\varepsilon = u + v$. Table 7 shows the procedures of two stochastic frontier methods, maximum likelihood estimator and modified least squares.

Table 7 Se	elected Method	ls to Esti	imate Stocl	hastic Frontiers
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Name Reference Steps	Problem formulation and assumptions	Formula estimation
Maximum likelihood estimator	$y = \mathbf{\beta}\mathbf{x} + \boldsymbol{\varepsilon}$	Solve the log-likelihood function:
 (Aigner, Lovell and Schmidt 1977) (Meeusen and van der Broeck 1977) (Battese and Corra 1977) (Jondrow, Lovell, Materov and Schmidt 1982) 	$y = \mathbf{\beta}\mathbf{x} + u + v$ $u \le 0 \approx N(0, \sigma_u^2)$ $v \approx N(0, \sigma_v^2)$ $\sigma^2 = \sigma_u^2 + \sigma_v^2$	$\ln L(y \mid \boldsymbol{\beta}, \sigma, \gamma) = -\frac{n}{2} \ln \frac{\pi}{2} - \frac{n}{2} \ln \sigma^2 + \sum_{i=1}^n \ln [1 - \Phi(z_i)] - \frac{n}{2} $
 Find ordinary least squares estimates of β, σ Find log-likelihood L(y β, σ, γ) Find best γ in [0,1] Find max (lnL) by applying non- linear programming method (like 	$\gamma = \frac{\sigma_u^2}{\sigma^2}$ $E_{(\varepsilon)} = E_{(u)} = -\frac{\sqrt{2}}{\sqrt{\pi}}\sigma_u$ $V_{(\varepsilon)} = V_{(u)} + V_{(v)} = \sigma^2$ $\sigma^2 = \left(\frac{\pi - 2}{\pi}\right)\sigma_u^2 + \sigma_v^2$	$-\frac{1}{2\sigma^{2}}\left(\sum_{i=1}^{n} y_{i} - \mathbf{x}_{i}\boldsymbol{\beta}\right)^{2}$ where, $z_{i} = \frac{(y_{i} - \mathbf{x}_{i}\boldsymbol{\beta})}{\sigma}\sqrt{\frac{\gamma}{1 - \gamma}}$ $\Phi(z_{i}) = \int_{-\infty}^{z} (2\pi)^{-\frac{1}{2}} \exp\left(-\frac{1}{2}t^{2}\right) dt$
Davidon-Fletcher-Powell)	Same as above	
Modified least squares (Fried, Lovell and Schmidt 1993)	Apply theorem by which estimators of ordinary least squares are unbiased	$m^{3} = \left(\frac{2}{\pi}\right)^{\frac{1}{2}} \left[1 - \left(\frac{4}{\pi}\right)\right] \sigma_{u}^{3}$ $m^{2} = \left[\left(\frac{\pi}{2}\right) - 1\right] \sigma_{u}^{2} + \sigma_{v}^{2}$
1. Find ordinary least squares estimates of $\boldsymbol{\beta}, \boldsymbol{\sigma}$	estimators of stochastic	
2. Find $\hat{\sigma}_u^2$ from m^3	frontier except constant β_0	$E_{(u)} = -\frac{\sqrt{2}}{\sqrt{\pi}}\sigma_{u}$
3. Find $\hat{\sigma}_v^2$ from m^2 4. Find constant term $\hat{\beta}_0$	\mathcal{P}_0 Moments m ^k = $\Sigma(y - \hat{y})^k \hat{y}$ of OLS	$\hat{\beta}_0 = \hat{\beta}_{0 \text{ ordinary-least-squares}} - \hat{\sigma}_u \left(\frac{1}{2}\right)^2$

y = output, β = parameter vector, x = input vector, ε = disturbance, u = efficiency component of ε , v = stochastic component of ε , N = normal distribution, σ_{ε}^2 = total variance of disturbance ε , σ_u^2 = variance of efficiency, σ_v^2 = variance of stochastic component, γ = efficiency component of disturbance variance, E = expected value, V = variance, L = joint density probability function of the observed outputs, n = size of sample, Φ = normal cumulative distribution function, ln = natural logarithm, z_i = normal standard value of y_i , exp = exponential function, m^k = moments k, ^ = estimated, i = observation i.

3.2.2 Stochastic Frontier Analysis in Heterogeneous Conditions

The following text makes a critical review of the current methods of productivity analysis in heterogeneous conditions.

3.2.2.1 Conventional. Transportation studies applied conventional stochastic frontier analysis to compare methods of estimation and therefore, the operating conditions were explicitly excluded to avoid their

influence over the differences between methods. For example, Kumbhakar (1987) estimated efficiency of US railroads to compare four estimation methods and Coelli and Perelman (1999) estimated efficiency of European railways to compare DEA and stochastic frontier analysis.

3.2.2.2 Two-Step. Two-Step estimates a conventional cost frontier and then uses the efficiency scores as a dependent variable that is a function of operating conditions. The second step usually estimates a Tobin regression that is a special method for those dependent variables that are bounded (efficiency should be larger or equal to zero and smaller or equal to one). The second step implicitly assumes that internal inefficiency approximates the residual, the constant term, or the parameter of a firm-specific dummy.

Gathon (1989) estimated the cost frontier of European transit agencies and found that speed explained a significant part of the variation of the efficiency score. Gathon and Pestieau (1995) estimated the production frontier of European railways, and found that regulation was significant to explain the variation of efficiency scores. Liu (1995) estimated the production frontier of British ports, and found that ownership was not significant to explain the variation of efficiency scores although location and size were significant. Sakano and Obeng (1995) estimated the cost frontier of US bus transit agencies and found that neither capital nor operating subsidies were significant to explain variations of technical efficiency. McMullen and Lee (1999) estimated the cost frontier of US motor carriers, and found that seven variables explained the variation of efficiency scores, except deregulation. In brief, Two-Step measures inefficiency and attributes it to operating conditions.

The second step usually does not consider internal inefficiency as a variable because this is unknown; therefore, a relevant variable is excluded from the regression creating a specification error in which estimators can be biased and inconsistent (Intriligator 1978). Even though the second step may assume that inefficiency was the constant term or the firm-specific dummy, the second equation is still incomplete. Dummies are used in cases where there is lack of knowledge about the model and they are limited to choose between "existence or nonexistence" of internal inefficiency (Pindyck and Rubinfeld 1998). The specification of the model improves but it cannot completely separate internal inefficiency from the effect of operating conditions because there can be an internal inefficiency in any agency caused by its culture management, employees morale, etc.

3.2.2.3 Operating Conditions as Inputs. Sarndal and Statton (1975), Sarndal, Oum, and Statton (1978), and Oum, Tretheway, and Waters (1992) demonstrated that output characteristics of the airline industry were associated to production and cost and concluded that they should be included in the production functions. Similarly, Rus and Nombela (1997) assumed that speed affected efficiency of Spanish bus agencies because it contained information about the type of routes of the firm and therefore they included it in the production function. Schmidt and Sickles (1984) estimated the production frontier of US airlines including load factor and average stage length while Cornwell, Schmidt, and Sickles (1990) included season (winter-spring), stage length, and quality of the service. Viton (1993) estimated a cost frontier function for US rail rapid transit including cars per track mile as a proxy for level of service, technological variables, and fixed factors and also he included a dummy for firm-specific characteristics.

However, this method has the caveat of correlation of inputs with operating conditions. Xu, Windle, Grimm, and Corsi (1994) estimated a cost frontier function for the US trucking industry with network variables and they proved that size and network variables are correlated and that both variables affect returns to scale in a unique but combined effect. The preceding result suggests that operating conditions do not affect productivity by themselves but that they do it through their influence on inputs; therefore, it is not possible to separate the effect of inputs from the effect of operating conditions when both appear in the same equation. Larger firms, compared to smaller systems, appeared to have advantages in increasing their length of haul and their average load size. Furthermore, if this interpretation stretches to include speed and peak-to-base ratio in the transit industry, it affects productivity through labor and vehicles causing multicollinearity that biases the parameters of inputs and operating conditions.

3.2.2.4 Operating Conditions in Additional Constraints. Additional constraints to equations (8) and (9) of page 22 transmit the effect of operating conditions to productivity by using an adequate theoretical framework. Operating conditions have been added in a demand or in a budgetary constraint attached to the original formulation of the cost minimization problem (Applebaum and Berechman 1991; Obeng and Azam 1997; Berechman 1993, Chapter 6; Sakano, Obeng, and Azam 1997).

The only problem with the additional constraints is that it is difficult to achieve comprehensiveness because one constraint is necessary to explain the effect of one operating condition while many operating conditions would reduce the degrees of freedom and complicate the estimation of the model. This method can be practical to explain the effect of few operating conditions but it becomes complicated for a large number of operating conditions.

3.2.2.5 Cost Elasticity of Operating Conditions. This method tries to simplify the inclusion of operating conditions in additional constraints. The method consists of deriving the algebraic relation between inputs and operating conditions to later use it to estimate unbiased returns to scale. The method was developed in Jara-Diaz and Cortes (1996) who related motor carrier returns to scale to several operating conditions. Savage (1997) applied this method in his estimation of returns to scale for US rail transit. Similarly Marin (1998) multiplied a linear function of operating conditions as a component of the productivity elasticity of input for airlines.

However, the cost elasticity of operating conditions seems to present only a partial view of the global relations between operating conditions, inputs, and outputs. Ourn and Zhang (1997) already observed that the algebraic constructions of Jara-Diaz and Cortes (1996) assumed no relations between attributes themselves and that output had to remain constant for the relations to hold. The finding of Ourn and Zhang (1997) can also be interpreted as the consequences of applying a partial empirical framework instead of a global theoretical framework to explain the relations between operating conditions, inputs, and outputs.

3.2.3 Conclusions on Stochastic Frontier Analysis

Stochastic frontier analysis may include operating conditions with additional constraints within a sound theoretical framework but additional constraints may turn too complicated if all operating conditions were included simultaneously. Therefore, this approach is adequate to measure the influence of one or two operating conditions rather than the simultaneous influence of all of them. The other methods have estimation problems like multicollinearity and specification errors derived from an inadequate theoretical formulation.

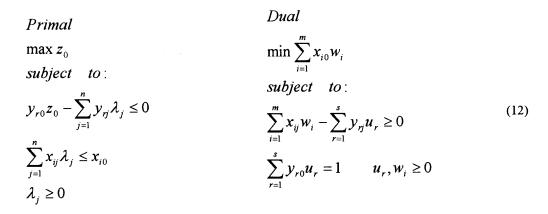
3.3 Data Envelopment Analysis (DEA)

3.3.1 Basic Features of DEA

DEA is the linear programming approach to productivity analysis developed by Charnes, Cooper, and Rhodes (1978) to evaluate regulated industries, public utilities, public services, and activities with nonexistent or regulated prices.

3.3.1.1 The Charnes, Cooper and Rhodes (1978) Model. Charnes, Cooper, and Rhodes (1978) extended the model made by Farrell (1957) from a model of single outputs to a model of multiple outputs. The formulation is presented in equations (12).

Charnes, Cooper, Rhodes 1978



DEA Variables of the Primal

In the primal of model (12), z_0 is the efficiency score, if $z_0 = 1$ then agency 0 is efficient, if $z_0 > 1$ then agency 0 could augment outputs in the proportion $z_0 - 1$. There are two sets of constraints; the output set and the input set. The output set has coefficients y_{rj} describing the output r of agency j, with s outputs and n agencies. The input set has coefficients x_{ij} describing the input i of the agency j, with m inputs and n agencies. Variables z_0 , λ_j are the decision variables. Variable z_0 is the maximum proportional expansion of outputs to achieve efficiency. Variables λ_j are the weights of a linear composite of the inputs of the agencies j to reproduce the inputs used by agency 0. At the optimal solution those $\lambda \neq 0$ identify those efficient agencies that are the technological reference for agency 0. Figure 4 shows the role of the decision variables of the primal of model (12), λ and z_0 . In the inputs plane (left), the input of agency A is equal to a linear composite of the inputs of B and C, $Xa = \lambda_c Xc + \lambda_b Xb$. In the outputs plane (right), the same linear combination applies to outputs B and C to build frontier BC where z_0 multiplies the output of agency A is the necessary proportional augmentation of the output to reach the frontier BC, $z_0 Ya = \lambda_c Yc + \lambda_b Yb$.

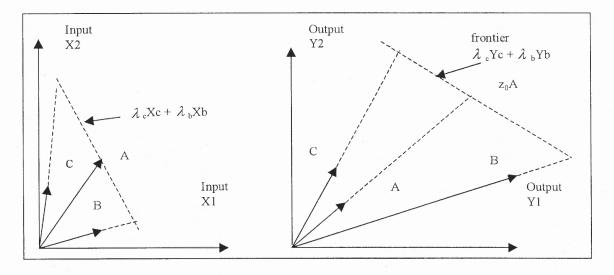


Figure 4 Decision Variables of DEA

DEA Variables of the Dual

In the dual of model (12), a set of constraints normalizes the outputs of agency 0 to 1.00 to bound the problem while the other set of constraints build several hyperplanes of linear production functions with the maximum hyperplane, the binding constraint, describing the frontier. The variable u_1 of the dual is the price associated to the slack of the primal constraint for y_1 . If $u_1 = 0$ the constraint for y_1 of the primal is not binding since its slack is not zero. If $u_1 \neq 0$ the constraint for y_1 of the primal is binding since its slack is lack is u_1 of agency 0 increases by one unit, efficiency increases by u_1 units.

Figure 5 shows the hyperplane built by the dual of model (12) with its equation uy - wx = 0, where u, w are the coefficients of the optimal piecewise linear production function. The value of the objective function represents the proportional distance between the hyperplane that passes through the agency and the hyperplane of the efficient frontier.

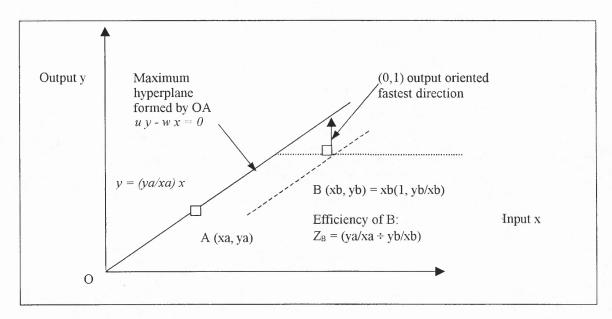


Figure 5 Optimal Hyperplane of DEA

DEA Orientation

Figure 6 illustrates that DEA is output oriented if it follows path AB to increase outputs for achieving efficiency, DEA is non-oriented if it follows path AC, and DEA is input oriented if it follows path AD to reduce inputs for achieving efficiency.

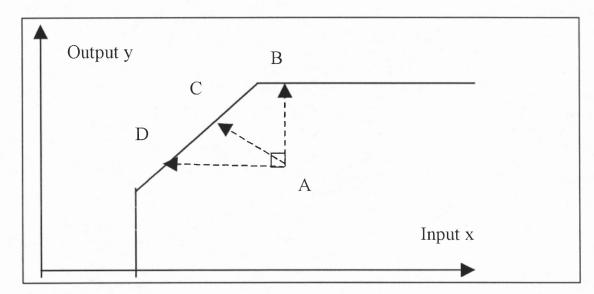


Figure 6 Orientation of DEA

Theoretical Framework of DEA

The theoretical framework of DEA is based on the radial distance function that relates observations to the frontier planes of seemingly related variables. Seemingly related variables are those already considered so by any theory. For example, the theory of the firm considers the production function as a relation between inputs and outputs where more input corresponds to more output. Thus, constraint sets of outputs and inputs of the primal of model (12) are consistent with the general agreement in the positive relation between input and output. Similarly, the planes formed in the constraints of the dual of model (12) are also consistent with the implicit linear production functions. Chang and Guh (1991) showed that the dual of DEA implies a piecewise linear envelope and that for each agency the envelope acts as a piece of a linear production function that gauges efficiency.

Information Provided by (Charnes, Cooper, and Rhodes 1978)

- Efficiency score. The efficiency score indicates overall efficiency. In the case of an output oriented model, a score larger than one indicates insufficient production and the proportional excess over unity indicates the proportional increase of outputs needed to achieve efficiency.
- > *Efficient Peers*. Efficient peers are those efficient agencies that are technologically near the evaluated agency. They are identified as those agencies with a lambda different than zero ($\lambda \neq 0$).
- Improvement Path. The improvement path is the product of the outputs times the efficiency score minus one plus the output slacks. It is the actual increase of output needed to achieve efficiency.
- Linear Production Function. The linear production function is uy wx = 0 as shown in Figure 5. The linear production function is a piecewise set of linear equations that relate outputs to inputs at the production possibility frontier. The coefficients of the inputs are the shadow prices of the agency in that they express the increase in the production of an output when the input increases in one unit. Moreover, they are the value of marginal productivity of the input when the coefficient of the output is unity and the rest of the outputs remain constant. Only those inputs whose constraints are binding in the primal show a coefficient different than zero in the primal.

> Returns to scale. In the case of output-oriented models, the indicator $\frac{\sum \lambda_j^{(12)}}{z_0}$ indicates returns to

scale where z_0 is the efficiency score. If $\frac{\sum \lambda_j^{(12)}}{z_0} > 1$ the agency operates in decreasing returns to

scale. If
$$\frac{\sum \lambda_j^{(12)}}{z_0} < 1$$
 the agency works in increasing returns to scale.

3.3.1.2 The Banker, Charnes and Cooper (1984) Model. Banker, Charnes, and Cooper (1984) assumed variable returns to scale but recommended that the decision on returns to scale be based on previous

knowledge of the transit industry. They added a convexity constraint $\sum_{i=1}^{k} \lambda_{i} = 1$ to the primal of the model

as indicated in equations (13) to adjust the frontier according to the size of the agency. The dual of the model augments the unconstrained w_0 that indicates that the implicit frontiers are locally significant to the observations.

Banker, Charnes, Cooper 1984

PrimalDualmax
$$h_0$$
min $\sum_{i=1}^m x_{i0} w_i + w_0$ subject to: $min \sum_{i=1}^m x_{i0} w_i + w_0$ $y_{r0}h_0 - \sum_{j=1}^n y_{rj}\lambda_j \le 0$ subject to: $\sum_{j=1}^n x_{ij}\lambda_j \le x_{i0}$ $\sum_{i=1}^m x_{ij} w_i - \sum_{r=1}^s y_{rj} u_r + w_0 \ge 0$ $\sum_{i=1}^n \lambda_j = 1$ w_0 unconstrained $\lambda_j \ge 0$ $\lambda_j \ge 0$

Information Provided by (Banker, Charnes and Cooper 1984)

Scale efficiency score. The scale efficiency score is the ratio of efficiency scores of model (12) to model (13); $\frac{z_0}{h_0}$ where z_0, h_0 are the objective functions of the models (12) and (13) respectively

indicating the degree of productivity efficiency caused by the scale of production.

> Technical efficiency score. The technical efficiency score is the variable h_0 of model (13). It indicates the degree of productivity efficiency caused by the technical skills of the agency.

3.3.1.3 Applications of DEA to Fields Other than Productivity Analysis. DEA has been used to estimate efficiency of site location based on travel distance and extent of coverage of sites (Desai, Haynes, and Storbeck 1994; Desai and Storbeck 1990). More recently, DEA has selected dispatching rules for scheduling problems in manufacturing and servicing systems (Braglia and Petroni 1999; Ho and Lau 1999). Haskel and Sanchis (2000) applied DEA to create a bargaining model between labor and management under certain market conditions. Reinhard, Lovell, and Thijssen (2000) extended the models that evaluate environmental efficiency with multiple environmentally detrimental inputs. Innovative contributions in transportation include (Nozick, Borderas, and Meyburg, 1998) that used parking availability and proximity to transit to evaluate travel demand programs. Also, DEA has used attributes of network links to evaluate efficiency of non-dominated paths on a road network (Cardillo and Fortuna 2000). A common feature of the innovative applications of DEA is the positive correlation of two groups of variables that measure the distance function between the observation and the frontier, a feature that can be extended to operating conditions and productivity.

3.3.2 DEA in Heterogeneous Conditions

The following text makes the critique of the current methods of productivity analysis in heterogeneous conditions.

3.3.2.1 Conventional DEA. Conventional DEA explicitly assumes an industry working in homogeneous operating conditions (Golany and Roll 1989; Boussofiane, Dyson, and Thanassoulis 1991). However, conventional DEA has been applied to transportation by authors who say that they did not consider operating conditions in order to compare different methods of DEA because they would bias the

comparison of methods. For example, Forsund (1992) estimated the efficiency of Norwegian ferries to compare DEA to stochastic frontier analysis. Tofallis (1997) tested a new method to improve the discriminating power of DEA in small samples of airlines by estimating input-specific DEAs in cases of non-substitutable inputs. Therefore, conventional DEA has been applied only to compare methods of estimation and because operating conditions were not necessary.

3.3.2.2 Two-Step DEA. In 1988, Ray observed that different levels of operating conditions behave like different levels of technology because by varying their values they build productivity frontiers. He concluded that operating conditions cannot be included as inputs but that they can be related to efficiency scores in a separated Tobit regression at a second step. Tobit regression is a special Ordinary Least Squares applied to a dependent variable is bounded as efficiency is bounded between 0 and 1.00. Our and Yu (1994) found that railways of developed countries with higher subsidies were less efficient. Good, Roller, and Sickles (1995) found that European airlines benefited from deregulation with large productivity gains. Kerstens (1996) found that ownership and subsidies were important to determine efficiency of French transit agencies. Nolan (1996) made a similar study for the US bus transit firms and he found fleet age significant in explaining technical efficiency followed by maintenance practices and operating subsidies. Gillen and Lall (1997) in their study of American airports found that reducing the movements of general aviation improved the efficiency on the airside part of the airport, while expanding the number of common gates improved terminal efficiency. Chapin and Schmidt (1999) found that mergers permitted US rail freight agencies to operate track networks more efficiently but that total productivity gains between merging firms and non-merging firms were not different. In summary, Two-Step DEA identified operating conditions with sources of inefficiency.

However, the second step does not consider internal inefficiency and therefore it produces a specification error. Also, firm-specific dummies overlap internal inefficiency with other non-controllable effects. More importantly, Two-Step DEA creates a methodological inconsistency between the deterministic efficiency score of the first step and the stochastic efficiency score of the second step.

3.3.2.3 Non-Discretionary Factors DEA. Non-Discretionary Factors DEA considers operating conditions as if they were fixed factors. Banker and Morey (1986b) developed the model presented in equations (14).

Banker, Morey - 1986b: Non - discretionary Factors, DEA - ND
Primal
max
$$\phi_0$$

subject to:

$$\sum_{j=1}^{N} y_{\eta} \gamma_j \leq y_{r0} \phi_0 \quad r \in v_D \text{ discretionary outputs}$$
(14)

$$\sum_{j=1}^{N} y_{\eta} \gamma_j \leq y_{r0} \quad r \in v_F \text{ fixed outputs}$$

$$\sum_{j=1}^{N} x_{ij} \gamma_j \leq x_{i0}$$

$$\sum_{j=1}^{N} \gamma_j = 1 \qquad \phi_0, \gamma_j \geq 0$$

In model (14), y_{η} is the output r of the unit j, v_D the group of discretionary outputs, v_F the group of fixed (non-discretionary) outputs, x the input (m inputs), γ the matching multiplier, and ϕ_0 the efficiency score of agency 0. The factor ϕ_0 multiplies only the discretionary outputs of agency 0 because the agency is responsible for producing the discretionary outputs while maintaining the comparability of at least similar levels of non-discretionary outputs. The model can also consider non-discretionary inputs.

Cook, Kazakov, Roll, and Seiford (1991) included snowfall for winter cost increases in efficiency of highway maintenance patrols in Ontario, Canada. Obeng (1994) included subsidies to estimate the efficiency of American transit firms, but Kerstens and Eeckaut (1995) discussed his work favoring Two-Step DEA on the same issue. Cowie and Riddington (1996) used population density for the productivity efficiency of European railways. Viton (1997) included speed and fleet age to estimate the productive efficiency of American multimodal bus and demand response transit. Parker (1999) included ownership to estimate technical efficiency of British airports.

However, Non-Discretionary Factor DEA has been contested in three areas. Yu (1998) found it inaccurate because it achieved only a 25 percent correlation with the real efficiency score. Moreover, adding inputs that are unnecessary increases artificially the estimated efficiency scores (Nunamaker 1985). Additionally, operating conditions do not behave as inputs and therefore they cannot be included as fixed inputs (Ray 1988). The three problems are related because the low empirical accuracy of Non-Discretionary Factors may be caused by the overestimation caused by the inclusion of operating conditions as unnecessary inputs.

3.3.2.4 Cluster Analysis DEA. There are three models of cluster analysis DEA. The first pre-assigns the value of a categorical variable to a group and estimates DEA inside the group. The second applies cluster analysis to form the groups. The third measures efficiency differences between groups called "programs". The first model is the categorical variables model which assigns a value to each cluster and then includes the agency if it belongs to the same group of the evaluated agency. This model is represented by equations (15) (Banker and Morey 1986a).

Banker, Morey - 1986a: DEA and Cluster Analysis, DEA - CL
Primal
min
$$z_0$$

subject to:

$$\sum_{j=1}^{N} x_{ij} \lambda_j \ge x_{ij0} z_0$$

$$\sum_{j=1}^{N} y_{rj} \lambda_j \ge y_{rj0}$$

$$\sum_{j=1}^{N} \lambda_j = 1$$

$$\lambda_j \ge 0$$

$$\sum_{j=1}^{N} \lambda_j \delta_{m,j}^{(k)} \le \delta_{m,j}^{(k)} \qquad \delta_{m,j}^{(k)} = 0 \text{ or } 1 \text{ group discriminant}$$
(15)

In model (15), x is the input i of a total of m, y the output r of a total of s, λ the multiplier of agency j of a total of n, and z the efficiency score, δ is a binary variable that activates the comparison of those agencies of the same cluster. The multipliers λ_j are activated by δ if agencies are in the same

cluster as the evaluated agency. An extension to model (15) related the value of the categorical variable to values of operating conditions (Cook, Chai, Doyle and Green 1998). Rouse, Putterill, and Ryan (1997) applied model (15) to estimate the managerial performance of highway maintenance in New Zealand.

The second model applies cluster analysis and uses its results to estimate DEA using model (15). This model was developed in (Ruggiero, Duncombe, and Miner 1995) and applied in (Ruggiero 1996; 1998). Chu, Fielding, and Lamar (1992) used it earlier when they estimated efficiency of American bus transit agencies presented in the previous work of (Fielding, Brenner, and Faust 1985) on the basis of peak-to-base-ratio, speed, and size. Charnes, Gallegos, and Li (1996) clustered Latin American airlines in two groups depending on their environmental characteristics before applying DEA. Karlaftis (2000) clustered American bus transit agencies by size with the objective to estimate returns to scale.

The third model called "program evaluation" compares efficiency of groups working under different policy programs. This method uses tests of non-parametric statistics to determine if efficiency scores are different between groups (Charnes, Cooper and Rhodes 1981; Carrington, Puthucheary, Rose and Yaisawarng 1997; Ozcan, Watts, Harris and Wogen 1998; Bates 1997; Ozcan 1992).

Chan and Sueyoshi (1991) applied program evaluation to American airlines to measure the effect of deregulation. Chang and Kao (1992) applied program evaluation to urban bus transit agencies of Taiwan to measure the effect of ownership. Hjalmarsson and Odeck (1996) estimated productivity efficiency of trucks in road construction and maintenance in Norway identifying sources of inefficiency. Cowie (1999) applied program evaluation to Swiss private railways to estimate the effect of ownership on productivity. In all applications, program evaluation measured the simultaneous effect of *one* but not the effect of *several* operating conditions.

The caveat of the first and second models of cluster analysis DEA is that they reduce the effect of heterogeneous conditions but that they do not eliminate differences within the cluster causing inaccuracy. Moreover, since DEA applies to a smaller set of reference it raises the efficiency scores artificially. The caveat of the third model applies for cases of only one operating condition but does not apply for the case of many operating conditions.

3.3.2.5 Reversed Two-Step DEA. Reversed Two-Step DEA estimates the effect of heterogeneous conditions and uses the results to adjust the inputs and outputs to estimate DEA in the second step of the

model. Fried, Schmidt, and Yaisawarng (1999) applied a Reversed Two-Step DEA to American nursing homes. The method has five stages; first, it calculates the traditional DEA to find the slacks of the inputs. Second, it estimates the parameters of input slacks as a linear function of operating conditions. Third, it uses the estimated equation to calculate the input slacks for each nursing home. Fourth, it calculates an adjusted input, that is, the observed input plus the maximum estimated slack minus the slack estimated for each nursing home. Fifth, the method runs DEA one more time using the adjusted inputs.

The combination of stochastic regression and deterministic DEA produces a methodological inconsistency when it considers that efficiency is deterministic in DEA while it is stochastic in the Tobit regression. Moreover, the regression between input slacks and operating conditions (second step) does not consider sources of internal inefficiency (unknown variable) and therefore it has a specification error.

3.3.3 Conclusions on DEA

DEA has not yet developed an adequate model for operating conditions. The Reversed Two-Step DEA could be extended with a sound but simple theoretical framework to link operating conditions and productivity. In that way, the new method would avoid the specification errors of the Two-Step DEA, the overestimation of the Non-Discretionary Factors DEA, and the overestimation and inaccuracy of the Cluster Analysis DEA.

DEA has additional benefits that make it attractive for transit productivity analysis. It does not require rigid assumptions regarding production technology or regarding efficiency distribution and it does not require market prices of inputs or outputs (Oum, Tretheway, and Waters 1992). DEA is a simple approach for the elevation of multiple outputs relative to other approaches that consider complex relations between inputs and outputs as in the case of stochastic frontier analysis (Cooper, Seiford, and Tone 2000).

However, DEA has four limitations. First, DEA does not consider stochastic events and therefore DEA cannot be tested for statistical significance. Second, DEA is sensitive to outliers, so that unusually good performance of a single unit can push the production frontier to levels that may expose DEA to inaccuracy. Third, it has been observed that the higher the number of inputs or outputs, the higher the efficiency scores. Consequently, unnecessary factors increase the general level of estimated efficiency artificially (Nunamaker 1985). Fourth, overestimated efficiency occurs after partitioning a sample because each partition has a lower number of evaluated agencies.

3.4 Conclusions of the Literature Review

After reviewing the current methods for transit productivity analysis, it was found that all methods have limitations to measure efficiency in heterogeneous operating conditions and therefore it is necessary to develop a new model. Since DEA has more advantages to be applied to transit, the new model will build on DEA. Since the Reversed Two-step DEA estimates first the effect of heterogeneous conditions and later the productivity efficiency, the new model will build on the Reversed Two-Step DEA.

CHAPTER 4

THE NEW MODEL

4.1 Objectives and Assumptions of the New Model

4.1.1 Objectives of the New Model

The new model aims to accomplish four objectives. First, to extract the effect of heterogeneous conditions from productivity efficiency by using two steps, one to estimate the effect of heterogeneous conditions and the other to estimate productivity efficiency. Second, it intends to avoid specification errors caused by absent variables by solving the apparent conflict of avoiding redundant operating conditions while including all their effect. Third, to avoid inaccuracy caused by dummy variables intended to describe internal inefficiency by isolating internal inefficiency in the last step. Finally, the new model aims to use the theory of the firm to link inputs, outputs, and operating conditions in a sound framework. The adequacy of the model is based on its assumptions and its internal coherence.

4.1.2 Assumptions of the New Model

4.1.2.1 Operating Conditions Build Multiple Production Frontiers. A technology level determines the maximum outputs achievable by a given combination of inputs. Therefore, changes in technology will shift the production frontier (Emery 1984). Similarly, a bundle of operating conditions determines the maximum outputs achievable by a given combination of inputs such as changes in operating conditions will shift the production frontier (McFadden 1978). Ray (1988) adopted this approach and applied it to DEA, and this formulation is the departing point of the development of the new model.

Let the observed production function be a multiplicative and separable function of inputs and operating conditions working at the efficient frontier. Let the industry have n agencies. The generic agency j produces \tilde{y}_j observed units of a single output by using a bundle of s inputs working at a bundle of q operating conditions. Let the s-element vector \mathbf{x}_j be the inputs of the firm. Let the q-element vector \mathbf{c}_j be the operating conditions affecting the output. Equation (16) is the observed production as a function of inputs and operating conditions.

$$\widetilde{y}_{j} = g(\mathbf{x}_{j}, \mathbf{c}_{j}) \tag{16}$$

Assume that two efficient and identical agencies, j and h, have the same bundles of inputs, $\mathbf{x}_j = \mathbf{x}_h$ but produce different levels of outputs, $\tilde{y}_j \neq \tilde{y}_h$, due to differences in operating conditions, $\mathbf{c}_j \neq \mathbf{c}_h$. Equal levels of outputs $\tilde{y}_j = \tilde{y}_h$ could only be produced at equal levels of operating conditions, $\mathbf{c}_j = \mathbf{c}_h$, therefore the formulation allows for shifts in the productivity frontier caused by changes in operating conditions. Let isolate the effect of the operating conditions \mathbf{c}_j in the observed production of equation (17).

$$\widetilde{y}_{j} = \delta_{b} \left(\mathbf{c}_{j} \right)^{*} f \left(\mathbf{x}_{j} \right)_{b}$$
⁽¹⁷⁾

Where \tilde{y} is the observed output and $f(\mathbf{x}_j)_b$ is the production function of the equivalent output produced if agency j worked at a bundle of operating conditions called "base" expressed by "b". If $\delta_b(\mathbf{c}_j) = 1$ for all j agencies, then, the output is the same at both bundles of operating conditions, j and b. If $\delta_b(\mathbf{c}_j) \neq 1$ the effect of operating conditions acts as a proportional technical change. Expression (18) converts the observed output to an equivalent output produced at operating conditions "base".

$$\frac{\widetilde{y}_{j}}{\delta_{b}(\mathbf{c}_{j})} = f(\mathbf{x}_{j})_{b}$$
(18)

Let $\mathbf{c}_j \in \Delta$ such as Δ is the set of all admissible vectors of operating conditions of agency j. Assume that $0 \leq \delta_b(\mathbf{c}_j) \leq M$, where M a big number, for any $\mathbf{c}_j \in \Delta$, and therefore, $\delta_b(\mathbf{c}_j)$ is bounded and positive. After that, let define $y_j = f(\mathbf{x}_j)_b$ the equivalent output of the agency j if its operating conditions were \mathbf{c}_b , the vector of operating condition "base". Expression (19) illustrates the meaning of multiplier $\delta_b(\mathbf{c}_j)$ in the relation between output produced at the operating conditions j and b.

If
$$\delta_{b}(\mathbf{c}_{j}) \ge 1 \Rightarrow y_{j} \le \widetilde{y}_{j}$$
 \mathbf{c}_{j} is more advantageous than \mathbf{c}_{b}
If $\delta_{b}(\mathbf{c}_{j}) \le 1 \Rightarrow y_{j} \ge \widetilde{y}_{j}$ \mathbf{c}_{j} is less advantageous than \mathbf{c}_{b} (19)
If $\delta_{b}(\mathbf{c}_{j}) = 1 \Rightarrow y_{j} = \widetilde{y}_{j}$ \mathbf{c}_{j} is as advantageous as \mathbf{c}_{b}

Let $\delta_b(\mathbf{c}_b) = 1$ and $\delta_b(\mathbf{c}_j) \neq 1$ if $j \neq b$, then, as a result of expression (19), efficient operations

$$y_j$$
 represent productivity frontiers $\frac{y_j}{x_j} = p_j$ at levels that depend on \mathbf{c}_j in an orderly manner, and

therefore, different bundles of operating conditions build different production frontiers.

4.1.2.2 Effects of Operating Conditions Are Independent of Scale. This assumption ensures that the scale of the agency and the size of the city produce differentiated effects on productivity. Large agencies can benefit from centralized planning or attract more riders with a more extensive network. On the other hand, large cities have different levels of traffic congestion or downtown employment than small cities. The independence assumption ensures that the effect of operating conditions does not vary with the size of the agency and avoids a special value of $\delta_b(\mathbf{c}_j)$ for each scale of production. The following text traces the consequences of this assumption.

Let the production function be the relation of a single output to a single input in a linear function at constant returns to scale. Let two efficient agencies, j and h, work at the same operating conditions but at different scale of production. Both agencies may express their observed outputs in terms of a production at "base" operating conditions and in terms of the expression (20).

$$\widetilde{y}_{j} = \delta_{b}^{j}(\mathbf{c}_{j})f(\mathbf{x}_{j})_{b}$$
 such as $x_{j} < x_{h}$ and $f(x_{j})_{b} \leq f(x_{h})_{b}$ (20)
$$\widetilde{y}_{h} = \delta_{b}^{h}(\mathbf{c}_{h})f(x_{h})_{b}$$

If expression (21) holds, the operating conditions at scale h would affect the production more intensely than at scale j.

$$\delta_b^j < \delta_b^h \text{ such as } \quad \delta_b^j, \delta_b^h > 0$$
 (21)

If production functions are linear with constant returns to scale, and, if "a" and "b" are technical coefficients relating inputs to outputs, the equations of expression (22) hold for the observed output \tilde{y} and for its equivalent at operating conditions "base" y.

$$\widetilde{y} = ax, \quad y = bx$$
 (22)

Figure 7 shows that, if expression (21) holds, the production function \tilde{y} would not be linear because $(b-a) = \delta_h > \delta_j$ by which "b" or "a" would have to vary with scale and the observed production function would not be linear and there would not be constant returns to scale. The same conclusion holds for all piecewise linear production functions in the case of variable returns to scale to maintain the same linear properties of the production function. Therefore independence of heterogeneous conditions versus scale ensures linear production functions, and that could also be proved for variable returns to scale at the vicinity of the observations.

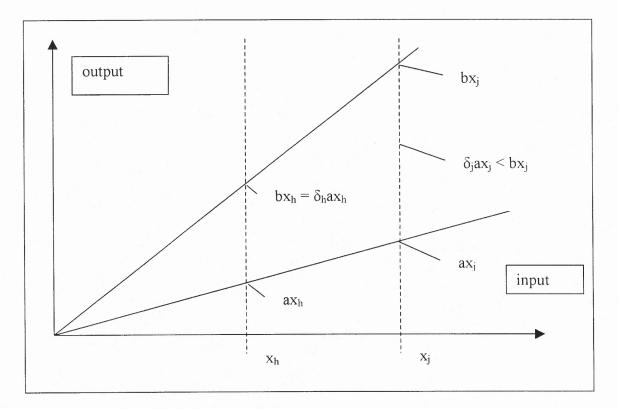


Figure 7 Scale and Operating Conditions

4.1.2.3 Effects of Operating Conditions Are Independent of the Level of Efficiency. The assumption of independence between efficiency and the effects of operating conditions ensures the fairness of the analysis because the evaluated agency does not control operating conditions. Let two agencies operate at the same scale and at the same operating conditions but at different levels of efficiency, j at 100% efficiency and h at θ *100% of efficiency; $0 \le \theta \le 1$. Even though efficiency levels were different the multipliers that convert the outputs to operating conditions "base" are identical $\delta_b^j = \delta_b^h$.

4.2 Formulation of the New Model

4.2.1 Selection of Operating Conditions

Factor analysis is a mutitivariate statistical method whose primary purpose is data reduction and summarization. It addresses the problem of analyzing the interrelationships among a large number of variables and explains these variables in terms of their common underlying dimensions called factors. By using factor analysis the analyst can identify the separate factors being measured by a survey and determine a factor loading for each variable on each factor. All variables are simultaneously considered. Each variable is a linear function of an hypothetical set of factors and each factor is a linear function of the original variables (Karson 1982; Hair, Anderson, Tatham and Black 1987). The selection of operating conditions follows three steps; collecting operating conditions correlated with transit productivity, applying factor analysis, and selecting those conditions that represent factors which are not correlated with other selected operating conditions.

4.2.2 Data Envelopment Analysis Number One—DEA(1)

Model (23) presents the first DEA model relating transit productivity to operating conditions.

PrimalDualmax
$$\phi_0$$
min $\sum_{t=1}^{q} c_{t0} w_t$ subject to :subject to : $p_{k0}\phi_0 - \sum_{j=1}^{n} p_{kj}\lambda_j \le 0$ $\sum_{t=1}^{q} c_{tj}w_t - \sum_{k=1}^{L} p_{kj}u_k \ge 0$ $\sum_{j=1}^{n} c_{ij}\lambda_j \le c_{t0}$ $\sum_{k=1}^{L} p_{k0}u_k = 1$

Variables of DEA(1)

D · 1

In the primal of model (23), j is one of the n agencies that evaluate the agency 0, 0 is the evaluated agency that prior formulations associated to operating conditions "base". In this model "base" is replaced by the subscript 0 to describe the evaluated agency. k is one of L productivity ratios such as TRIPS/loper or

VRM/cars (see Appendix B for variable abbreviations), L is the product of m and s, m being the number of inputs and s the number of outputs, t is one of q operating conditions, and ϕ_0 is the distance function between the observation and the productivity frontier at operating conditions similar to 0, $\phi_0 \ge 1.00$ because the frontier cannot exist below observed productivity. DEA maximizes ϕ_0 because it expresses the radial extension from the observation to the frontier. λ_j is the contribution of j to reproduce the operating conditions and productivity ratios of agency 0 with one linear composite of operating conditions and one of productivity ratios of efficient agencies, respectively. p_{k0} , p_{kj} are the productivity ratios k of agencies 0 and j, respectively, c_{t0} , c_{ij} are the operating condition t of 0 and j, and $p_{k0}\phi_0$ is the productivity benchmark achievable at operating conditions similar to 0. In the dual of model (23), u_k and w_t are the dual prices associated with the slacks of constraints of productivity k and of operating condition t of the primal, respectively.

Constraints of DEA(1)

The set of constraints $\sum_{j=1}^{n} c_{ij} \lambda_j = c_{i0}$ reproduces the operating condition t of agency 0. The constraint

 $\sum_{k=1}^{L} p_{k0} u_k = 1$ normalizes the productivity of agency 0 to unity. The set of constraints

 $\sum_{k=1}^{L} p_{kj} u_k - \sum_{t=1}^{q} c_{tj} w_t = 0$ is the binding constraint that builds the frontier plane of operating conditions

with productivity benchmarks, and $\sum_{t=1}^{q} c_{t0} w_t$ is the objective function that measures the distance from the

productivity of 0 to the productivity benchmark.

Information Provided by DEA(1)

> Productivity Benchmark, $p_{k0}\phi_0$ in the primal of model (23). It is the maximum productivity achievable by agency 0 working at operating conditions 0.

- > Distance to the Frontier, ϕ_0 in the primal of model (23). It multiplies the productivity of 0, p_0 , to reach the frontier at the operating conditions of agency 0.
- > Productivity Peers, those agencies j such as $\lambda_j > 0$ in the primal of model (23). Those agencies j that achieve the maximum productivity at operating conditions similar to 0.

> Linear Observed Relations Productivity-Operating Conditions, $\sum_{k=1}^{l} p_{kj} u_k - \sum_{t=1}^{q} c_{tj} w_t = 0$ from the

dual of model (23). It is the binding constraint that calculates productivity benchmarks at given operating conditions.

> Transforming Multiplier,
$$\delta_j = \frac{\phi_0 \tilde{P}_{k0}}{\phi_j \tilde{P}_{kj}}$$
. It is the ratio between the productivity benchmarks of two

agencies working at different operating conditions When the \tilde{y}_j multiplies δ_j it transforms the observed output \tilde{y}_j into the equivalent output y_j produced at operating conditions 0. If $\delta_j > 1$, agency j is working at less advantageous operating conditions than agency 0. If $\delta_j < 1$ then j is working at more advantageous operating conditions than agency 0.

> Advantage Factor of Operating Conditions,
$$\overline{\delta}_0 = \frac{\sum_{j=1}^{n} \delta_{j/0}}{n}$$
. It indicates the advantage of operating

conditions of agency 0 relative to the operating conditions of the transit industry. If $\overline{\delta}_0 > 1$, agency 0 is working in more advantageous conditions than the industry. If $\overline{\delta}_0 < 1$, 0 is working at less advantageous conditions than the industry.

Connection Between DEA(1) and DEA(2) by using Transforming Multiplier δ_{ij}

Let one observed output be $\tilde{y}_j = \tilde{y}_j(\mathbf{x}_j, e_j, \mathbf{c}_j)$, where \mathbf{x}_j is the input vector of agency j, e_j is the efficiency level of agency j, and \mathbf{c}_j is the vector of operating conditions of agency j. In expression (24) let the observed output of j be a composite of three parts $(\mathbf{x}_j, e_j, \mathbf{c}_j)$ that are separable and multiplicative. The first component depends on the level of inputs $y_j^{frontier of j}(\mathbf{x}_j)$, the second depends on the level of efficiency $y_{j}^{efficiency of j}(e_{j})$, and the third depends on the operating conditions of agency j relative to agency 0 $y_{j}^{conditions of j/0}(\mathbf{c}_{j})$. $\widetilde{y}_{j} = y_{j}^{frontier of j}(\mathbf{x}_{j}) * y_{j}^{efficiency of j}(e_{j}) * y_{j}^{conditions of j/0}(\mathbf{c}_{j})$ $y_{j} = y_{j}^{frontier of j}(\mathbf{x}_{j}) * y_{j}^{efficiency of j}(e_{j})$ $\delta_{j} = \frac{1}{y_{j}^{conditions of j/0}(\mathbf{c}_{j})}$ $y_{j} = \widetilde{y}_{j}\delta_{j}$ (24)

4.2.3 Data Envelopment Analysis Number Two-DEA(2)

Model (25) is the primal of model (12) incorporating expression (24). Since the first set of constraints includes the term $y_j^{conditions of j/0}$ the linear composite of outputs would not reproduce the output of the evaluated agency and therefore the model cannot estimate efficiency properly. Note that $y_0^{conditions of 0/0}(\mathbf{c}_0) = 1$ and it does not appear in model (25). The objective function θ_0 is the efficiency score of agency 0.

$$\max \theta_{0}$$
subject to:

$$y_{0}\theta_{0} - \sum_{j=1}^{n} y_{j} * y_{j}^{conditions of j/0}(\mathbf{c}_{j})\lambda_{j} \leq 0$$

$$\sum_{j=1}^{n} x_{ij}\lambda_{j} \leq x_{i0} \qquad i = 1,...,m \text{ inputs}$$

$$\sum_{j=1}^{n} \lambda_{j} = 1 \qquad j = 1,...,n \text{ agencies}$$
one output y

Since model (25) still has the unknown components y_j , $y_j^{conditions of j/0}(\mathbf{c}_j)$, its first set of constraints can not be used. Instead, model (25) is replaced by model (26) by including δ_j the multiplier that transforms observed outputs of j to equivalent quantities of outputs produced at operating conditions 0.

In other words, the observed outputs of model (25) are replaced with equivalent outputs as if they were produced at operating conditions of agency 0. Model (26) replaces model (25) with a formulation that considers all equivalent outputs at operating conditions of agency 0. One more time, notice that $\delta_0 = 1$ by definition of the transforming multiplier.

$$\max \theta_{0}$$
subject to:

$$\widetilde{y}_{0}\theta_{0} - \sum_{j=1}^{n} \widetilde{y}_{j} \delta_{j} \lambda_{j} \leq 0$$

$$\sum_{j=1}^{n} x_{ij} \lambda_{j} \leq x_{i0} \qquad i = 1, ..., m \text{ inputs}$$

$$\sum_{j=1}^{n} \lambda_{j} = 1 \qquad j = 1, ..., n \text{ agencies}$$
one output y_{i}

$$\sum_{j=1}^{n} \lambda_{j} = 1 \qquad j = 1, ..., n \text{ agencies}$$

one output y

The Meaning of Transforming Multiplier δ_j

In expression (24) the multiplier δ_j eliminated the productivity difference between j and 0 caused by heterogeneous conditions. Instead, in equation (27) δ_j is the proportional distance between productivity frontiers at operating conditions 0 and j. In other words, it expresses the difference between the observed output \tilde{y} and its equivalent produced at "base" operating conditions 0. In equation (28) the difference between the equivalent outputs produced at different operating conditions is indeed the difference between productivity ratios caused by heterogeneous conditions.

$$\delta_{j} = \frac{y_{j}}{\widetilde{y}_{j}} = \frac{y_{j}^{frontier of j}(\mathbf{x}_{j}) * y_{j}^{efficiency of j}(\boldsymbol{e}_{j})}{y_{j}^{frontier of j}(\mathbf{x}_{j}) * y_{j}^{efficiency of j}(\boldsymbol{e}_{j}) * y_{j}^{conditions of j/0}(\mathbf{c}_{j})}$$
(27)

$$= \frac{y_{j}^{frontier of j}(\mathbf{x}_{j})}{y_{j}^{frontier of j}(\mathbf{x}_{j}) * y_{j}^{conditions of j/0}(\mathbf{c}_{j})} = \frac{y_{j}^{frontier of j}(\mathbf{x}_{j}) * y_{j}^{conditions of 0/j}(\mathbf{c}_{0})}{y_{j}^{frontier of j}(\mathbf{x}_{j})} = \frac{(28)}{y_{j}^{frontier of j}(\mathbf{x}_{j})}$$

In expression (29) the effect of operating conditions does not depend on scale and the optimal productivity is unique at a given bundle of operating conditions. Therefore, the productivity of j at the frontier at operating conditions of agency 0 equals the productivity of 0 at the frontier at the same level of operating conditions.

$$p_{j}^{\text{frontier of 0}} = p_{0}^{\text{frontier of 0}} \quad \text{uniqueness of DEA(1) solution}$$
(29)

In expression (30) δ_j equals the proportional distance between the frontier projections of productivity, ϕ the objective function of DEA(1) of model (23), and $p^{\text{frontier of 0}}$, $p^{\text{frontier of j}}$ the efficient productivity at operating conditions of agencies 0 and j, respectively.

$$\delta_{j} = \frac{p_{ij}^{\text{frontier of } 0}}{p_{ij}^{\text{frontier of } j}} = \frac{p_{i0}^{\text{frontier of } 0}}{p_{ij}^{\text{frontier of } j}} = \frac{\phi_{0}\widetilde{p}_{0}}{\phi_{j}\widetilde{p}_{j}}$$
(30)

Figure 8 illustrates the concept of equation (30) of a unique difference of productivity ratios between two agencies with independence of scale.

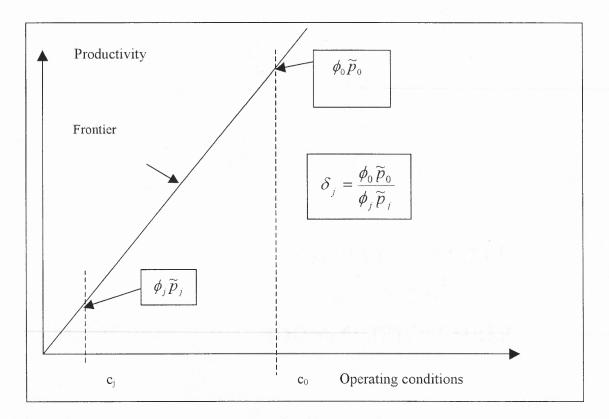


Figure 8 Productivity Frontier versus Operating Condition

4.2.4 The Multiple Factor Industry

Case of Single Output and Multiple Inputs

Let the transforming multiplier δ_j express the productivity differences between the operating conditions of agency j and agency 0. Let be a single output and two inputs 1 and 2. In expression (31) assume that the transforming multiplier δ_j applies for both inputs.

$$\delta_{j} = \frac{\phi_{j}\widetilde{p}_{1j}}{\phi_{0}\widetilde{p}_{10}} = \frac{\phi_{j}\widetilde{p}_{2j}}{\phi_{0}\widetilde{p}_{20}}$$
(31)

In expression (32) productivity is expressed in ratios of output to inputs.

$$\delta_{j} = \frac{\phi_{j} \frac{y_{j}}{x_{1j}}}{\phi_{0} \frac{y_{0}}{x_{01}}} = \frac{\phi_{j} \frac{y_{j}}{x_{j2}}}{\phi_{0} \frac{y_{0}}{x_{02}}}$$
(32)

In expression (33) the level of output disappears from the equation.

51

$$\frac{\frac{1}{x_{j1}}}{\frac{1}{x_{01}}} = \frac{\frac{1}{x_{j2}}}{\frac{1}{x_{02}}}$$
(33)

Equation (34) describes the particular case of a unique technique of production for both agencies and therefore, it is a contradiction that δ_j holds for all techniques.

$$\frac{x_{01}}{x_{j1}} = \frac{x_{02}}{x_{j2}}$$
(34)

Thus, δ_j would hold only for one input at a time unless δ_j changes to be input-specific δ_{ij} and that it changes place from the output set of constraints to the input set of constraints using the value of its inverse δ_{ij}^{-1} as seen in the adjusted DEA(2) of model (35).

$$\max \theta_{0}$$
subject to:

$$\widetilde{y}_{0}\theta_{0} - \sum_{j=1}^{n} \widetilde{y}_{j}\lambda_{j} \leq 0 \quad i = 1,...,m \quad inputs$$

$$\sum_{j=1}^{n} x_{ij}\delta_{ij}^{-1}\lambda_{j} \leq x_{i0} \quad j = 1,...,n \quad agencies$$
one output y

Case of Multiple Outputs and Multiple Inputs

Let expression (36) formulate a multiplier δ_{ij} that is common for two outputs, 1 and 2 of agency j, and two bundles of operating conditions, 0 and j.

$$\delta_{ij} = \frac{\phi_j p_{ji1}}{\phi_0 p_{0i1}} = \frac{\phi_j p_{ji2}}{\phi_0 p_{0i2}}$$
(36)

Expression (37) presents the productivity as ratios of outputs to inputs

$$\delta_{ij} = \frac{\frac{y_{j1}}{x_{ji}}}{\frac{y_{01}}{x_{0i}}} = \frac{\frac{y_{j2}}{x_{ji}}}{\frac{y_{02}}{x_{0i}}}$$
(37)

In expression (38), the transforming multiplier δ_{ij} holds for the two outputs only in the particular case of fixed joint production of outputs as in expression (38) and therefore it is a contradiction that δ_{ij} holds for all output bundles. As an approximate alternative, let the transforming multiplier approximate the average of the outputs and bounded to the observed range of productivity ratios, as in expression (39) and expression (40). This dissertation chooses the simple approximation because any alternative for approximation will not fix the inaccuracy of the model in the multiple output case.

$$\frac{y_{j1}}{y_{01}} = \frac{y_{j2}}{y_{02}}$$
(38)

Approximate Solution for two outputs

$$\hat{\delta}_{ij} = \frac{1}{2} \left(\frac{\phi_j p_{ji1}}{\phi_0 p_{0i1}} + \frac{\phi_j p_{ji2}}{\phi_0 p_{0i2}} \right) = \frac{1}{2} \frac{\phi_j}{\phi_0} \left(\frac{p_{ji1}}{p_{0i1}} + \frac{p_{ji2}}{p_{0i2}} \right)$$
(39)

$$\min_{j=1,\dots,n} \widetilde{p}_j \le \hat{\delta}_{i_0} \widetilde{p}_0 \le \max_{j=1,\dots,n} \widetilde{p}_j \tag{40}$$

Model (41) presents the new model with the expressions (39) and (40).

NEW MODEL

 $\max \phi_{0}$ subject to: $\phi_{0} \tilde{p}_{0} - \sum_{j=1}^{n} \tilde{p}_{j} \lambda_{j} \leq 0$ DEA(1) (41) $\sum_{j=1}^{n} c_{j} \lambda_{j} \leq c_{0}$ $\delta_{ij} = \frac{\sum \delta_{ij}}{s} \qquad \max \frac{\tilde{y}_{ij}}{x_{ij}} > \frac{y_{r0}}{x_{i0}} > \min \frac{\tilde{y}_{ij}}{x_{ij}}$ $\max \theta_{0}$ subject to: $\tilde{y}_{r0} \theta_{0} - \sum_{j} \tilde{y}_{ij} \lambda_{j} \leq 0$ DEA(2) $\sum_{j=1}^{n} \delta_{ij}^{-1} x_{ij} \lambda_{j} \leq x_{i0}$ $\sum_{j=1}^{n} \lambda_{j} = 1$

Variables of DEA(2)

In model (41), θ_0 is the efficiency score of 0, \tilde{y}_{r0} , \tilde{y}_{rj} are the observed outputs r of 0 and j, and λ_j is the multiplier used to reproduce the inputs of 0 with a linear composite of the inputs of j. x_{i0}, x_{ij} are the observed input i of 0 and j, respectively, and $\hat{\delta}_{ij}^{-1}$ the transforming multiplier that adjusts outputs to their equivalent at operating conditions 0.

So far the transforming multiplier $\hat{\delta}_{ij}^{-1}$ has been applied to pairs of individual agencies, the following text traces the global effect of the multiplier $\hat{\delta}_{ij}^{-1}$ on DEA with the matrix formulation of model (42).

Model (42) simplifies to model (43) where \mathbf{Q} is the production matrix, λ the variable vector, and \mathbf{q}_0^{y} the output vector of agency 0.

$$\min \theta_0$$
subject to:
$$Q\lambda = q_0^{\nu}$$
(43)

Let λ_B be the vector of basic variables that excludes those variables whose basic solution is zero. \mathbf{Q}_B is the production matrix formed by the columns of those variables present in the basis of comparison. and $\boldsymbol{\delta}$ the transforming multiplier of DEA(1). $\mathbf{Q}_B = \boldsymbol{\delta}_B \hat{\mathbf{Q}}_B$, and $\mathbf{Q}_B^{-1} = \hat{\mathbf{Q}}_B^{-1} \boldsymbol{\delta}_B^{-1}$. Where $\hat{\mathbf{Q}}_B^{-1}$ is the inverse of the basic matrix, the multiplier matrix of the observed inputs and outputs.

Let \mathbf{v}_j be the comparison weights with those product columns not in the basis, transformed as in the following expression $\mathbf{v}_j = \mathbf{Q}_B^{-1} \mathbf{q}_j$; $\hat{\mathbf{v}}_j = \mathbf{Q}_B^{-1} \boldsymbol{\delta}_B^{-1} \mathbf{q}_j$. The new dual prices are also modified by $\mathbf{u}^T = \mathbf{c}_B^T \mathbf{Q}_B^{-1}$; $\hat{\mathbf{u}}^T = \mathbf{c}_B^T \mathbf{Q}_B^{-1} \boldsymbol{\delta}_B^{-1}$, where $\mathbf{c}_B = (\mathbf{0} \ \mathbf{1}_{\theta_0} \mathbf{0})$.

Therefore, the efficiency function of (44) says that δ is an additional multiplier of the output vector of agency 0. Since intuitively δ_{B}^{-1} would make all agencies closer to agency 0 it is expected that there will be a reduction of differences in productivity with a general increase of the estimated efficiency.

$$\boldsymbol{\theta}_{0} = \mathbf{c}_{B}^{T} \mathbf{Q}_{B}^{-1} \mathbf{\delta}_{B}^{-1} \mathbf{q}_{0}^{y}$$

4.2.5 The Name of the New Model

A special name will facilitate the reference to the new model henceforth. Since the new model applies two sequential DEAs and applies accurately to a single output, the model can be named Two Farrell DEA (2F-DEA) in reference to the single output model developed by Farrell (1957).

4.3 Algorithm of 2F-DEA

- 1) Let x_i be the input i, y_r the output r, c_i the operating condition t, and p_k the productivity k.
- 2) Calculate $p_{kj} = \frac{y_{rj}}{x_{ij}}$ and select c_{tj} such as correlation $\rho_{p_i c_k} > 0.5$ for all agencies j.
- 3) Apply factor analysis to reduce the number of operating conditions to the most significant ones.
- 4) Estimate DEA(1) with model (41), calculate benchmarks $\phi_j \tilde{p}_{ij}$, repeat [s (outputs) times n (agencies)] times.
- 5) Calculate transforming multiplier $\delta_{ij}^{-1} = \frac{\phi_0 P_{i0}}{\phi_j P_{ij}}$ and calculate $x_{ij} \hat{\delta}_{ij}^{-1}$ described in model (41)
- 6) Bound the results with $\max_{j} \frac{\widetilde{y}_{ij}}{x_{ij}} > \frac{y_{r0}}{x_{i0}} > \min_{j} \frac{\widetilde{y}_{ij}}{x_{ij}}.$
- 7) Estimate DEA(2) with model (41), repeat [n (agencies) times n (agencies)] times.

4.4 Conclusions on the New Model

The new model, 2F-DEA, consists in the application of DEA in two steps with accurate results for single output and approximate results for multiple outputs. The model is the first that links both steps of DEA by using the theory of the firm. The model 2F-DEA requires the additional work of running (s times n) more simplex algorithms than the conventional DEA. Theoretically, the model DEA(2) includes the effect of operating conditions as a separable multiplier that reduces the productivity differences between agencies to those attributed only to productivity efficiency.

(44)

CHAPTER 5

THE RESULTS

5.1 Data and Software

5.1.1 National Transit Database

The National Transit Database is the primary source of data for inputs and outputs. It gathers the data of the annual reports submitted by transit agencies to the Federal Transit Administration in compliance with the Section 15 reporting system (US-DOT-FTA 1985-2000; US-DOT- UMTA 1989). This database provides information for the following variables.

Outputs

Annual Vehicle Revenue Miles (000's) (VRM) measures the service supplied.

Annual Unlinked Passenger Trips (000's) (TRIPS) measures the service utilized.

Inputs

Annual Labor Hours (000's) used in transportation and general administration (*loper*) and in maintenance (*lmain*).

Annual Consumption of Energy (000's Kilowatt Hours) (ener) expresses the electricity consumed by the rail system.

Vehicles available for maximum service (cars) is the number of revenue vehicles at the maximum season of the year, on the week and day that this maximum occurs, not taken at special event or extreme circumstances. It includes spares, out of service vehicles, and vehicles awaiting maintenance. It does not include vehicles for sale or emergency contingency use. For 1984 the figure is the active fleet.

Track length (miles) (*rails*) is the directional track length.

Stations (stats) is the number of stations, considered only for heavy rail.

5.1.2 National Transportation Atlas and Census Tracts Data

A complementary source of data is the National Transportation Atlas. It provides the geographic layout of rail transit as presented in the example of Figure 9 that shows Chicago's heavy rail network (US-DOT-BTS 2000). Appendix A contains the list of modifications made to the Atlas for this dissertation.

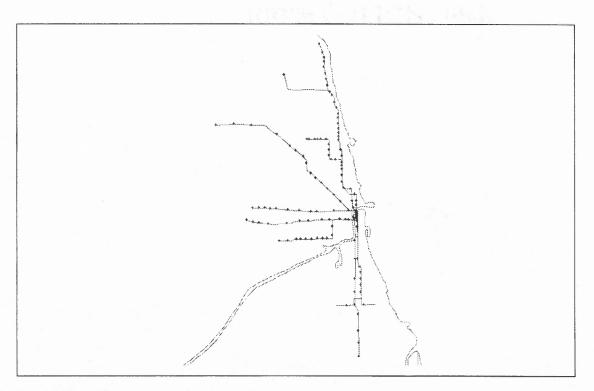


Figure 9 Heavy Rail Network of Chicago-CTA

Operating Conditions of the Urban Form

The operating conditions of the urban form refer to those socioeconomic variables describing the environment at the vicinity of the rail stations. They are calculated by combining of the National Transportation Atlas with the 1990 Census Tract Data within 0.3 miles of the stations, the served area of rail systems. The following is the list of the variables obtained.

Population is the population residing in the served area.

Household income is the average household income in the served area.
Income per capita is the average income per capita in the served area.
Population density is population per square mile of the served area.
Household size is the average household size in the served area.
Household density is the number of households per square mile in the served area.
Vacant houses is the proportion of vacant houses in the served area.

Autos per household is the number of autos divided by the number of households in the served area. Autos per capita is the number of autos divided by the population residing in the served area. Rush hour concentration is the proportion of workers leaving for work, using a motorized mode (transit or auto), during rush hour in the served area. One variable corresponds to people going out to work from 6 to 9 a.m. and the other from 8 to 8:30 a.m.

Transit market share is the proportion of people choosing transit to go to work in the served area among those that use motorized modes.

Population employment is the number of employed persons residing in the served area.
Density of employees is the population employment density of the served area.
Minority population is the number of Blacks and Hispanics living in the served area.
Poor population is the number of people below the line of poverty living in the served area.

Operating Conditions of the Network Form

The operating conditions of the network form are those that describe the graphical form of the network and its spatial coverage. They are calculated from the National Transportation Atlas with operations available in the GIS software. The following is the list of the variables related to the network form.

Comprehensive access is the proportion of metropolitan area served by rail.

Density of access is the metropolitan area per access point.

Density of network is the network length per square mile of metropolitan area.

Connectivity index is the observed number of links divided by the maximum possible number of links. It indicates if network is spinal (1/3 to $\frac{1}{2}$), grid (1/2 to 1/3), or delta grid (2/3 to 1).

Density of service is the number of vehicle revenue miles per track mile. It measures frequency and capacity of the network.

Available circuits index measures the redundancy of the system. It is the ratio of the number of circuits in a graph to the maximum possible circuits. It indicates if network form is spinal (0), grid (0 to $\frac{1}{2}$), or delta grid (1/2 to 1).

Network complexity is the ratio links to vertices in the network.

Stop spacing is the average length of the links of the network.

Circuitry index is the ratio of network distance to airline distance among access points.

5.1.3 The State of the Nation's Cities

The State of the Nation's Cities is a database of the Center for Urban Policy Research at Rutgers, the State University of New Jersey (Glickman, Lahr, and Wyly 1998). The collected variables may refer to the metropolitan area (m) or to the center-city (c) and they can be expressed in absolute or in density units. This database provides information for the following variables.

Population is the number of persons residing in the area.

Population employment is the employed population residing in the area. Jobs is the total number of jobs located in establishments at center city. Minority population is Black and Hispanic population residing in the area.

5.1.4 Annual Urban Mobility Study

The Urban Mobility Study, published by the Texas Transportation Institute of Texas A&M University System, analyzes the nation's highway transportation system by using data from several sources. The report evaluates travel conditions and operations of the freeway and principal arterial street networks in 68 urbanized areas from 1982 to 1997. The source of data is primarily the Federal Highway Administration's Highway Performance Monitoring System (HPMS) database with supporting information from various state and local agencies (Texas A&M University System 2000). The following is the definition of the congestion index.

Congestion Index is the Travel Rate Index (TRI), that is the average travel time in peak period divided by the travel time in off peak period, in other words, the amount of extra travel time during the peak period compared to free-flow travel. This measure considers days without crashes or vehicle breakdowns calculating delay due to high traffic volumes on freeways and principal arterials.

Absent connectivity data refers to those variables that describe the degree of connection of the rail system with other modes and agencies that are not included in this dissertation. Absent connectivity data at rail stations includes the following. (1) Parking spaces, (2) street parking spaces, (3) rail transit connections, (4) bus and shuttle-bus connections, (5) Dial-a-Ride and taxi-cabs, and (6) operating conditions of additional connected zones.

5.1.6 Selection of Data Points

Some data points were not used in the analysis. Some systems did not report some of the variables for a given year, reported them as zero, or recorded unusual productivity levels linked to tourism, opening years, or major renovation years. Table 8 presents the non-selected data points.

 Table 8 Non-selected Data Points

Heavy Rail	Light Rail
Boston 1984	Boston 1984, 1987 and 1989
PATH 1992	New Orleans 1984 to 1997
Atlanta 1984, 1985, 1993	Newark 1985, 1986, 1987
Los Angeles 1993	San Diego 1986
-	Sacramento 1987
	Baltimore 1992
	Denver 1994
	San Jose 1988
	Dallas 1996
	St. Louis 1994
Total Data Points Used 179	Total Data Points Used 152

5.1.7 Software, Degrees of Freedom, and Algorithm

Commercial software was developed by researchers in the field of DEA with the following capabilities; maximum number of observations: 200, maximum number of variables: 15, maximum number of cells: 1500. To maintain an adequate degree of freedom, the minimum number of observations for the application of DEA should be higher than the sum of the number of inputs plus the number of outputs (Ali 1990; Golany and Roll 1989). The algorithm consists of the application of the simplex algorithm n times, one per

agency. For each simplex, the initial feasible solution is $\lambda_0 = 1.00$ and $z_0 = 1.00$ (Sueyoshi and Chang 1989; Ali 1993; Pitaktong, Brockett, Mote, and Rousseau 1998).

5.2 Results of 2F-DEA

5.2.1 Rail Transit Systems

The application of 2F-DEA involved seventeen light and fourteen heavy rail systems. Table 9 shows that light rails serve 1 million persons at walking-distance, 55 percent of them served by three systems; Boston, San Francisco, and Philadelphia. Light rails produce 258 millions of passenger trips per year, 50 percent of them produced by the aforementioned three systems. Henceforth, the short names of the second column will represent the full names of the agency.

Table 9	Population	and Ridership	- Light Rail
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Table 9 Population and Ride			TDIDC (0002-) (1007)
System	Short name	Population (*) (1990)	TRIPS (000's) (1997)
Boston-MBTA	bos	165,771	67,000
San Francisco-MUNI	sfr	191,753	36,738
Philadelphia-SEPTA	phi	234,999	25,003
Los Angeles-LACMTA	lan	92,621	22,659
San Diego Trolley	sdi	56,002	18,287
St. Louis-Bi-State	slo	13,895	14,486
Portland Tri-County MTD	por	28,722	10,432
Dallas-DART	dal	21,293	7,972
Sacramento-RTD	sac	27,695	7,862
Pittsburgh-PAT	pit	53,592	7,421
Buffalo-Niagara Frontier	buf	20,037	6,919
Baltimore-Maryland MTA	bal	28,949	6,772
Santa Clara County TD	sjo	33,160	6,728
New Orleans Public Svc	nor	40,977	5,605
Cleveland-RTA	cle	33,168	5,337
Denver-RTD	den	10,300	4,428
Newark-NJT	new	32,918	4,294
Hudson-Bergen Light Rail	HB	96,258	31,200
TOTAL (**)		1,085,132	257,940

(*) Served area within 0.3 miles of a station or a stop. (**) It does not consider Hudson-Bergen

Table 10 presents the population served and annual ridership of heavy rails. They serve 5.3 million persons at walking distance, 84 percent of them served by three systems; New York, Washington, and Chicago. Heavy rails transport 2,429 million passenger trips per year, 79 percent of them transported by the three aforementioned systems. Henceforth, the short names represent the full names of the agencies.

System	Short name	Population(*) (1990)	TRIPS (000's) (1997)
New York-CTA	nyo	3,732,428	1,579,783
Washington-WMTA	was	155,623	198,003
Chicago-CTA	chi	512,234	151,010
Boston-MBTA	bos	168,775	113,715
Atlanta MARTA	atl	37,686	90,991
Philadelphia-SEPTA	phi	247,894	86,245
San Francisco-BART	sfr	112,617	80,490
New York-PATH	path	99,990	67,998
Miami-Dade Cnty TA	mia	41,699	14,020
Baltimore-MTA	bal	41,142	12,600
Los Angeles-LACMTA	lan	52,235	11,628
Lindenwold-PATCO	patco	33,927	10,660
Cleveland-RTA	cle	33,797	7,695
Staten Island Rapid Trans	sta	44,799	4,618
San Juan Heavy Rail	SJ		31,300
TOTAL (**)		5,314,846	2,429,456

Table 10 Population and Ridership - Heavy Rail

(*) Served area within 0.3 miles of a station.

(**) It does not include San Juan Heavy Rail

5.2.2 Inputs, Outputs, and Operating Conditions

This application considers the following inputs, annual labor hours dedicated to operation and administration in (*loper*) in thousands, annual labor hours dedicated to maintenance in (*lmain*) in thousands, annual kilowatt-hours of electricity in (*ener*) in thousands, number of rail cars (*cars*), track length (*rails*), and number of stations (*stats*). This application considers two measures of outputs, annual vehicle revenue miles in (*VRM*) in thousands, and annual unlinked passenger trips (*TRIPS*) in thousands, they measure the same output from different approaches, *VRM* the capacity offered and *TRIPS* the capacity utilized. The list of inputs and outputs is presented in Table 11.

Table	11	Inputs	and	Outputs
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Factor	Short name	Units
Outputs		
1 Vehicle revenue miles	VRM	Annual vehicle miles (000's)
2 Unlinked passenger trips	TRIPS	Annual passenger boarding (000's)
Inputs		
1 Labor in operations	loper	Annual labor hours in operation and administration (000's)
2 Labor in maintenance	lmain	Annual labor hours in maintenance (000's)
3 Energy	ener	Annual kilowatt hours of electricity (000's)
4 Vehicles	cars	Number of rail cars
5 Track length	rails	Directional track miles
6 Stations (only heavy rail)	stats	Number of stations

Light Rail Operating Conditions

The selection of operating conditions consists of correlation analysis, factor analysis, and planning of the estimation of DEA(1). Table 12 shows the correlation of productivity with twenty-one operating conditions with values larger than or equal to 0.5. *VRM* productivity correlates with stop spacing and rush half-an-hour concentration and *TRIPS* productivity correlates with density of service. Note that, contrary to the popular belief that congestion is associated with higher productivity of rail transit, the congestion index is absent.

Operating		VRM pe	er			TRIPS p	er	
Conditions(**)	loper	lmain	ener	cars	loper	ener	cars	rails
1 Access density								.58
2 Network density								.58
3 Comprehensive			51			.51		.53
accessibility								
4 Employment density						.53		.69
5 Housing density						.60		
6 Population density						.58		.65
7 Transit share						.55		.67
8 Employment	52							.53
9 Stop spacing	.69	.74		.78				
10 Density of service					.54	.63	.63	.81
11 Employment density (m)			.51					
12 Jobs density			.51					
13 Population (c)			.55					
14 Employment (c)			.56					
15 Population density (c)						.56		
16 Employment density (c)						.59		.52
17 Auto per household					54	59		
18 Auto per capita						52		
19 Income per household			52	53				
20 Income per capita	50		54					
21 Rush half-an-hour	- .66	61	50	63				
Concentration								
	$p \ge 0.50$			(m) = met				

Table 12 Correlation between Operating Conditions and Productivity (*) - Light Rail

Table 13 shows the results of factor analysis. Four factors explain 89 percent of the total variance of the twenty-one operating conditions; served area conditions describing environment near the rail stations, metropolitan area conditions describing the general environment of the city, car factor, and income and rush hour concentration. From Tables 12 and 13 served area conditions associate with productivity of *VRM* and *TRIPS*, metropolitan area conditions relate to productivity of *VRM* and *TRIPS* with *ener* and *rails*, car

factor correlates with TRIPS productivity only, and income and rush hour concentration factor associates

with *VRM* productivity only.

Operating conditions(**)	 Served area conditions(***) 	(2) Metropolitan area conditions)	(3) Car factor	(4) Income and rush hour concentration
(89% of variance)	(34%)	(26%)	(15%)	(13%)
1 Access density	.95	.16		.15
2 Network density	.95	.16		.15
3 Comprehensive accessibility	.90	.31		.14
4 Employment density	.78	.12	.45	.27
5 Housing density	.77	.18	.54	.21
6 Population density	.73	.32	.52	.13
7 Transit share	.71		.63	.19
8 Employment	.71	15	.47	.27
9 Stop spacing	61		19	38
10 Density of service	.66	.24		28
11 Employment density (m)	.19	.97		
12 Jobs density	.24	.96		
13 Population (c)		.95	.12	23
14 Employment (c)		.95	.11	24
15 Population density (c)	.55	.75	.31	.12
16 Employment density (c)	.63	.69	.28	.12
17 Auto per household	29	24	80	.25
18 Auto per capita	13	49	72	.37
19 Income per household	.23		28	.88
20 Income per capita	.20	28		.87
21 Rush half-an-hour concentration	.35		.54	.66

Table 13 Factor Analysis of Operating Conditions - Light Rail(*)

(*) Shows significance larger or equal than 0.1 (smaller or equal to -0.1)

(**) (m) = metropolitan area, (c) = center city

(***) Served area = within 0.3 miles of stops

Table 14 presents the selected seven operating conditions that are highly correlated with productivity,

with one operating condition per factor, and with no correlation between selected operating conditions.

Selected operating condition	Output	Input	Factor
9 Stop spacing	VRM	loper, Imain, cars	(1) Served area
13 Population (c)	VRM	ener	(2) Metropolitan area
20 Income per capita	VRM	ener	(4) Income and concentration factor
21 Rush half-an-hour concentration	VRM	loper, Imain, cars	(4) Income and concentration factor
10 Density of service	TRIPS	loper, ener, cars, rails	(1) Served area
16 Employment density (c)	TRIPS	ener, rails	(2) Metropolitan area
17 Auto per household	TRIPS	loper, ener	(3) Auto factor

Table 14 Selected Operating Conditions - Light Rail

Table 15 re-orders Table 14 to present the estimation plan for eight DEA(1) models, four of *VRM* productivity and four of *TRIPS* productivity. Note that *VRM* per *rails* and *TRIPS* per *lmain* do not appear to be affected by operating conditions of light rail.

Output	Input	Operating condition	Short name
VRM	loper	Stop spacing	Stopsp
	-	Rush half-an-hour concentration	Rushalf
	lmain	Stop spacing	Stopsp
		Rush half-an-hour concentration	Rushalf
	ener	Population cc	PopCC
		Income per capita	<i>IncoPC</i>
	cars	Stop spacing	Stopsp
		Rush half-an-hour concentration	Rushalf
TRIPS	loper	Density of service	Denserv
		Autos per households	AutoPH
	ener	Density of service	Denserv
		Autos per households	AutoPH
		Employment density (c)	EmpCCD
	cars	Density of service	Denserv
	rails	Density of service	Denserv
		Employment density (c)	EmpCCD

Table 15 Estimation Plan for DEA(1) - Light Rail

Heavy Rail Operating Conditions

The selection of operating conditions of heavy rail follows the same process followed for light rail. Table 16 shows that productivity correlates with twenty-seven operating conditions with coefficients larger than or equal to 0.5. Productivity of the inputs *rails* and *stats* correlates with several operating conditions, both are the fixed inputs of the rail network. Productivity of *cars* does not correlate with any of the operating conditions, and density of service correlates with several *TRIPS* productivity ratios.

Operating conditions(**)		VRM per	•		7	RIPS per		
	loper	rails	stats	loper	lmain	ener	rails	stats
1 Jobs Density (c)		.53						
2 Employment (c)		.53						
3 Employment density (m)	and the country	.53						
4 Population (c)		.52						
5 Employment density (c)		.55					.52	
6 Population (m)		.53					.52	
7 Jobs		.55					.54	
8 Employment (m)		.52					.52	
9 Transit share		.83	.51				.81	.76
10 Population		.77					.69	
11 Employment		.78					.69	
12 Density of network		.76					.73	
13 Density of service				.54	.50	.60	.88	.77
14 Population density		.88					.82	.58
15 Comprehensive		.63					.68	
accessibility								
16 Housing density		.88					.82	.68
17 Employment density		.89					.83	.71
18 Household size			56					64
19 Rush half-an-hour		.65		.63		.51	.65	.67
Concentration								
20 Income per capita								.68
21 Network complexity		.76	.76	.50		.52	.65	.80
22 Connectivity index			.52					.59
23 Auto per capita	A 1994	65					65	
24 Auto per household	a data la mini de	72					70	63
25 Circuit availability		.61	.74				.53	.81
26 Density of access	.59							
27 Stop spacing	.61		.50					

Table 16 Correlation between Operating Conditions and Productivity (*) - Heavy Rail

(*) Significant correlation is $\rho \ge 0.50$

(**) (m) = metropolitan area, (c) = central city

Table 17 shows the results of factor analysis. Five factors explain 94 percent of the total variance of operating conditions; metropolitan area conditions, served area conditions, income and rush hour concentration, car factor, and stop spacing. From Tables 15 and 16, metropolitan area conditions associate with *rails* productivity while the served area conditions relate with *rails* and *stats* productivity, although density of service associates also with other *TRIPS* productivity. Income and rush hour concentration correlates with productivity of both outputs and several inputs, car factor relates with *rails* and *stats* productivity, and *stats* productivity.

Operating conditions(*)	(1) Metropo litan area	(2) Served area (**)	(3) Income and rush hour concentration	(4) Car factor	(5) Stop spacing
(94% of variance)	(30%)	(24%)	(15%)	(13%)	(11%)
1 Jobs Density (c)	.91	.29		.18	
2 Employment (c)	.91	.28		.21	.15
3 Employment density (m)	.91	.30		.19	
4 Population (c)	.91	.28		.20	.15
5 Employment density (c)	.85	.30	.21	.13	.11
6 Population (m)	.79	.22	.26	.12	.42
7 Jobs	.77	.21	.33		.39
8 Employment (m)	.73	.20	.32		.44
9 Transit share	.56	.43	.47	.45	.17
10 Population	.25	.95			.13
11 Employment	.26	.95			.13
12 Density of network	.32	.82		.12	.37
13 Density of service	.29	.78	.42	.26	
14 Population density	.43	.76	.18	.41	.17
15 Comprehensive	.34	.73	14	.10	.52
accessibility					
16 Housing density	.45	.63	.32	.52	.14
17 Employment density	.50	.60	.34	.50	.12
18 Household size			91	27	.13
19 Rush half-an-hour	.14	.33	.87		.13
concentration					
20 Income per capita	.45	12	.83	.19	
21 Network complexity	.37	.31	.56	.27	27
22 Connectivity index	.38	21	.26	.80	19
23 Auto per capita	14	51		79	24
24 Auto per household		47	40	73	18
25 Circuit availability	.44		.49	.62	28
26Density of access	22	20			88
27 Stop spacing	25	26			87

Table 17 Factor Analysis of Operating Conditions - Heavy Rail

(*) (m) = metropolitan area, (c) = center city.

(**) Served area is within 0.3 miles of stations

Table 18 selects four operating conditions using three criteria; (1) highest correlation index, (2) one operating condition per factor, and (3) no correlation between selected operating conditions. Since the operating conditions of factor (1) correlated with factor (2), none of factor (1) was selected.

Operating condition	Output	Input	Dimension
27 Stop spacing	VRM	loper, stats	(5) Stop spacing
17 Employment density	VRM	rails	(2) Served area
21 Network complexity	VRM	stats	(3) Income and concentration factor
13 Density of service	TRIPS	loper, Imain, ener, rails, stats	(2) Served area

Table 18 Selected Operating Conditions - Heavy Rail

Table 19 presents the plan to estimate eight DEA(1) models for heavy rail, three with *VRM* and five with *TRIPS* productivity. Density of service is the surrogate of operating conditions related to all *TRIPS* productivity ratios. Note that the productivity of cars is not present and it may indicate that the observation of Demery (1994) that vehicle loading varies with socioeconomic conditions is not detected by the considered operating conditions.

Output	Intput	Operating condition	Short name
VRM loper		Stop spacing	Stopsp
	rails	Employment Density	EmpDen
	stats	Network Complexity	NetCom
		Stop spacing	Stopsp
TRIPS	loper	Density of service	Denserv
	lmain	Density of service	Denserv
	ener	Density of service	Denserv
	rails	Density of service	Denserv
stats	stats	Density of service	Denserv

Table 19 Estimation Plan for DEA(1) - Heavy I	IUI DEA(I) - HEAVY RA	$PEA(1) = \Pi Ca$	DEAL	Pian Ior	Esumation	1 able 19
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5.2.3 Results of DEA(1)

Light Rail Productivity Benchmarks

Productivity benchmarks are the projections of the frontier estimated in DEA(1) after the application of the plan of Table 19. Table 20 shows that Boston can produce 8.3 *VRM/loper*, Philadelphia 6.6, and Los Angeles 28.5. *VRM* productivity benchmarks are lower for Boston, San Francisco, and Philadelphia; but higher for San Diego and Los Angeles.

VRM per	Loper	lmain	ener	cars
Condition	(Stopsp & Rushalf)	(Stopsp & Rushalf)	(PopCC & IncoPC)	(Stopsp & Rushalf)
bos	8.3	6.9	0.14	32.1
sfr	7.1	6.7	0.15	28.0
phi	6.6	8.2	0.21	26.3
lan	28.5	27.0	0.25	88.8
sdi	28.5	27.0	0.21	88.8
slo	22.3	24.3	0.15	83.9
por	24.1	16.3	0.19	60.3
dal	24.2	24.8	0.21	84.8
sac	26.5	19.7	0.19	68.2
pit	13.2	11.1	0.15	36.4
buf	15.4	12.7	0.10	48.5
bal	15.4	15.8	0.17	66.1
sjo	24.9	18.8	0.17	64.1
cle	13.7	12.4	0.07	48.1
den	21.7	14.9	0.20	49.2
new	22.3	13.7	0.28	50.1
VRM per	Labor hour	Labor hour	Kw-h	000's per car

 Table 20 Productivity Benchmarks for VRM-1997 - Light Rail

Table 21 shows the productivity benchmarks in *TRIPS*. This time Boston, San Francisco, Philadelphia, and Newark have higher benchmarks than Los Angeles or San Diego. Productivity benchmarks have similar extreme differences in *TRIPS* productivity as in *VRM* productivity suggesting that operating conditions have a balanced incidence on *VRM* and *TRIPS*.

TRIPS per	loper	ener	cars	rails
Condition	(Denserv & AutoPH)	(Denserv, AutoPH &	(Denserv)	(Denserv &
		EmpCCD)		EmpCCD)
bos	88.6	2.8	520.9	1915
sfr	75.6	1.7	461.3	1145
phi	83.5	1.5	398.8	675
lan	70.1	1.2	420.1	772
sdi	68.3	1.0	442.7	686
slo	77.5	1.4	471.3	839
por	72.9	1.1	409.8	575
dal	64.0	0.5	391.9	472
sac	70.7	1.2	412.2	653
pit	69.4	1.1	402.8	606
buf	80.7	1.8	461.8	1045
bal	77.5	1.5	420.8	785
sjo	35.8	0.4	403.2	611
cle	66.0	1.0	378.8	424
den	88.6	0.9	422.5	425
new	88.6	2.2	476.7	1290
TRIPS per	Labor hour	Kw-h	000's per car	000's per mile

Table 21 Productivity Benchmarks for TRIPS - 1997 - Light Rail

First Observation of DEA(1) for Multiple Outputs

This observation confirms the adequacy of estimating individual productivity ratios rather than estimating a group of productivity ratios in DEA(1). If DEA(1) includes all operating conditions in one model, some of them would associate with productivity ratios that they do not affect. Figure 10 illustrates this observation by showing the values of productivity benchmark *VRM/loper* found in three different estimations. The lowest curve corresponds to the estimate of *VRM/loper* when DEA(1) includes eight productivity benchmarks (four *VRM* productivity ratios and four *TRIPS* productivity ratios of Table 15), the intermediate curve is the result of DEA(1) when it includes two productivity benchmarks (*VRM/loper* and *TRIPS/loper*), and the highest curve is the productivity ratio *VRM/loper* when DEA(1) includes only that ratio. Since the plateaus of productivity of the highest curve have more stable values corresponding to relevant operating conditions and since the other curves show variability unrelated to the value of operating conditions, the highest curve renders more realistic results. The corollary of a single productivity estimation of DEA(1) is that benchmarks simultaneously.

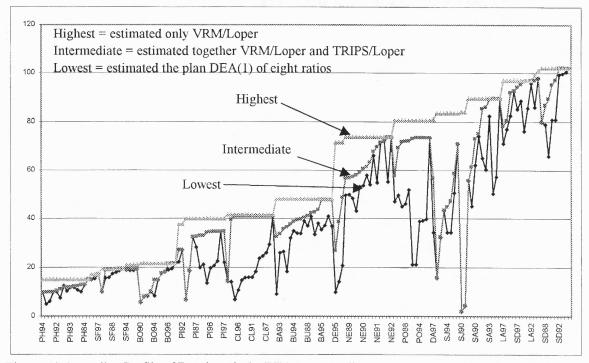


Figure 10 Ascending Profile of Benchmarks by DEA(1) - VRM/loper (maximum=100%) - Light Rail

The advantage factor indicates the higher (or lower) proportion of productivity achievable at the operating conditions of the agency with respect to the average of the industry. Table 22 shows the advantage factor of

the evaluated light rail $\overline{\delta}_{i0}$, the average of the transforming multipliers of DEA(1) $\overline{\delta}_{i0} = \frac{\sum_{j=1}^{n} \delta_{ij/0}}{n}$. The

factor $\overline{\delta}_{i0}$ indicates how advantageous are the operating conditions of 0 to produce high productivity. If the index is greater than 1.00, like $\overline{\delta}_{Loper \ Sacramento} = 1.20$, the operating conditions allow 20 percent higher productivity of *loper* in Sacramento. If the index is less than 1.00, say $\overline{\delta}_{Ener \ Buffalo} = 0.97$ operating conditions allow 3 percent below average of productivity of *ener* in Buffalo.

Boston, San Francisco, and Philadelphia have operating conditions with lower advantage factors in the productivity of *loper*, *lmain* and *cars* although they have a better potential for *ener* and *rails*. Two systems, Pittsburgh and Cleveland have all advantage factors below 1.00 indicating low advantage in all inputs. On the other hand, four systems have all advantage factors greater than one, so that they have high advantage in all inputs; Los Angeles, St. Louis, Baltimore, and Newark. The advantage factor summarizes the effect of operating conditions on productivity.

14010	1 IG TUTINE	,• = a•••=	o por a a a a a		
Agency	loper	lmain	ener	cars	rails
bos	0.69	0.61	1.03	0.78	1.07
sfr	0.61	0.65	1.15	0.83	1.37
phi	0.53	0.71	1.22	0.65	0.92
lan	1.36	1.37	1.42	1.38	1.15
sdi	1.34	1.39	1.05	1.38	0.93
slo	1.27	1.32	1.07	1.42	1.14
por	1.25	1.12	1.04	1.11	0.90
dal	1.14	1.33	0.45	1.26	0.84
sac	1.20	1.22	0.95	1.16	0.80
pit	0.85	0.90	0.83	0.83	0.91
buf	1.08	0.98	0.97	1.07	1.22
bal	1.02	1.10	1.08	1.17	1.01
sjo	0.48	1.20	0.35	0.90	0.72
cle	0.88	0.97	0.60	0.96	0.80
den	1.37	1.07	0.98	1.00	0.75
new	1.39	1.03	1.87	1.11	1.31

Table 22 Advantage Factor of Operating Conditions - Light Rail

Second Observation for Multiple Outputs

The second observation refers to the inaccuracy tolerated by the transforming multipliers $\hat{\delta}_{ij}$ in the case of multiple outputs. The value of $\hat{\delta}_{ij}$ holds for two outputs and therefore DEA(1) estimates two multipliers per input, $\delta_{ij VRM}$, $\delta_{ij TRIPS}$, described by the average of two productivity-ratios $\hat{\delta}_{ij} = \frac{\delta_{ij VRM} + \delta_{ij TRIPS}}{2}$. A weighted average or a ratio of *TRIPS* per *VRM*, would not improve the approximation. Consequently, $\hat{\delta}_{ij}$ is an approximation with three possibilities; (1) both partial deltas are either greater than one or both are smaller than one, (2) one is greater than one and the other is smaller than one, or (3) both are near one. Figure 11 shows that the transforming multiplier $\hat{\delta}_{ij}$ conceals different effects for each output.

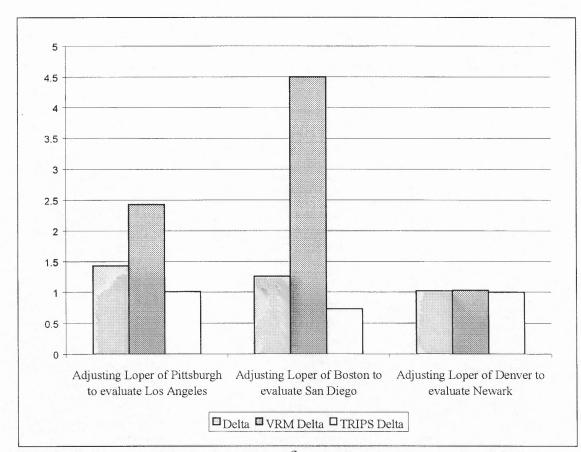


Figure 11 Consequences of the Approximation of δ_{ij} in the Multiple Output Case - Light Rail

Productivity benchmarks determine the upper limits of productivity achievable at the operating conditions of individual agencies. For example, Table 23 shows that Philadelphia can produce 13.7 *VRM/loper* that is only 72 percent of the benchmark of San Francisco, 18.9 *VRM/loper*. San Francisco and PATCO are better suited for high *VRM* productivity than New York and Philadelphia. In terms of *VRM/loper*, the highest benchmarks correspond to BART and PATCO, in *VRM/rails* the highest benchmarks correspond to New York and PATH, while in *VRM/stats* the highest benchmarks correspond to San Francisco and PATH. The lowest benchmarks correspond to Philadelphia and Staten Island.

VRM per	loper	rails	stats
Condition	(Stopsp)	(EmpDens)	(Stopsp & NetCom)
nyo	12.9	638	673
was	17.2	350	862
chi	15.9	402	752
bos	16.0	390	661
atl	16.9	299	895
phi	13.7	373	227
sfr	18.9	359	1264
path	16.7	611	1023
mia	17.0	320	676
bal	17.0	342	621
lan	16.1	476	319
patco	18.6	371	636
cle	17.0	311	665
sta	15.9	333	502
VRM per	Labor hour	000's per mile	000's per station

Table 23 Productivity Benchmarks for VRM - 1997 - Heavy Rail

Table 24 shows the *TRIPS* productivity benchmarks for heavy rail. They are lower for both Cleveland and Staten Island while higher for both New York and PATH.

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TRIPS per	loper	lmain	ener	rails	stats
Condition	(Denserv)	(Denserv)	(Denserv)	(Denserv)	(Denserv)
nyo	47.7	107.1	1.27	3421	5440
was	43.1	101.0	1.06	2047	3228
chi	46.1	106.2	1.16	2267	3714
bos	46.8	107.1	1.26	2477	4177
atl	46.8	107.1	1.24	2429	4071
phi	42.6	100.4	1.05	2024	3176
sfr	46.7	106.8	1.20	2357	3912
path	47.2	107.1	1.27	2892	5440
mia	33.7	73.5	0.81	1580	2195
bal	35.6	80.2	0.86	1675	2406
lan	38.9	91.8	0.95	1839	2767
patco	35.1	78.4	0.84	1650	2350
cle	19.0	42.0	0.35	400	638
sta	23.0	50.0	0.55	1049	1306
TRIPS per	Labor hour	Labor hour	Kw-h	000's per	000's per
•				mile	station

Table 24 Productivity Benchmarks for TRIPS - 1997 - Heavy Rail

Heavy Rail Advantage Factor

The advantage factor summarizes the effect of operating conditions on productivity benchmarks. Table 25 shows that some factors are larger than one (higher productivity) and some smaller than one (lower productivity). Four systems have all advantage factors smaller than one, Miami, Baltimore, Cleveland, and Staten Island. Five systems have all advantage factors larger than one, Washington, Chicago, Boston, San Francisco, and PATH. The application of DEA(2) finds efficiency levels by taking into account the individual differences in operating conditions.

Agency	loper	lmain	ener	rails	stats
nyo	0.90	1.14	1.19	1.94	1.43
was	1.17	1.11	1.11	1.08	1.35
chi	1.07	1.13	1.16	1.24	1.24
bos	1.07	1.13	1.16	1.20	1.25
atl	1.17	1.12	1.12	0.97	1.33
phi	0.97	1.10	1.09	1.10	0.46
sfr	1.28	1.13	1.15	1.15	1.82
path	1.18	1.14	1.19	1.74	1.91
mia	0.94	0.89	0.90	0.86	0.90
bal	0.98	0.94	0.94	0.93	0.88
lan	0.85	0.89	0.89	1.03	0.39
patco	1.02	0.97	0.97	0.99	0.95
cle	0.56	0.55	0.41	0.30	0.32
sta	0.65	0.71	0.67	0.69	0.56

Table 25 Advantage Factor of Operating Conditions - Heavy Rail

Light Rail Efficiency

The model DEA(2) adjusts the value of inputs to calculate scores of overall, technical, and scale efficiency. Table 26 shows that San Francisco and St. Louis are overall efficient. The least efficient agencies are Los Angeles, Sacramento, Pittsburgh, and Cleveland with less than 80 percent efficiency. Most of the inefficiency of Los Angeles is scale inefficiency. Most of the inefficiency of Sacramento, Pittsburgh, and Cleveland is technical inefficiency. Light rail is 88.7 percent overall efficient, and it reaches 95.4 percent of the possible scale efficiency and 93.2 percent of the technical efficiency. In general, the results show mild levels of inefficiency equally balanced between scale and technical.

Agency	Efficiency (%)				
0.1	Overall	Scale	Technical		
bos	99.6	99.6	100.0		
sfr	100.0	100.0	100.0		
phi	94.3	99.1	95.2		
lan	78.1	78.9	99.0		
sdi	93.5	93.5	100.0		
slo	100.0	100.0	100.0		
por	93.5	100.0	93.5		
dal	89.3	96.4	92.6		
sac	75.2	99.2	75.8		
pit	70.9	96.5	73.5		
buf	90.9	93.6	97.1		
bal	86.2	96.6	89.3		
sjo	90.1	93.7	96.2		
cle	79.4	100.0	79.4		
den	90.9	90.9	100.0		
new	87.7	88.6	99.0		
Average	88.7	95.4	<i>93.2</i>		

 Table 26 Efficiency Level - 1997 - Light Rail

 Agency
 Efficiency (%)

Heavy Rail Efficiency

The levels of efficiency are similar in the case of heavy rail. Table 27 shows that the most efficient agencies are New York, Atlanta, San Francisco, and PATH. The least efficient agencies are Washington (88.5 percent), Chicago (75.8 percent), Los Angeles (88.5 percent), and Staten Island (84 percent). The inefficiency of Los Angeles and Staten Island is mostly scale inefficiency, while the inefficiency of Philadelphia, Boston, Washington, and Miami is mostly technical inefficiency. Heavy rail is 92.4 percent

overall efficient and it reaches 94.8 percent of the possible scale efficiency, and 97.5 percent of the technical efficiency. Levels of inefficiency are mild and similarly distributed between technical and scale.

Table 27 Efficiency Level - 1997 - Heavy Rai						
Agency	E	fficiency	(%)			
	Overall	Scale	Technical			
nyo	100.0	100.0	100.0			
was	88.5	97.3	90.9			
chi	75.8	81.1	93.5			
bos	89.3	99.1	90.1			
atl	100.0	100.0	100.0			
phi	92.6	100.0	92.6			
sfr	100.0	100.0	100.0			
path	100.0	100.0	100.0			
mia	98.0	100.0	98.0			
bal	90.1	90.1	100.0			
lan	88.5	88.5	100.0			
patco	92.6	92.6	100.0			
cle	94.3	94.3	100.0			
sta	84.0	84.0	100.0			
Average	<i>92.4</i>	94.8	97.5			

Table 27 Efficiency Level - 1997 - Heavy Rail

5.2.5 Efficiency in Absolute Figures

Efficiency in absolute terms indicates the dollar amount in improvement achievable in the hypothetical case of total efficiency. Table 28 summarizes the potential for improvement in higher revenues and in its equivalent in savings of resources. At 55 cents per trip, as the average revenue published in (APTA 2001), light rail can improve efficiency by \$ 2 million of revenue per year, mostly in Los Angeles, Sacramento, and Pittsburgh. From the resources point of view the potential improvement is equivalent to 585 thousand labor hours in operations and administration, 89 vehicles, and 70 track miles, totaling \$ 55 million per year. Of the \$55 million only \$ 14 millions correspond to expenses per year while the rest is annual capital cost, sometimes considered as sunk cost.

Agency	Revenue (\$ 1M)	loper	cars	rails	Cost (\$ 1M)	
bos	0.012	4	1		0.160	
sfr						
phi	0.096	36	8	4	3.380	
lan	0.534	205	15	18	15.025	
sdi	0.181	22	6	3	2.410	
slo					0	
por	0.056	18	2	2	1.570	
dal	0.105	25	4	4	2.865	
sac	0.253	43	9	9	6.115	
pit	0.275	86	17	11	8.670	
buf	0.045	10	2	1	0.870	
bal	0.174	40	5	6	4.300	
sjo	0.103	26	5	4	2.950	
cle	0.134	52	10	6	4.900	
den	0.032	10	2	1	0.870	
new	0.044	8	3	1	0.880	
Total	2.045	585	89	70	54.965	
		Prices /	Unit Cost			
Output TRIPS					\$ 0.55 per trip	
Input						
loper					per person-year	
lmain		\$ 50,000 per person-year				
ener						
cars	•					
rails	f Prices / Unit Cost:				1 per track mile	

Table 28 Potential for Improvement - Light Rail

Sources of Prices / Unit Cost: (APTA 2001; CUTA 1993, Vuchic 1981)

Table 29 presents the potential for improvement for heavy rails. Revenues could improve in \$ 79 million per year at an average fare of 96 cents per trip, as published by (APTA 2001), mostly by Washington, Chicago, and Boston. From the resources point of view the inefficiency level of heavy rail is equivalent to 2,161 thousands of labor hours in operations and administration, 474 vehicles, 99 track miles, and 63 stations, summarized in \$ 189 million per year. A total of \$ 54 million correspond to annual expenses while the rest is usually considered sunk cost.

nyo		loper	cars	rails	stats	Cost (\$ 1M)
1200						
was	21.859	428	88	21	9	38.105
chi	35.083	1192	278	50	34	100.730
bos	11.681	238	44	8	6	17.340
atl						
phi	6.127	126	26	6	6	11.460
sfr						
path		:				
mia	0.269	7	3	1	1	1.355
bal	1.197	41	10	3	1	4.750
lan	1.284	37	3	1	1	2.230
patco	0.757	23	9	2	1	3.240
cle	0.421	22	3	2	1	2.855
sta	0.709	47	10	5	4	7.275
Total	79.388	2,161	474	99	63	189.340
			Price / Unit Co.	st		
Output TRIPS						\$ 0.96 per trip
Input						1 1
loper					\$ 50,000 p	er person-year
lmain						er person-year
ener					\$ 63.70 per tho	
cars						§ 1.5 M per car
rails						f per track mile
stat						5 M per station

Table 29 Potential for Improvement - Heavy Rail

5.3 Comparison of 2F-DEA to Other Methods

5.3.1 Accuracy of Cluster Analysis

Clusters of Rail Transit

Cluster analysis is currently used to compare transit productivity in heterogeneous conditions because it reduces the bias in favor of the agencies working at more advantageous conditions. Cluster analysis can be adequate at given levels of accuracy and therefore the levels of accuracy should be presented to the reader during the application of 2F-DEA. This dissertation uses cluster analysis with a hierarchical algorithm to build four groups based on similarities and differences in operating conditions affecting productivity. Table 30 shows that cluster 2, Southern Californian systems, and cluster 4, Newark, are so small that they do not support standard statistical analyses within the clusters. Accuracy should be calculated as the difference due to operating conditions within clusters 1 and 3.

Cluster	1	2	3	4
Stop spacing (miles)	0.24	0.99	0.54	0.41
Rush concentration (%)	17	8	13	13
Income per capita (\$)	16,700	9,400	15,600	9,500
Car ownership (per household)	0.9	1.2	1.2	0.7
Density of service (000' VRM per track mile)	121	115	92	151
Employment density (workers per square mile)	5,900	2,300	2,400	10,200
Members	bos, sfr, phi, den	lan, sdi	slo, por, dal, sac, pit, hub, cle	new
Observations	41	20	80	11

Table 30 Typology of Light Rail

Table 31 presents the typology of heavy rail transit. The tests of empirical accuracy consist of the estimation of productivity differences due to operating conditions within clusters 2 and 3.

 Table 31 Typology of Heavy Rail

Cluster	1	2	3	4
Stop spacing (miles)	0.7	1.0	0.8	2.0
Density of service (000' VRM per track mile)	1040	210	480	530
Employment density (workers per square mile)	20,300	4,100	5,500	5,400
Members	nyo, path	sta, cle, patco, lan, bal, mia	bos, phi, chi, atl, was	sfr
Observations	27	73	65	14

Test of Clustering in Partial Productivity Analysis

Table 32 shows that stop spacing and density of service have statistically significant correlation with productivity within the cluster.

Mode	Cluster	Productivity	Operating condition	Trend	(t-statistics)	
Light rail	1	VRM/loper	Stop spacing	2.9	(1.9, 94%)	
Light rail	3	VRM/loper	Stop spacing	6.7	(5.2, 99%)	
Light rail	3	TRIPS/loper	Density of service	0.45	(10.5, 99%)	
Heavy rail	2	VRM/loper	Stop spacing	9.1	(4.7, 99%)	
Heavy rail	3	VRM/loper	Stop spacing	5.3	(6.5, 99%)	
Heavy rail	2	TRIPS/rails	Density of service	1.6	(4.9, 99%)	

Table 32 Trends of Productivity versus Operating Conditions within Selected Clusters

Table 33 shows that operating conditions caused a productivity difference of 5 to 36 percent of inaccuracy to be accepted by the user of cluster analysis.

Sample	Cluster	Operating	Rate of	Maximum	Maximum	Productivity
-		condition	change	productivity	(best)	difference owed to
		difference	(a) -	difference	productivity	"Z"
		(Z)		$(p_z = a * z)$	<i>(p)</i>	$(T = p_z / (2*p))$
Light rail	1	Stop spacing	2.9	VRM/loper	5.72	5 %
		0.19		0.54		
Light rail	3	Stop spacing	6.7	VRM/loper	15.51	18 %
		0.84		5.64		
Light rail	3	Density of service	0.45	TRIPS/loper	73	36 %
		118		53		
Heavy rail	2	Stop spacing	9.1	VRM/loper	16.53	14 %
		0.50		4.53		
Heavy rail	3	Stop spacing	5.3	VRM/loper	14.68	12 %
-		0.68		3.59		
Heavy rail	2	Density of service	1.6	TRIPS/rails	1278	18 %
-		254		460		

Table 33 Productivity Difference due to Operating Conditions within Selected Clusters

Test of Clustering in Data Envelopment Analysis (DEA)

DEA was estimated at the interior of clusters 1 and 3 of light rail and clusters 2 and 3 of heavy rail using the outputs *VRM* and *TRIPS* and the inputs *loper, lmain, ener, cars, rails,* and *stats.* Table 34 shows that efficiency scores are correlated with operating conditions in both modes, light rail and heavy rail.

Sample	Cluster	Operating condition	Correlation with Efficiency score(*)
Light rail	1	Stop spacing	-0.51
•		Density of service	-0.51
Light rail	3	(Income per capita) ⁻¹	-0.75
C C		Density of service	-0.62
Heavy rail	2	Density of service	-0.60
Heavy rail	3	Density of service	-0.58
-		Stop spacing	-0.56

Table 34 Correlation of DEA Efficiency Score versus Operating Conditions within Selected Clusters

(*) signs are correct, the larger the DEA score the larger the augmentation of outputs necessary to be efficient

Table 35 shows that there exists significant correlation between operating conditions and productivity within the clusters, all are statistically different from zero.

 Table 35 Trends of DEA Efficiency Score versus Operating Conditions within selected Clusters

Sample	Cluster	Dependent variable	Operating condition	Trend	(t-statistics)
Light rail 1		Efficiency score	Stop spacing	-0.64	(-3.6, 99%)
U		•	Density of service	-0.00079	(-3.5, 99%)
Light rail	3	Efficiency score	(Auto per household) ⁻¹	-7,550	(-7.6, 99%)
U		•	Density of service	-0.0024	(-5.1, 99%)
Heavy rail	2	Efficiency score	Density of service	-0.00118	(-6.3, 99%)
Heavy rail	3	Efficiency score	Density of service	-0.00083	(-7.7, 99%)
2		•	Stop spacing	-0.205	(-7.5, 99%)

Finally, Table 36 estimates that operating conditions caused 13 to 27 percent of the differences of productivity to be accepted by the user of cluster analysis.

Sample	Operating condition	Rate of	Maximum score	Maximum	Efficiency % difference
-	difference	change	difference	(best) score	owed to "z"
	(Z)	(a)	$(p_z = a * z)$	(p)	$(T = 1 - 1/(p_z/2+1))$
Light rail cluster 1	Stop spacing 0.25	-0.64	0.16	1.00	13 %
	Density of service 192	00079	0.15		
Light rail cluster 3	(Auto per household) ⁻¹ 0.00006	-7,550	-0.45	1.00	27 %
	Density of service 118	-0.0024	-0.28		
Heavy rail cluster 2	Density of service 254	00118	-0.30	1.00	13 %
Heavy rail cluster 3	Density of service 236	00083	-0.20	1.00	14 %
	Stop spacing 0.68	-0.205	-0.14		

Table 36 Efficiency Difference due to Heterogeneous Operating Conditions in Selected Clusters

Light Rail

The conventional DEA (DEA-C) underestimates efficiency because it compares productivity against the best practice at the most advantageous operating conditions. The amount of overestimation can be calculated by the difference of efficiency between the scores of DEA-C and the scores of 2F-DEA. Table 37 shows that DEA-C underestimated 41 percent of Cleveland's efficiency, 43 percent on San Jose's, 28 percent in Pittsburgh's, and 30 percent in San Francisco's. DEA-C underestimated 17.6 percent of the efficiency of light rail on the average.

Agency	Differenc	e DEA-C m	inus 2F-DEA	DEA-	C (convention	al)
0.	Overall	Scale	Technical	Overall	Scale	Technical
bos	-7	-6.1	-1	92.6	93.5	99.0
sfr	-29.6	-2.8	-27.5	70.4	97.2	72.5
phi	-39.4	-10.6	-33.1	54.9	88.5	62.1
lan	-2.9	-3.7	1	75.2	75.2	100.0
sdi	0.8	0.8		94.3	94.3	100.0
slo				100.0	100.0	100.0
por	-12.9	-2.4	-10.9	80.6	97.6	82.6
dal	-36.4	1	-38.3	52.9	97.4	54.3
sac	-5.8	0.1	-5.9	69.4	99.3	69.9
pit	-28.3	0.5	-29.6	42.6	97.0	43.9
buf	-6.2	2.2	-8.6	84.7	95.8	88.5
bal	-15.8	-5.8	-11.8	70.4	90.8	77.5
sjo	-42.9	0.6	-46.2	47.2	94.3	50.0
cle	-40.8	-4.2	-39.1	38.6	95.8	40.3
den	-23.3	-17.9	-7.4	67.6	73.0	92.6
new	9.4	8.5	1	97.1	97.1	100.0
Average	-17.6	-2.5	-16.1	71.2	92.3	77.1

Table 37 2F-DEA versus DEA-C (Conventional) (%) - Light Rail

Heavy Rail

Table 38 shows that DEA-C underestimated the efficiency level of Philadelphia by 13 percent, Baltimore's by 18 percent, PATCO's by 14 percent, Cleveland's by 54 percent, and Staten Island's by 40 percent. On the average, DEA-C underestimated heavy rail efficiency by 11 percent.

Agency	Differenc	e DEA-C min	us 2F-DEA	DEA-C	C (convention	al)
	Overall	Scale	Technical	Overall	Scale	Technical
nyo				100	100	100
was	-4	3	-6	85	100	85
chi	-2	-2		74	79	93
bos	-1		-1	88	99	89
atl				100	100	100
phi	-13	-1	-13	79	99	80
sfr	-1	-1		99	99	100
path				100	100	100
mia	-5	-5	-1	93	95	97
bal	-18	-18		72	72	100
lan	-4	-4		85	85	100
patco	-14	-14	-1	78	79	99
cle	-54	-54		40	40	100
sta	-40	-40		44	44	100
Average	-11	-10	-2	81	85	96

Table 38 2F-DEA versus DEA-C (Conventional) (%) - Heavy Rail

5.3.3 Comparison of DEA-CL (Cluster Analysis) to 2F-DEA

Light Rail

Besides the reduction of the effect of operating conditions in cluster analysis, DEA-CL may overestimate efficiency by considering a smaller sample for the comparison. Table 39 shows that DEA-CL underestimates the efficiency of six agencies and overestimates the efficiency of four agencies. Overall, the total efficiency of light rail was overestimated by 4.7 percent.

Agency (cluster	Difference	e DEA-CL mir	us 2F-DEA	DEA-CL (cluster analysis)		
number)	Overall	Scale	Technical	Overall	Scale	Technical
bos (1)	0.4	0.4		100.0	100.0	100.0
sfr (1)	-8.3	-0.9	-7.4	91.7	99.1	92.6
phi (1)	-11.0	-0.8	-10.5	83.3	98.3	84.7
lan (2)	13.6	12.8	1.0	91.7	91.7	100.0
sdi (2)	0.8	0.8		94.3	94.3	100.0
slo (3)				100.0	100.0	100.0
por (3)	6.5		6.5	100.0	100.0	100.0
dal (3)	-28.3	-8.6	-23.2	61.0	87.8	69.4
sac (3)	4.2	0.0	4.2	79.4	99.2	80.0
pit (3)	-11.7	-7.7	-6.8	59.2	88.8	66.7
buf (3)	-1.6	-4.3	2.9	89.3	89.3	100.0
bal (3)	-6.8	-6.9	-0.8	79.4	89.7	88.5
sjo (3)	-25.2	-4.7	-23.2	64.9	89.0	73.0
cle (3)	-29.1		-29.1	50.3	100.0	50.3
den (1)	9.1	9.1		100.0	100.0	100.0
Average	-4.7	0.0	-5.3	84.0	95.5	87.8

Table 39 2F-DEA versus DEA-CL (Cluster Analysis) (%) – Light Rail

Heavy Rail

Table 40 shows that DEA-CL model overestimates efficiency of almost all agencies because the cluster implies a lower number of observations. For example, clusters 1 and 4 (New York and San Francisco) will always be efficient in their corresponding clusters because they are composed of one or two systems. Cluster 2 (systems in medium-size cities) charges all overestimated efficiency to apparent "scale efficiency". DEA-CL overestimated the overall efficiency of heavy rail by 3 percent.

Agency (cluster	Difference	e DEA-CL mit	nus 2F-DEA	DEA-C	CL (cluster ana	lysis)
number)	Overall	Scale	Technical	Overall	Scale	Technical
nyo (1)				100	100	100
was (3)	4	-5	9	93	93	100
chi (3)	7	2	6	83	83	99
bos (3)	11	1	10	100	100	100
atl (3)				100	100	100
phi (3)	-9	-3	-7	83	98	85
sfr (4)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
path (1)				100	100	100
mia (2)				98	100	98
bal (2)	10	10		100	100	100
lan (2)	12	12		100	100	100
patco (2)	7	7		100	100	100
cle (2)	2	2		96	96	100
sta (2)	-4	-4		80	80	100
Average	3	2	1	95	96	99

Table 40 2F-DEA versus DEA-CL (Cluster Analysis) (%) - Heavy Rail

5.3.4 Comparison of DEA-ND (Non-Discretionary Factors) to 2F-DEA

Light Rail

DEA-ND may overestimate efficiency caused by the inclusion of operating conditions as if they were "inputs" or it may underestimate efficiency caused by the remaining effect of heterogeneous conditions in DEA. The final result is unpredictable. Table 41 shows that DEA-ND did not find any technical inefficiency in light rail and that DEA-ND overestimates technical efficiency, although it overestimates the overall efficiency by 3.7 percent. This is due to the increase in the number of "inputs" from five to twelve including stop spacing, density of service, rush-half-an-hour concentration of demand, income per capita of served area, and employment density of center-city.

Agency	Difference	DEA-ND n	ninus 2F-DEA	DEA-ND (non-discretionary factors)				
	Overall	Scale	Technical	Overall	Scale	Technical		
bos	0.4	0.4		100.0	100.0	100.0		
sfr				100.0	100.0	100.0		
phi		-4.8	4.8	94.3	94.3	100.0		
lan	21.9	21.1	1.0	100.0	100.0	100.0		
sdi	6.5	6.5		100.0	100.0	100.0		
slo				100.0	100.0	100.0		
por	-10.9	-17.4	6.5	82.6	82.6	100.0		
dal	-26.4	-33.5	7.4	62.9	62.9	100.0		
sac	4.2	-19.0	23.2	79.4	80.2	99.0		
pit	7.8	-17.8	26.5	78.7	78.7	100.0		
buf	-6.2	-8.9	2.9	84.7	84.7	100.0		
bal	8.1	-2.3	10.7	94.3	94.3	100.0		
sjo	-27.6	-31.2	3.8	62.5	62.5	100.0		
cle	-23.2	-43.8	20.6	56.2	56.2	100.0		
den	-22.4	-22.4		68.5	68.5	100.0		
new	9.4	8.5	1.0	97.1	97.1	100.0		
Average	-3.7	-10.3	6.8	85.1	85.1	99.9		

Table 41 2F-DEA versus DEA-ND (Non-Discretionary Factors) (%) - Light Rail

Heavy Rail

Table 42 shows that DEA-ND underestimates overall efficiency of almost all heavy rail agencies. The new "inputs" were stop spacing and density of service. DEA-ND underestimated overall efficiency by 10 percent that is mostly contributed by scale efficiency.

Agency	Difference	e DEA-ND n	ninus 2F-DEA	DEA-ND (non-discretionary factors)				
	Overall	Scale	Technical	Overall	Scale	Technical		
nyo				100	100	100		
was	-3		-3	85	97	88		
chi	20	18	4	96	99	97		
bos	-1	-11	10	88	88	100		
atl				100	100	100		
phi	-13	-21	7	79	79	100		
sfr				100	100	100		
path				100	100	100		
mia	-5	-6		93	94	98		
bal	-18	-18		72	72	100		
lan	-4	-4		85	85	100		
patco	-14	-14		78	78	100		
cle	-54	-54		40	40	100		
sta	-40	-40		44	44	100		
Average	-10	-11	1	83	84	99		

 Table 42 2F-DEA versus DEA-ND (Non-Discretionary Factors) (%) - Heavy Rail

Light Rail

The method DEA-2S (Two-Step) assumes that some operating conditions are sources of inefficiency and as such they are correlated with the efficiency scores that result from the conventional DEA (DEA-C). Consequently, a low correlation between efficiency and operating conditions indicates an empirical success of 2F-DEA. Table 43 shows that operating conditions correlation with efficiency are noticeably higher for DEA-C than for 2F-DEA. All correlation coefficients of 2F-DEA are lower than 0.5 suggesting that 2F-DEA successfully extracted the effect of heterogeneous operating conditions from efficiency.

		Efficienc	y scores			Ι	nefficien	cy scores		
	Overall		Technical		Overall		Scale		Technical	
	2F-	DEA-	2F-	DEA-	2F-	DEA-	2F-	DEA-	2F-	DEA-
:	DEA	2S	DEA	2S	DEA	2S	DEA	2S	DEA	2S
Auto factor										
Per capita	0.14	0.46	0.31	0.54	0.13	0.49	-0.45	-0.26	0.32	0.63
Per household Income factor	0.11	0.48	0.23	0.58	0.11	0.47	-0.31	-0.20	0.23	0.59
Per household Supply quality	0.22	0.54	0.18	0.60	0.00	0.50	-0.42	-0.16	0.17	0.60
Density of serv.	-0.29	-0.55	-0.32	0.47	-0.31	-0.57	0.04	-0.23	-0.34	-0.49

Table 43 2F-DEA versus DEA-2S (Two-Step) - Light Rail

Heavy Rail

Table 44 shows that operating conditions have higher correlation with DEA-C scores than with 2F-DEA scores. Correlation with 2F-DEA scores have values lower than 0.5 suggesting that the effect of operating conditions on productivity has been successfully extracted by DEA(1). Neither DEA-2S nor 2F-DEA detects any correlation in the case of technical efficiency suggesting that the effect of heterogeneous conditions in heavy rail cause apparent "scale inefficiency."

	Efficiency scores				Inefficiency scores				
	Overall		Technical		Overall		Scale		
	2F-	DEA-	2F-	DEA-	2F-	DEA-	2F-	DEA-	
	DEA	2S	DEA	2S	DEA	2S	DEA	2S	
Demand factor									
Rush half-an-hour									
Concentration	-0.18	-0.68	-0.04	-0.44	-0.17	- .66	-0.21	60	
Network factor									
Circuit availability	-0.31	-0.42	-0.13	-0.28	-0.33	51	-0.34		
Network complexity	-0.32	-0.58	-0.02	-0.23	-0.34	- .66	-0.44	68	
Supply quality									
Density of service	-0.32	-0.65	-0.14	-0.40	-0.35	72	-0.35	64	
Circuity index	-0.15	-0.51	0.01	0.25	-0.17	52	-0.43	66	

Table 44 2F-DEA versus DEA-2S (Two-Step) - Heavy Rail

5.4 Application of 2F-DEA to Productivity Analysis

Transit productivity analysis estimates the maximum possible production given the available resources determined by transit policy. Variables useful for policy include the returns to the consumption of one input, returns to scale, substitutability between inputs, and the production function itself. Policies may include increasing the use of those inputs that permit faster increases of the outputs, producing at the optimal scale of the transit firm, decreasing dependence on one production technique, and maximizing the effectiveness of additional funding to the transit industry.

5.4.1 Returns to the Consumption of One Input

Returns to the consumption of a single input are the changes of the marginal productivity of the input when its consumption increases. This variable estimates the law of diminishing returns which states that, when the quantity of one input increases, its marginal productivity decreases continually after a certain threshold. The curve of the output as a function of input usually consists of three sections representing increasing, constant, and decreasing returns to the scale. The more inputs that have values in the increasing returns to scale region the more favorable will be to expand operations. Usually this is a characteristic cited to explain the increase of production achieved by rail operations that use the track length more intensely. The returns to scale for a single input is the change of marginal productivity and therefore it is the trend of the marginal productivity when the quantity of the input increases. The method of calculating marginal productivity

consists of taking the coefficients of the linear production function and calculating their trend with ordinary least squares using a small sample. Since the application presented here has two outputs, two analyses are possible.

Table 45 indicates that marginal production of trips will be decreasing by -0.013 trips for each additional hour of labor in operations. Vehicle revenue miles on the other hand, will increase by 0.319 for each additional hour of labor in operations. Light rail has increasing returns to scale with respect to energy and decreasing returns with respect to rail tracks. Vehicles generate decreasing returns in the production of trips and increasing returns in the production of vehicle revenue miles.

 Table 45 Returns to Quantity of a Single Input (*) – Light Rail

Input	Trend of marginal productivity				
-	TRIPS	VRM			
loper	-0.013	+0.319			
Imain	0	-0.063			
ener	+0.000006	+0.00005			
cars	-0.16	+3.53			
rails	-3.78	-10.79			

(*) Rate of change of the marginal productivity of the input when input increases.

Table 46 shows that heavy rail has increasing returns for both outputs not only with respect to energy but also with respect to rail tracks. On the other hand, expanding labor hours in operation will always produce decreasing returns. Notice that the expansion of stations generates increasing returns with respect to trips but decreasing returns with respect to vehicle revenue miles consistent with the fact that the number of stations affects operating speed when stop spacing is reduced below a threshold.

Input	Trend of marginal productivity				
-	TRIPS	VRM			
loper	-0.017	-0.0003			
Imain	+0.115	-0.0002			
ener	+0.0000001	+0.00000005			
cars	-0.237	+0.023			
rails	+9.35	+6.28			
stats	+16.93	-0.595			

Table 46 Returns to Quantity of a Single Input (*) - Heavy Rail

(*) Rate of change of the marginal productivity of the input when input increases

5.4.2 Returns to Scale

Returns to scale compares the expansion of outputs to the expansion of inputs. The expansion of outputs may be larger, equal, or smaller than the expansion of inputs corresponding to increasing, constant, or decreasing returns to scale, respectively. The optimal size corresponds to the point of scale efficiency, right at the point of constant returns to scale. The proposition that an agency should break down in systems of less than 150-buses each, to increase the efficiency of the system was based on returns to scale arguments (Naciones Unidas-CEPAL 1992). In another application, the 1947 Transport Act that nationalized the British Railways assumed that central planning of a large organization increased efficiency over several independent private railways (Gwilliam 1964). Policy makers sometimes break down giant organizations in smaller more efficient units as in the case of the Japanese Railways (Hughes 1994). The method of obtaining returns to scale consists of estimating scale efficiency with the ratio $\frac{z_0}{h_0}$ (Charnes, Cooper and

Rhodes 1978 efficiency score to Banker, Charnes and Cooper 1984 efficiency score of formulas (12) and (13)). Another way to check optimal size is with the constant term w_0 calculated in the dual of the model (12). The optimum size occurs simultaneously with a change in sign of the constant w_0 . Scale efficiency means that the company may be technically efficient, but if it operates in the non-optimal region, the loss of productivity is the percentage of scale inefficiency. Two optimal sizes are expected, one for trips and the other for vehicle revenue miles, both optimal sizes indicate the existence of two techniques of production, one technique intensely producing trips and the other technique intensely producing vehicle revenue miles. A technique of production is defined in this dissertation as a particular set of technical ratios like labor per vehicle, stop spacing, and others.

Figure 12 shows the optimal size for light rail. The two upper curves describe the envelope of scale efficiency, with respect to the right-hand scale, of two groups of agencies versus network length. Following the leaders of each group, San Francisco and St. Louis, the rest of the agencies have been assigned to two groups, traditional and newer systems. The lower curve represents the constant term of the linear production function. The optimal size occurs when this curve crosses the zero level. One optimal size corresponds to the first crossing at a network of approximately 35 miles. Systems of that size usually operate fleets of 30 to 50 vehicles. Another optimal size corresponds to the second crossing at a 50-mile

network (135-vehicle fleet). The optimal sizes are associated with different system reliance on trips, with San Francisco experiencing more intense trip making than St. Louis. Also, the optimal sizes are associated with different technical ratios of vehicles per track mile (2.7 in San Francisco versus 1.1 in St. Louis).

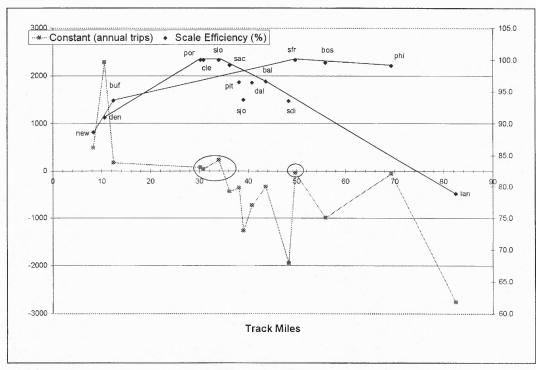


Figure 12 Graphic Determination of Optimal Size – Light Rail

Figure 13 presents the graphical estimation of the optimal size for heavy rail. The upper curves are the envelopes of scale efficiency of two groups of agencies, those that are more intensive in producing trips (traditional group) and those that are more intensive in producing vehicle revenue miles (newer group). The lower curve represents the value of the constant term in the linear production function for vehicle revenue miles. The optimal size occurs when this curve crosses the zero level. One optimal size is between a 300 and 600-vehicle fleet that usually operates on a 100 to 200-mile network represented by systems like Miami, Atlanta, and San Francisco, with a technical ratio of 1.1 vehicles per track mile. Another optimal size corresponds to the size of New York with a fleet larger than 5,000 vehicles and a network larger than 450 miles, with a technical ratio of 2.5 vehicles per track mile. Note that the graphical estimation of optimal size is more precise in the case of light rail than it is for heavy rail.

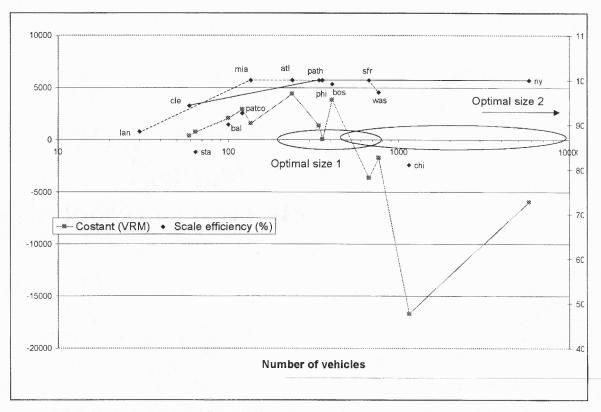


Figure 13 Graphic Determination of Optimal Size - Heavy Rail

5.4.3 Substitutability, Technical Ratios, and Scale of Production

Substitutability measures the degree to which one input can be used to replace another for the production of an output. An input is a substitute of other input if its consumption increases when the marginal production of the other input increases. DEA estimates piecewise linear production functions and therefore it assumes that all inputs are perfect complements to each other at a given scale. This dissertation assumes that an approximation to the elasticity of substitution refers to a variable scale by using the coefficients of the production function when the coefficient of output is 1.00.

This section also confirms the existence of two techniques of production by using the ratio between the values of technical ratios between both groups. Finally, the elasticity of substitution is the change of the logarithm of the technical ratio caused by changes of the logarithm of the ratios of marginal productivity.

Table 47 contains a list of the traditional light rail systems where production is more intensive in trips and where there is a high number of vehicles per track mile. It also shows the list of the newer light rail systems where production is more intensive in vehicle revenue miles and where there is a low number of vehicles per track mile.

Traditional	Newer
Boston	Los Angeles
San Francisco	San Diego
Philadelphia	St. Louis
Pittsburgh	Portland
Buffalo	Dallas
Newark	Sacramento
	Baltimore
	San Jose
	Cleveland
	Denver

Table 47 Technical Groups for Light Rail

Table 48 presents the proportional difference between the values of technical ratios of the groups. Each number is the ratio of the technical ratio of the traditional system over the technical ratio of the newer system. The technical ratio is the input numerator of the first row to the input denominator of the first column of Table 48. A value larger than one says that the traditional system uses a technical ratio more intense in the input of the denominator that is at the first column of the table. A value smaller than one says that the newer system uses a technical ratio more intense in the input of the denominator that is at the first column of the denominator that is in the same first column of the table. Therefore, the table shows that the row of *rails* (track miles) indicates that traditional systems have a technique of production that uses tracks intensely while from the row of *cars* (number of vehicles) indicates that newer systems use vehicles intensely.

	loper	lmain	ener	cars	
lmain	0.74				
ener	1.24	1.52			
cars	0.76	0.94	0.61		
rails	1.60	1.96	1.31	2.03	

Table 48 Proportional Difference of Technical Ratios between Traditional and Newer Light Rails

Table 49 presents selected results of the trend of the technical ratio with respect to size. The positive results of the trends indicate that the intensity of use of the network might also be linked with size while there are no trends on the intensity of use of vehicles. Therefore, since traditional systems are also the

larger and since there are no trends on the intensity of use of vehicles, this trend is indeed a coincidence because of the production technique chosen by the traditional systems.

Technical ratio	Trend (size in Trips)	R^2
loper/rail	0.0002	0.55
lmain/rail	0.0001	0.33
ener/rail	0.009	0.66
car/rail	0.00003	0.35

Table 49 Trends of Technical Ratios versus Scale - Light Rail

Table 50 presents the elasticity of substitution for light rail systems. Six out of ten indicators are negative and therefore indicate mostly complementary inputs. The most complementary of all are the labor hours in maintenance (*lmain*) and vehicles (*cars*). Four pairs of inputs have positive elasticity and therefore they are substitute, all related to labor hours in operations and to labor hours in maintenance, which has the highest value between these two inputs.

	loper	lmain	cars	ener
lmain	-0.11			
cars	+0.005	-0.173		
ener	+0.09	+7.957	-0.053	
Rail	-0.046	+0.231	-0.067	-0.123
	loper Imain	of substitution of loper	to Imain. Substitute i	if > 0 , complement if < 0 .
a m	product_lmain product_loper			

 Table 50 Elasticity of Substitution (Allowing for Varying Size) (*) – Light Rail

Table 51 presents the members of two groups of heavy rails, the traditional, with more intense production in trips and higher ratio vehicles per track mile, and the newer, with more intense production in vehicle revenue miles and lower ratio vehicles per track mile.

Traditional	Newer
New York	Washington
Chicago	Atlanta
Boston	San Francisco
Philadelphia	Miami
PATH	Baltimore
Cleveland	Los Angeles
Staten Island	PATCO

Table 51 Technical Groups for Heavy Rail

Table 52 presents the proportional difference between the values of technical ratios of the groups. Each number is the ratio of the technical ratio of the traditional system over the technical ratio of the newer system. The technical ratio is the input numerator of the first row to the input denominator of the first column of Table 52. A value larger than one says that the traditional system uses a technical ratio more intense in the input of the denominator that is at the first column of the table. A value smaller than one says that the newer system uses a technical ratio more intense in the input of the denominator that is at the first column of the table. A value smaller than one says that the newer system uses a technical ratio more intense in the input of the denominator that is in the same first column of the table. Therefore, Table 52 indicates that the traditional and newer groups confirm their different techniques of production. Traditional systems use tracks more intensely than newer while newer systems use vehicles and stations more intensely.

Table 52 Proportional Difference of Technical Ratios between Traditional and Newer Heavy Rails

	loper	Lmain	ener	cars	rails	
lmain	1.17					
ener	1.15	0.97				
cars	0.88	0.76	0.66			
rail	1.51	1.41	1.15	1.82		
stats	0.93	0.88	0.80	1.08	0.60	

Table 53 shows positive trends for technical ratios when network length increases revealing that larger agencies also tend to be more intense in the use of track length, as it was the case of light rail. There is no tendency for the intensity of use of vehicles and stations indicating that the tendency is a coincidence with size. Since New York is the largest system and also an efficient representative of the traditional systems, the trend is expressing the difference in production techniques of the groups rather than the effect of size.

Table 55 1	rends of Techn	ical Ratio versus	Scale – ne
Technical r	atio Trend (size in Trips) l	\mathbb{R}^2
car/rail	0.00000)5 (0.43
lmain/rail	0.00002	2 (0.45
loper/rail	0.00002	2 (0.48

Table 53 Trends of Technical Ratio versus Scale – Heavy Rail

Table 54 shows that all of the substitution elasticity indicators of heavy rail have positive values. They show that most of the inputs are substitutable, contrary to the case of light rail. The only complementary

relation exists between stations (*stats*) and labor hour in operations (*loper*)—including personnel in stations and security. Heavy rail shows more signs of flexibility in the use of resources than light rail.

1401001			·		
	loper	lmain	cars	ener	
lmain	0.181				
cars	0.07	0.101			
ener	0.095	0.169	0.028		
rails	0.136	0.138	0.121	0.178	
stats	-0.007	0.314	0.011	0.695	
(*)	(lover) Elast	icity of substitutio	n of loper to Imain	. Substitute if > 0 , c	omr

 Table 54 Elasticity of Substitution (Allowing for Varying Size) (*) – Heavy Rail

(*) $d \ln \left(\frac{loper}{lmain} \right)$ Elasticit

 $d\ln\left(\frac{marginal_product_lmain}{lmain}\right)$

marginal_product_loper

5.4.4 Piecewise Linear Production Function

The model 2F-DEA estimates piecewise linear production functions that are valid at the vicinity of individual observations. The production function calculates the increase of output achieved after marginal increases in inputs, indicating that it is possible to calculate the optimal direction of expansion. Answers can be provided to questions on whether additional miles of rail tracks should be built or more vehicles should be bought. The coefficients of the linear production function answer those questions because they are the marginal products when the coefficient of the output is 1.00. Since the marginal products are the shadow prices of the firm, they indicate the optimal direction of expansion, and, if the cost of the inputs is added, the most cost effective way of expansion. This analysis assumes that it is feasible to add inputs such as an additional mile of track or to buy one additional vehicle.

Table 55 presents the marginal production of labor hours in operation (*/loper*), in maintenance (*/lmain*), in energy (*/ener*), in vehicles (*/cars*), and in track miles (*/rails*). The smaller systems of Denver and Newark show the highest increase in trips caused by an additional mile of track. Also, Portland and Baltimore show the highest increase in trips with additional vehicles. Finally, Denver and St. Louis yield the highest increase in trips by expanding the labor hours in operations.

Agency	TRIPS	VRM	TRIPS/	/loper	/lmain	/ener	/cars	/rails	Total	Total
	('000)	('000)	VRM	('000)	('000)	('000)			TRIPS	$V\!RM$
bos	67000	5435	12	4			10	0	14	1
sfr	36738	3740	10	4	2		1		7	1
phi	25003	3049	8	5					5	1
lan	22659	4436	5				29		29	6
sdi	18287	5059	4			0		28	28	8
slo	14486	2585	6	22	2	0		4	29	5
por	10432	1579	7			0	81		81	12
dal	7972	1794	4			0	18		18	4
sac	7862	1852	4	5	5		17		28	7
pit	7421	1718	4			0			0	0
buf	6919	897	8	10		0	1		11	1
bal	6772	2296	3				68		68	23
sjo	6728	1888	4			0			0	0
cle	5337	1181	5			0			0	0
den	4428	648	7	24			13	219	255	37
new	4294	656	7	5	1	0	7	109	122	19

Table 55 Marginal Production of Trips per Unit Increase of Input - Light Rail

Cost effectiveness is the number of trips achieved per dollar spent on one additional unit of input. Table 56 shows that, excluding labor hours in maintenance (*lmain*) and energy (*ener*), the most costeffective options for expansion are buying additional vehicles for Portland and Baltimore, and expanding the labor force in operations in Denver and St. Louis.

Agency	loper	lmain	ener	cars	rails	Total	Total
	-					TRIPS	VRM
bos	0.14			0.16		0.31	0.02
sfr	0.15	0.10		0.02		0.26	0.03
phi	0.20					0.20	0.02
lan				0.49		0.49	0.10
sdi			1.93		0.06	1.99	0.55
slo	0.88	0.09	1.00		0.01	1.98	0.35
por			1.53	1.35		2.88	0.44
dal			6.98	0.29		7.27	1.64
sac	0.22	0.21		0.29		0.71	0.17
pit			3.14			3.14	0.73
buf	0.39		2.56	0.01		2.96	0.38
bal				1.13		1.13	0.38
sjo			2.30			2.30	0.65
cle			1.94			1.94	0.43
den	0.94			0.21	0.44	1.59	0.23
new	0.18	0.05	0.69	0.12	0.22	1.26	0.19
Avrg	0.19	0.03	1.38	0.25	0.05	1.90	0.39
			Expansio	n costs (*))		
Input		Unit cost (\$)		Life (ye	ears)	Annual o	cost (\$)
loper		50,000		1		25,000	
lmain		50,000		1	1		
ener		63.7		1	1		
cars		1.5 M		25		60,000	
rails		20 M		40		500,000	

 Table 56 Cost Effectiveness in Trips per Additional Dollar Spent in Inputs – Light Rail

(*) (APTA 2001; CUTA 1993; Vuchic 1981)

As a result a priority list can be made with the fifteen more cost-effective ways to expand light rail as shown in the Table 57. Priority also permits ordering options for expansion of individual agencies. For example, Newark would like to expand first with additional tracks (*rails*) and then with larger labor force in operations (*loper*). On the other hand, Sacramento would choose a combination of increasing fleet size (*cars*) and labor force in operations (*loper*). This analysis assumes that there are sufficient funds to finance the minimum lump sums for each input, say \$ 50,000 to hire an additional driver or \$ 20 million to finance the construction of an additional mile of track (*rails*).

Priority	Cost effectiveness	Agency	Input
	(TRIPS per \$)		
1	1.35	Portland	cars
2	1.13	Baltimore	cars
3	0.94	Denver	loper
4	0.88	St. Louis	loper
5	0.49	Los Angeles	cars
6	0.44	Denver	rails
7	0.39	Buffalo	loper
8	0.29	Dallas	cars
9	0.29	Sacramento	cars
10	0.22	Newark	rails
11	0.22	Sacramento	loper
12	0.21	Denver	cars
13	0.20	Philadelphia	loper
14	0.18	Newark loper	
15	0.16	Boston	cars

Table 57 Priority of Investment for Expansion Using Cost Effectiveness - Light Rail

Table 58 indicates that most of the heavy rail systems have high incremental production of trips with respect to stations. Also, high marginal production is generated by expanding the track mileage for Boston and Atlanta and by purchasing new vehicles for Los Angeles. In the case of heavy rail the larger systems seem to be capable of becoming more productive by expansion.

	TRIPS	VRM	TRIPS/	/loper	/lmain	/ener	/cars	/rails	/stats	Total	Total
			VRM							TRIPS	VRM
ny	1579783	304094	5	10	2	1			296	308	59
was	198003	37984	5	16			46		1590	1653	317
chi	151010	50687	3		38	0				38	13
bos	113715	22934	5	20	27		12	538		596	120
atl	90991	27101	3	2	19	0		552		574	171
phi	86245	15640	6	13		0	16		853	882	160
sfr	80490	48523	2		2	0			1393	1395	841
path	67998	12834	5	47	8	0	3		500	558	105
mia	14020	5739	2	19	4			98	206	327	134
bal	12600	4231	3	3	6	0	14		399	421	141
lan	11628	1737	7				480			480	72
patco	10660	4017	3	20	11	0	6		268	304	115
cle	7695	2046	4	10	7	0	5			22	6
sta	4618	2104	2	11	7	0	9	3		29	13

Table 58 Marginal Production of Trips per Unit Increase of Input – Heavy Rail

Table 59 indicates that besides energy and labor hours directed to maintenance, the more costeffective ways to expand heavy rail systems are increasing the number of stations (*stats*) and the labor hours for operations (*loper*). Noticeable is the high cost effectiveness of expanding stations in San Francisco and Washington.

Agency	loper	lmain	ener	cars	rails	stats	Total	Total
0.	-						TRIPS	VRM
nyo	0.40	0.06	10.91			2.36	13.74	2.64
was	0.63			0.77		12.72	14.13	2.71
chi		1.51	0.35				1.86	0.62
bos	0.78	1.07		0.20	0.54		2.59	0.52
atl	0.08	0.78	3.83		0.55		5.24	1.56
phi	0.51		0.12	0.27		6.83	7.72	1.40
sfr		0.09	1.03			11.14	12.26	7.39
path	1.89	0.31	0.78	0.05		4.00	7.02	1.33
mia	0.78	0.14			0.10	1.65	2.67	1.09
bal	0.10	0.22	5.42	0.24		3.19	9.17	3.08
lan				8.01			8.01	1.20
patco	0.79	0.43	1.16	0.09		2.15	4.62	1.74
cle	0.40	0.27	1.78	0.09			2.54	0.68
sta	0.42	0.26	0.79	0.15	0		1.63	0.74
Avrg	0.48	0.37	1.87	0.70	0.09	3.15		
			Exp	ansion co	sts (*)			
Input		Unit cos	st (\$)	Life (ye	ears)	Annual o	cost (\$)	
loper		50,000		1		25,000		
lmain	n 50,000		1		25,000			
ener	63.70		1 63.70					
cars		1.5 M		25	25		60,000	
rails		40 M		40	1 M			
stat		5 M		40		125,000		

Table 59 Cost Effectiveness in Trips per Additional Dollar Spent in Inputs - Heavy Rail

(*) (APTA 2001; CUTA 1993; Vuchic 1981)

Table 60 shows that eight out of twenty prioritized options include stations, two include vehicles, ten expand labor hours in operations, and two expand track length. Additionally, nine of the systems are traditional and eleven are newer systems. Besides that, individual systems can order their own priorities in investment programs. For example, Washington may want to increase its number of stations and later expand in vehicles and labor force.

Priority	Cost effectiveness	Agency	Input
	(TRIPS per \$)		
1	12.72	Washington	stats
2	11.14	San Francisco	stats
3	8.01	Los Angeles	cars
4	6.83	Philadelphia	stats
5	4.00	PATH	stats
6	3.19	Baltimore	stats
7	2.36	New York	stats
8	2.15	PATCO	stats
9	1.89	PATH	loper
10	1.65	Miami	stats
11	0.79	PATCO	loper
12	0.78	Boston	loper
13	0.78	Miami	loper
14	0.77	Washington	cars
15	0.63	Washington	loper
16	0.55	Atlanta	rails
17	0.54	Boston	rails
18	0.51	Philadelphia	loper
19	0.42	Staten Island	loper
20	0.40	New York	loper

Table 60 Priority of Investment for Expansion Using Cost Effectiveness – Heavy Rail

5.5 Application of 2F-DEA to Transit Operations Planning (Scheduling)

Operations planning are a blend of industrial engineering concepts with general management, quantitative methods, and statistics applied to operational activities. Techniques of operations planning help to locate garages, to design service, to plan fleet size, network length, and labor force. They optimize the resources allocated to the production of the transit service although there can be ways to improve the checking of the consistency of planned technical ratios. Notwithstanding that 2F-DEA can be extended to the more specific route-by-route analysis, this is left to further research. The contribution of productivity analysis to operations planning consists of checking the planned figures for new projects.

Transit operations planning (scheduling) designs transit service in stages called demand forecasting, routing, blocking (fleet size), and runcutting (labor force). Demand forecasting estimates transit demand based on the operating conditions of an urban area. Routing calculates the length of the route and the number of stops (stations) needed for optimal service. Blocking calculates the number of vehicles needed to supply the demand at the maximum load point of the route. Runcutting calculates the optimal number of operators that are adequate for the number of vehicles. The basic assumption of this analysis is that planned figures of new systems—Hudson Bergen Light Rail and San Juan Heavy Rail—are consistent if they fall

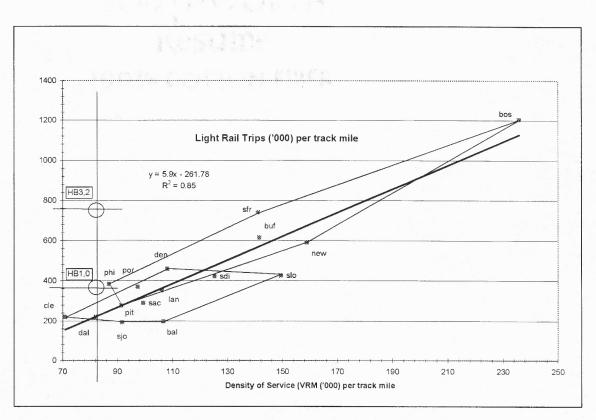
within the ranges of currently efficient systems. The evidence is presented graphically to illustrate easily the concept of ranges.

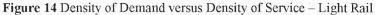
5.5.1 Ratios Related with the Planning of Transit Demand

Light Rail

Transit demand forecasting estimates the number of trips according to operating conditions. It uses two major approaches, a four-step model and a discrete choice model. Figure 14 presents the density of transit demand per track mile as a function of the density of service (vehicle revenue miles per track mile). The positive trend with density of service means that agencies are successfully adjusting their service to demand. The Hudson Bergen density of service (as by May 2000) does not seem to be enough to supply the density of demand of stages 2 and 3. The stages of Hudson-Bergen are described in the Appendix C. Range of traditional systems is the area within the observations of Boston, Newark, Pittsburgh, and Philadelphia. The range for newer systems is the area enveloped by the observations of St. Louis, Cleveland, Dallas, Denver, and Baltimore. Those planned figures outside the areas will need an explanation why the forecast is unique to the system or why it behaves like an outlier. In this case the evidence says that probably Hudson Bergen will increase its density of service in the future. Current operations of the Hudson Bergen system (stage minimum initial) is slightly out of the range of the expected density of transit demand.

Figure 15 presents the number of trips versus number of employees residing in the area served by the system (0.3 miles around the stops). In this case, stage 3 of Hudson-Bergen is in the range of the traditional systems and the result is consistent with existent efficient operations. Also the range of the newer systems is smaller than the range of the traditional systems.





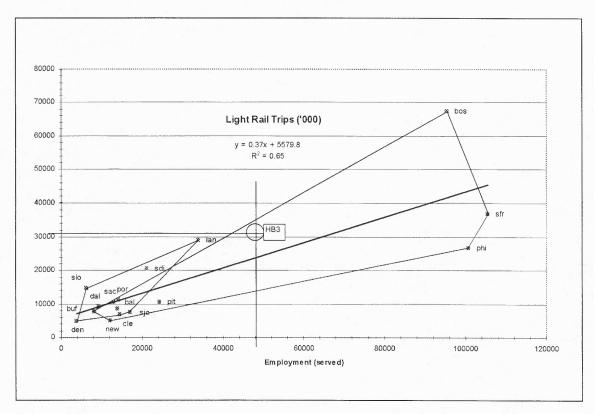


Figure 15 Transit Trips versus Employment Served around Stops - Light Rail

103

Figure 16 presents some evidence that groups of light rails correspond to the operating conditions of their respective urban areas. Traditional systems serve areas with lower demand per household and less autos per household. Notice how the range areas are almost separated. The Hudson Bergen system falls in the area of traditional systems.

Heavy Rail

Figure 17 presents the density of demand versus density of service for heavy rails. This time traditional and newer systems are all mixed and there is no evidence for a differentiated operating condition set for each heavy rail group. San Juan heavy rail assumes 4 minutes headway for peak hour with six-car trains and 8 minutes for off-peak hour but they are not consistent with existent efficient operations. Very probably the frequency during off-peak hours needed for San Juan is lower than the one assumed in this dissertation. Figure 18 shows that the planned figures of the transit demand of the San Juan system are consistent with the observed efficient operations of heavy rail.

5.5.2 Ratios Related with Route Design (Routing)

Light Rail

Routing is the stage of determining the route mileage and the number of stops (stations) of the transit service. Routing is determined by the location of residential areas, the location of trip generators (attracting centers) like downtown areas, job centers, retail centers, recreation centers, and other land uses that generate transit demand. Two ratios are useful to analyze routing, stops per track mile and density of demand versus size. Figure 19 shows that traditional systems increase their ratio stops per track mile with track length while newer systems decrease their ratio with track length. This is evidence that both groups serve different operating conditions to supply the demanded service. From Figure 19, Hudson Bergen has the supply of a newer system although, from Figures 15 and 16, its demand corresponds to the range of traditional systems. Figure 20 presents the density of demand versus track length. Traditional systems tend to be above newer systems with an overlapping zone. Hudson Bergen in stage 3 is far above the existing newer system behaving consistently like a traditional system. Figure 21 shows the density of transit demand versus the number of stops. This time the Hudson Bergen observations for stages 3 and 4 fall slightly above any efficient operation observed in reality.

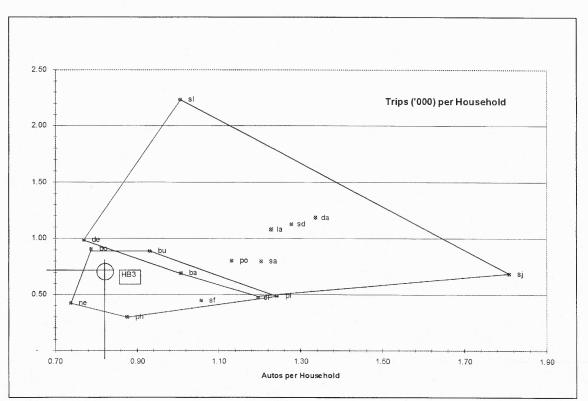


Figure 16 Trips per Household versus Autos per Household – Light Rail

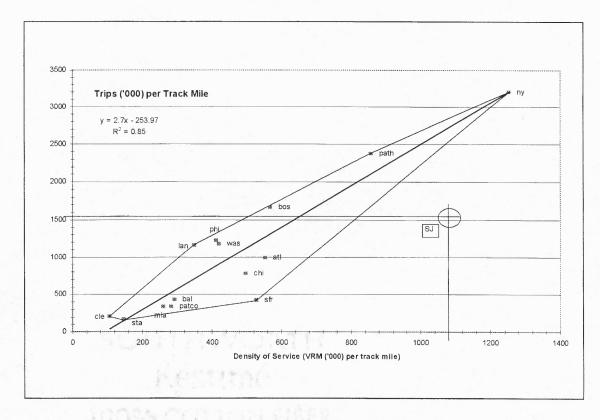


Figure 17 Density of Demand versus Density of Service - Heavy Rail

105

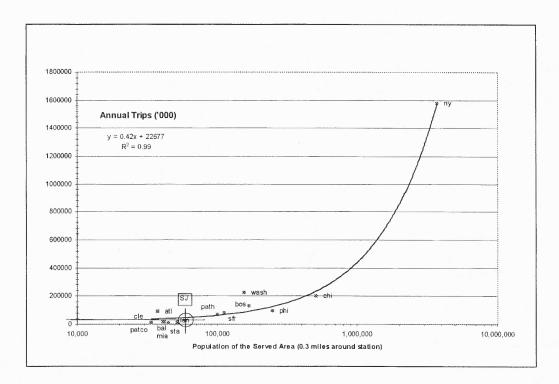


Figure 18 Demand versus Population of the Served Area (0.3 miles around stations) - Heavy Rail

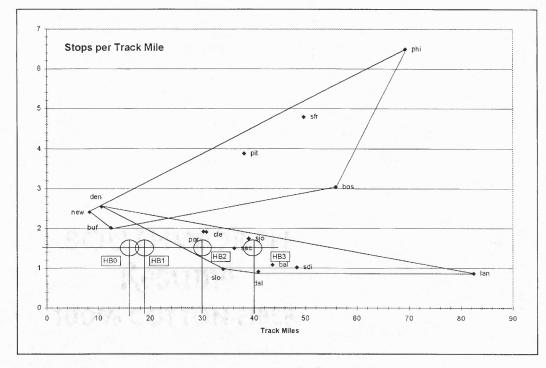


Figure 19 Ratio Stops per Track Mile versus Track Length - Light Rail

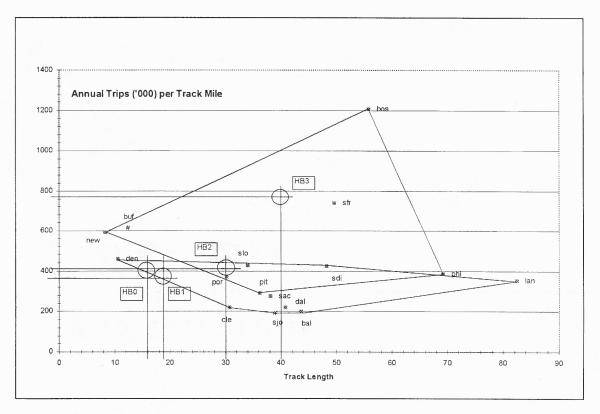


Figure 20 Density of Demand versus Track Length - Light Rail

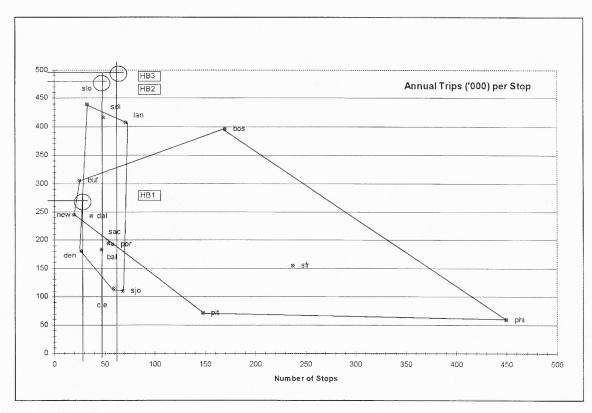


Figure 21 Density of Demand versus Number of Stops - Light Rail

Figure 22 shows that the ratio stations per track mile determines the difference between traditional and newer heavy rails. Traditional systems tend to increase their ratio stations per track mile with increases in track length. Newer systems tend to decrease their ratio stations per track mile with increases in track length, similar to the case of light rail. Notice that San Juan falls near the overlapping zone of both groups.

Figure 23 shows that traditional systems are almost completely separated from the newer systems with higher demand per station in a short range of the graph while traditional systems have lower demand per station for a broader range of size. PATH has exceptionally higher demand per station than any other system. The San Juan system appears small with 15 stations and near the area of newer systems, so high demand per station is expected.

5.5.3 Ratios Related with Fleet Size Planning (Blocking)

Light Rail

Blocking consists of developing vehicle assignments to specific routes. Consistency of blocking checks the density of demand per vehicle, the intensity of use of vehicles, the effectiveness ratio of trips per vehicle revenue mile, and the technical ratios of vehicles per track length and per stop. Figure 24 shows that newer systems can be less effective than traditional systems while effectiveness in traditional systems tends to increase with fleet size. Effectiveness planned for the Hudson Berger in stages 2 and 3 appear far higher than any observed efficient system in existence. Hudson Bergen may need more vehicles to cope with the demand of stages 2, 3. Figure 25 shows more signs of technical differences between traditional and newer groups. Newer systems use vehicles more intensely than traditional systems, while traditional systems tend to decrease the intensity of use of vehicles when fleet size increases. Also, Hudson-Bergen falls short in the intensity of use of vehicles and therefore it would need to adjust its density of service or to adjust its spare ratio assumed here as zero.

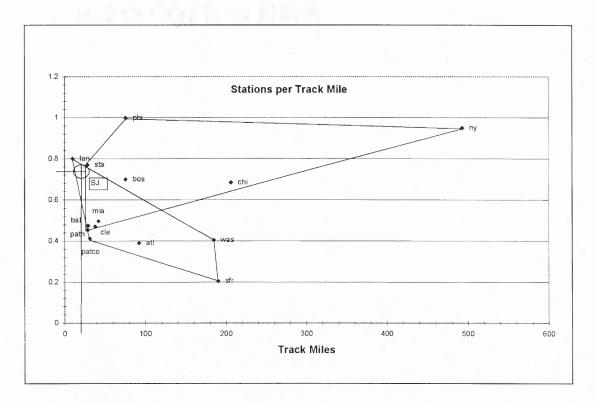


Figure 22 Ratio Stations per Track Mile versus Track Length - Heavy Rail

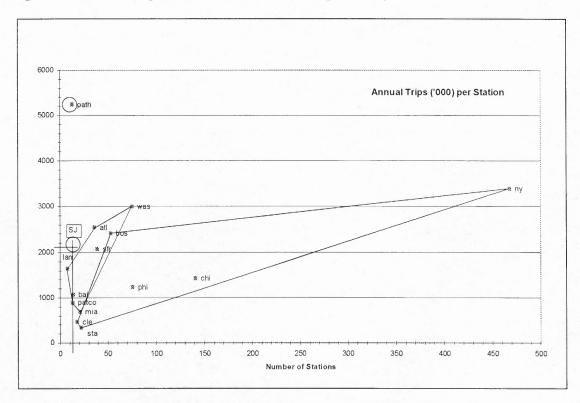


Figure 23 Density of Demand versus number of Stations - Heavy Rail

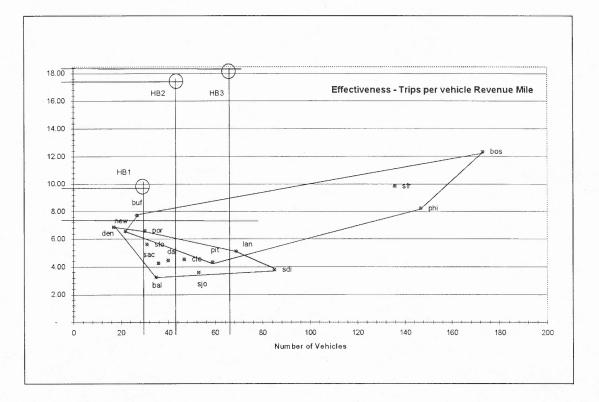


Figure 24 Effectiveness (TRIPS per VRM) versus Fleet Size - Light Rail

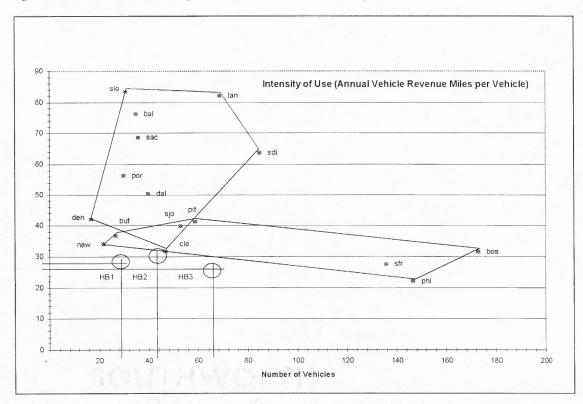


Figure 25 Intensity of Use of Vehicles versus Fleet Size - Light Rail

110

Figure 26 shows further evidence of the technical difference between traditional and newer systems. Traditional systems use more vehicles per track length than newer systems. Notice that Hudson-Bergen operates in the small overlapping zone between traditional and newer light rails. Currently, Hudson Bergen works with more vehicles per track mile than most of the newer systems. Figure 27 presents the intensity in the use of vehicles versus the ratio stops per track mile. Newer systems are clearly located at a lower number of stops per track mile but with more intense use of vehicles. Traditional systems work with higher number of stops per track mile but less intense use of vehicles. Consistently, Hudson Bergen shows that the current density of service will not be maintained if the system is to be as intense as others.

Heavy Rail

Figure 28 shows that the areas of newer and traditional heavy rails suggest a differentiated behavior between both groups. Newer systems tend to decrease their effectiveness when working at larger fleet size while traditional systems tend to increase effectiveness when working with larger fleet size. San Juan heavy rail is a small system that seems to be planned as effective as the most effective of the newer systems. Figure 29 shows that newer heavy rails tend to make more intense use of vehicles than traditional systems. The San Juan system seems to be designed more like a newer system than a traditional one. Figure 30 describes that newer heavy rails have less stations but higher number of vehicles per station. Traditional systems have more stations but work with a smaller ratio of vehicles per station although the ratio increases with fleet size. The PATH system behaves as an outlier due to its exceptionally higher number of vehicles per station. The San Juan system seems to be in between the newer and the traditional systems.

5.5.4 Ratios Related with Labor Force Design (Runcutting)

Light Rail

Figure 31 shows the assumed intensity of use of labor hours in operations per vehicle for Hudson Bergen. They are based on similarities with Newark, Dallas, or an average of both. Under any of the assumptions of the systems is near the range of current light rails. Figure 32 shows that Hudson-Bergen assumptions of labor with respect to vehicles are far from the range of existing efficient operations. Figure 33 shows that traditional light rails increase the ratio of labor in operations when fleet size increases, while newer systems decrease the ratio when fleet size increases. Los Angeles appears to be an outlier in this graph.

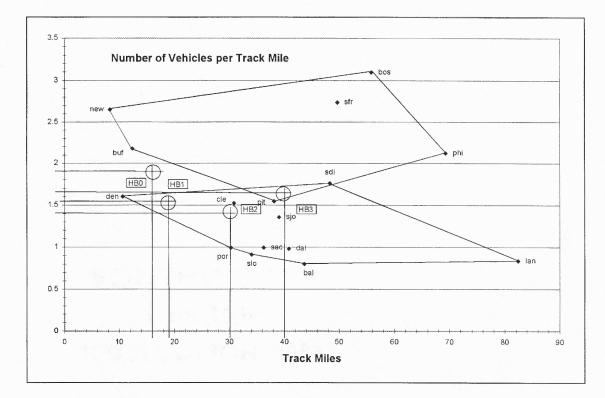
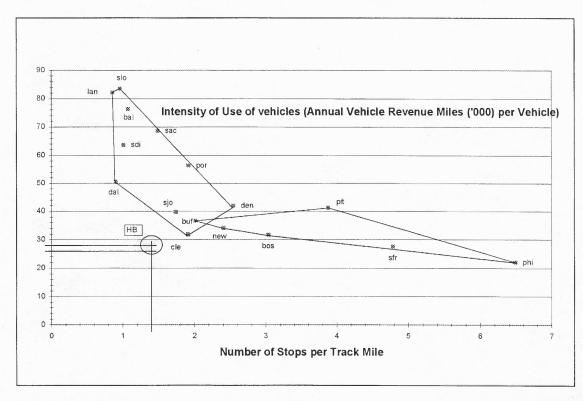
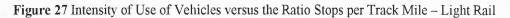


Figure 26 Ratio Vehicles per Track Mile versus Track Length - Light Rail





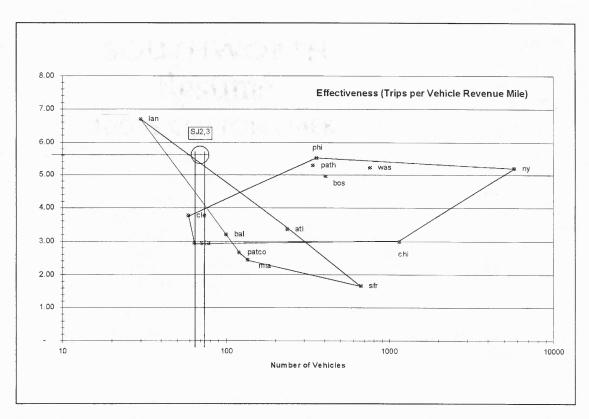


Figure 28 Effectiveness versus Fleet Size – Heavy Rail

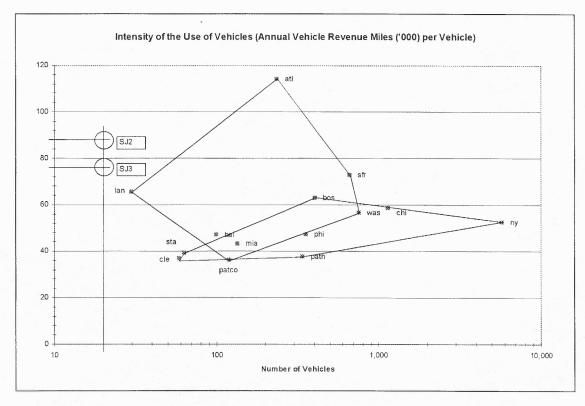
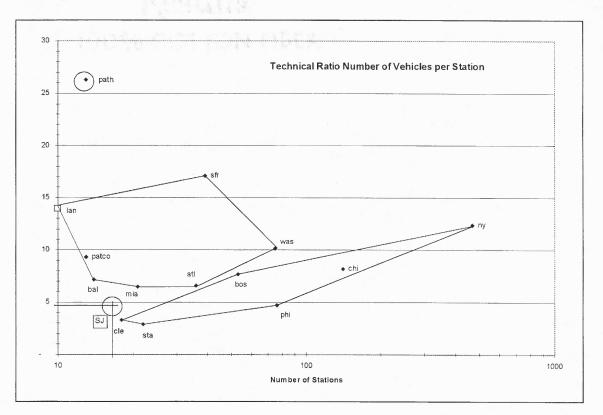


Figure 29 Intensity of Use of Vehicles versus Fleet Size - Heavy Rail

113





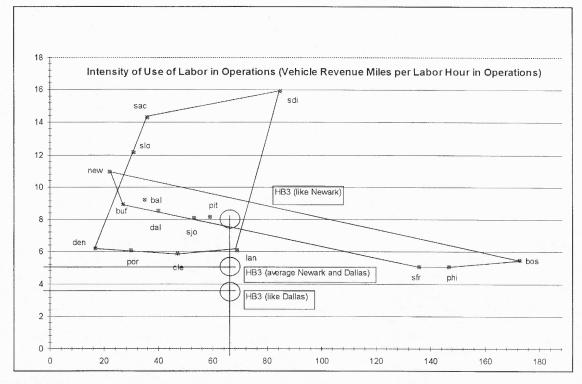
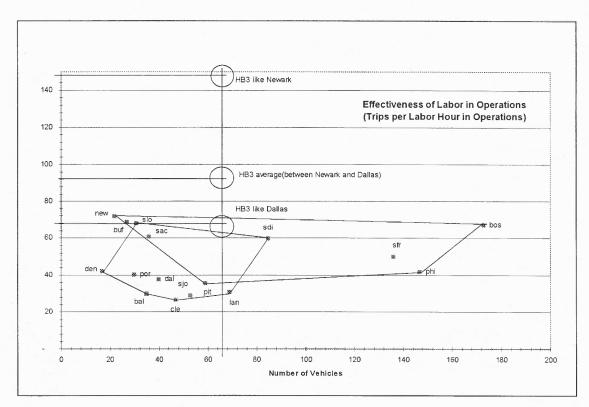


Figure 31 Intensity of Use of Labor in Operations versus Fleet Size - Light Rail

114





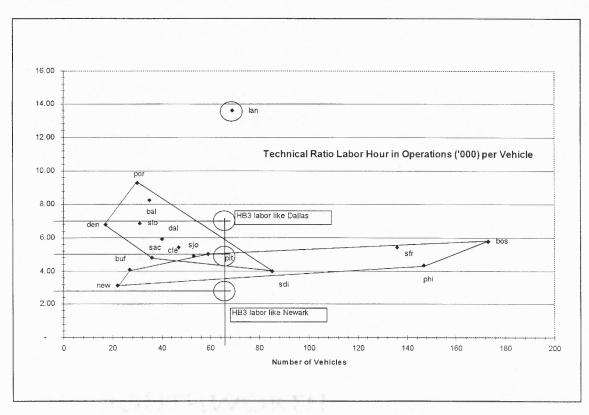


Figure 33 Ratio Labor in Operations per Vehicle versus Fleet Size – Light Rail

Heavy Rails

Figure 34 shows that San Juan works near the range of newer heavy rails in the intensity of use of labor hours versus fleet size. Figure 35 shows that the San Juan figures are above any agency. This dissertation assumes that San Juan uses a labor force ratio to fleet size similar to the average of the heavy rail industry in 1992. Notice the high productivity of *TRIPS* similar to PATH and New York. Finally, Figure 36 shows that there is no difference between traditional and newer heavy rails in the relation between labor force and fleet size.

5.6 Application of 2F-DEA to New Rail Projects

The new rail projects were designed to expand in stages. Four stages were considered for Hudson-Bergen light rail and one initial stage for San Juan heavy rail. For each stage there are planned a number of stations, a number of vehicles, and so on. Also, data on labor is assumed based on similarities to current operation or to the average of the industry. The following is the list of the cases considered.

5.6.1 Hudson-Bergen Light Rail

This application considers four segments, the initial operating segment as of May 2000 from Exchange Place in Jersey City to 34th Street in Bayonne (New Jersey). The first segment extends the northern tip to Hoboken as planned to operate in 2001, the second, and the third segments as published (US-DOT-FTA 1999). In this section, a case is feasible if it operates within the range of efficient current operations. Table 61 shows three cases, of the initial and first segments, that are feasible because they do not exceed observed productivity benchmarks. To achieve feasibility, Hudson-Bergen would need more or larger *cars* as well as labor resources as intensive as in the Dallas operations. Its efficient peers are Boston, St. Louis, Newark and San Diego. Feasible productivity benchmarks are; 8.4 *VRM/loper*, 6.6 *VRM/lmain*, 87 *TRIPS/loper*, and 39.5 thousands *TRIPS/cars*.

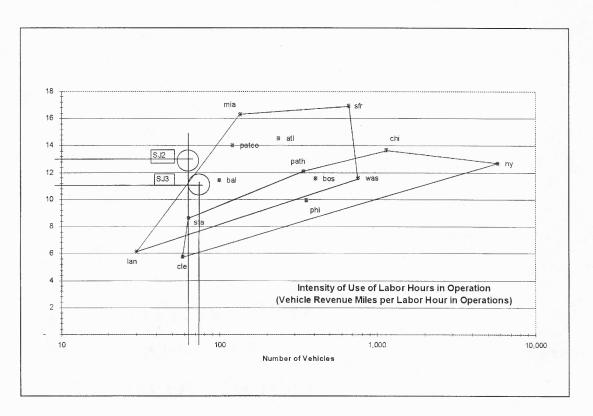


Figure 34 Intensity of Use of Labor in Operations versus Fleet Size - Heavy Rail

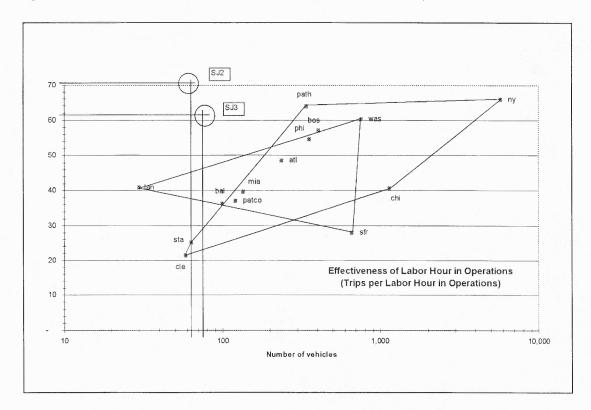


Figure 35 Trips per Labor Hour in Operations versus Fleet Size – Heavy Rail

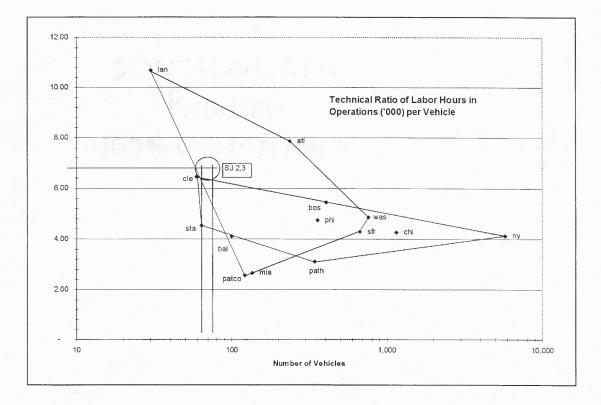


Figure 36 Ratio of Labor in Operations per Vehicle versus Fleet Size – Heavy Rail

<i>Case (*)</i>	VRM/loper	VRM/lmain	TRIPS/loper	TRIPS/cars	Feasible
3NJ	No	No	No	No	No
3DA				No	No
3AV			No	No	No
2NJ	No	No	No	No	No
2DA				No	No
2AV			No	No	No
1NJ	No	No			No
1DA					YES
1AV		No			No
0Njcon	No	No			No
0Dacon		No			No
0Avcon	No				No
0Njop	No	No			No
0Daop					YES
0Avop					YES
Efficient	Boston	Boston	Boston	Boston	
peers	St. Louis	Newark	San Diego	St. Louis	
Productivity	8.4	6.6	87	39.5	
benchmark	per labor hour	per labor hour	per labor hour	000's per vehicle	

Table 61 Hudson-Bergen Light Rail – Feasibility by using Results of DEA(1)

(*) Appendix C contains the definition of these cases.

Table 62 displays the advantage factor of Hudson-Bergen light rail and shows that its operating conditions are not as advantageous as the rest of the transit agencies but it is at least similar to Boston, San Francisco and Philadelphia as registered in Table 22 of page 72 of this dissertation.

Case	IDA	0Daop	0Avop
Labor in operations		0.78	
Labor in maintenance		0.73	
Energy		1.22	
Vehicles		0.85	
Track length	1.30	0.81	0.85

Table 63 presents the efficiency of the three feasible cases of Hudson-Bergen. Planning figures assume technical efficiency while implying a certain degree of scale inefficiency.

Table 03 11	uuson-Dergen Light Ran - D	1100000000000000000000000000000000000
Case	Technical efficiency	Overall efficiency
1DA	100.0	86.2
0Daop	96.2	76.3
0Avop	100.0	86.2

 Table 63 Hudson-Bergen Light Rail - Efficiency by using DEA(2) (%)

5.6.2 San Juan Heavy Rail

San Juan heavy rail planning figures that correspond to a unique initial stage that has been publicized. Appendix C indicates the cases included in this analysis. Table 64 indicates that two out of six San Juan cases are feasible, they consider 15,000 daily trips and 64 or 74 *cars*. As a result there are three benchmarks of *VRM* and *TRIPS* productivity ratios that can be used to check future operations of the project. Notice that planned figures of San Juan are within the acceptable ranges for *stats*, *cars* or *rails*, but not of the average ratios assumed for *loper* and *lmain*. San Juan heavy rail will need more than average labor resources, *loper* and *lmain* per *VRM* and per *TRIPS* to be feasible.

Case (*)	VRM/loper	TRIPS/loper	TRIPS/lmain	Conclusion, Feasible?
14low	No	No		No
14high	No	No	No	No
64low				YES
64high	No	No		No
74low				YES
74high	No	No		No
Efficient peers	Boston New York	Atlanta Washington	Chicago	
Productivity benchmark	13.40	47.0	107.0	

CDE 4 (1) . . < 1 G

(*) Appendix C contains the definition of these cases.

Table 65 shows the advantage factor of San Juan heavy rail and shows that it enjoys very advantageous operating conditions to develop high productivity in five inputs.

Table 65 San Juan Heavy Rail - Advantage Factor of Operating Conditions

64low & 74low
1.04
1.14
1.19
1.37
1.09

Table 66 indicates that the resources planned for San Juan assume technical efficiency and overall efficiency.

Table 66 San Juan Heavy Rail - Efficiency by using DEA(2) (%) Overall efficiency Case Technical efficiency 64low 100 94 74low 100 85

5.7 Conclusions on the Results

The results of the application of 2F-DEA indicate that the new model extracted the effect of heterogeneous conditions achieving fairer and more accurate estimation of efficiency, with a minimum of additional effort. Additionally, 2F-DEA provided productivity benchmarks tailored to the operating conditions of individual agencies. The new model also provided the advantage factor in operating conditions of an agency with respect to the average of the industry.

Also, this chapter calculated the correlation of productivity with operating conditions including for the first time those related to network form. Those network descriptors that refer to the access of passengers explained productivity of track miles in the same dimension as socioeconomic variables of the served area. Besides, connectivity indices explained productivity of track miles and of stations in the case of heavy rail in a dimension associated with auto availability. Factor analysis organized operating conditions in few well-defined dimensions; conditions of the served area, conditions of the metropolitan area, auto availability, and income and rush hour concentration of demand.

Efficiency is high in light rail (89 percent) and in heavy rail (92 percent). The opportunity for improvement is \$ 2 million for light rail and \$ 79 million for heavy rail in unachieved revenues. The equivalent improvement in the use of resources reaches \$ 14 million in possible annual savings in expenses for light rail and \$ 54 million for heavy rail.

Cluster analysis left a level of between 5 and 36 percent of productivity differences and between 13 and 27 percent of efficiency differences attributable to heterogeneous conditions, indicating that the effect of operating conditions continued within the cluster at considerable levels. Conventional DEA underestimates efficiency by 17 percent in light rail and by 11 percent in heavy rail, justifying the development of 2F-DEA. Finally, 2F-DEA extracted the effect of the operating conditions before the estimation of efficiency up to the point that none of the correlation between efficiency and operating conditions reached 0.5 or higher.

The results of productivity analysis made evident the existence of two techniques of production, one adopted by traditional (older) transit agencies and the other by newer. Traditional agencies specialize in the production of trips with higher use of their track length, while newer systems specialize in the production of vehicle revenue miles with intense use of vehicles and stations. The inputs that are sources of increasing returns to scale are the use of the rail tracks and the use of energy. Results of 2F-DEA built a method for investment priority for expansion in which light rail would achieve high cost effectiveness in expanding number of vehicles, labor force in operations and administration, and, in the case of smaller systems,

expanding rail tracks. Heavy rail achieves the highest cost effectiveness in expanding stations, labor force in operations, and, in the case of larger systems, expanding rail tracks.

Productivity analysis can check the consistency and feasibility of new rail projects. For example, Hudson Bergen light rail faces a demand typical of a traditional system while it plans a supply typical of a newer system. It would be advisable to study if more cars would be necessary for stages 2 and 3. Another example, San Juan heavy rail is planned like a newer system, although by some indicators a high production of trips per labor in operations is expected as in PATH or New York. Additional evidence on the production techniques of rail transit indicates that not only ratios of stops per track mile differ between traditional and newer systems, but also that the difference increases with size. Finally, feasibility analysis found that the first segment of Hudson Bergen could have productivity benchmarks near those of Boston and that their advantage factor indicates low advantage of operating conditions. The San Juan labor force would achieve productivity benchmarks of vehicle revenue miles like traditional systems and its advantage factor indicates high advantage in operating conditions.

CHAPTER 6

CONCLUSIONS AND SUGGESTIONS FOR FURTHER RESEARCH

This dissertation improves the accuracy and fairness in the estimation of transit productivity efficiency, a point that motivates major policy decisions on privatization, deregulation, contracting out, expansions, etc. Conventional methods underestimate efficiency under heterogeneous operating conditions because all observations refer to the performance of the most advantageous operating conditions while being unfair to all other agencies. The problem of transit productivity analysis arose because of the fact that transit operates under heterogeneous conditions with evident influence on productivity while current methods of productivity analysis do not calculate this influence in an adequate manner.

This dissertation discussed several methods of productivity analysis finding their limitations in the case of heterogeneous conditions. Cluster analysis reduced but did not eliminate the effect of heterogeneous conditions within the clusters. Empirical equations used an uncertain set of variables with the possible exclusion of relevant ones or the inclusion of irrelevant ones. Current Two-Step methods forget the estimation of internal inefficiency or assume the contradiction that efficiency is stochastic and deterministic at the same time. Other methods include operating conditions as if they were other inputs—that is not true—generating a source of redundancy with those inputs affected by the operating conditions. A theoretically correct method includes operating conditions in constraints for one-step estimation but becomes complicated for the case of many operating conditions, and methods to simplify it hold only for particular cases. Consequently, the dissertation found that a new method was necessary for productivity analysis for the case of heterogeneous conditions.

The approach of the new model is based on the Reversed Two-Step DEA approach, a method that estimates first the productivity differences caused by heterogeneous conditions and then it estimates the productivity efficiency. The formulation of 2F-DEA departs from (Ray 1988) who correctly assumed that operating conditions impose limits to the production process as if they were technological strata. The assumption of independence between the effect of operating conditions with scale and with efficiency complements the formulation of 2F-DEA. In a preliminary step, factor analysis gathers the relevant set of operating conditions for the analysis. A transforming multiplier is the connector between DEA(1) (applied to each productivity ratio versus operating conditions) and DEA(2) (applied to outputs versus adjusted

inputs). The transforming multiplier is the ratio of productivity of the agencies at the frontier calculated by DEA(1). It is used to adjust those inputs included in DEA(2). The model 2F-DEA enriches transit productivity analysis with two new indicators, productivity benchmarks and advantage factors. Productivity benchmarks are standards tailored to the unique reality of each individual agency while the advantage factors calculate the degree of goodness of the operating conditions of one agency with respect to the industry.

The application of 2F-DEA found that those operating conditions of the network form do correlate with transit productivity, including access density, network density, comprehensive accessibility, connectivity index, circuit availability, stop spacing, and density of service. Factor analysis reduced those operating conditions that correlated with transit productivity to few main factors. They are the served area conditions computed within 0.3 miles of the rail station, the metropolitan area conditions computed for the whole metropolitan area, the car factor that refers to auto availability, income and rush hour concentration of the demand, and stop spacing in the case of heavy rail.

The first stage DEA(1) calculated the productivity benchmarks for individual agencies indicating that some agencies could reach standards of vehicle revenue miles and of passenger trips well below other agencies adding to the evidence of the increased fairness of comparison of 2F-DEA. The advantage factors of light rail showed that Pittsburgh and Cleveland operated on less advantageous conditions than the industry in all their inputs, while this was true for the heavy rail systems of Miami, Baltimore, Cleveland, and Staten Island.

The second stage DEA(2) estimated that light rail systems are 89 percent efficient on the average, and identified two efficient agencies, San Francisco and St. Louis. The room for improvement is still considerable. Light rail systems could increase their revenues by \$ 2 million per year, at a 55-cent average fare, or save \$ 14 millions from the annual expenses of the used resources. The new method estimated the overall efficiency of heavy rail systems at 92 percent. Four agencies, New York, Atlanta, San Francisco, and PATH, reached the efficiency frontier. In this case, the potential for improvement reaches \$ 79 million per year in revenues at a 96-cent average fare, or an annual expense savings of \$ 54 million.

The results of 2F-DEA were very useful in interpreting the estimated production function. Returns to the consumption of a single input indicated sources for increasing returns to scale in heavy rail because the

most intense use of the tracks occurred at longer networks, while in light rail this source of increasing returns to scale does not exist. Since larger light rails operate extensively on the streets, these systems did not show increasing returns in the use of rail tracks.

The analysis of returns to scale of light rail indicated two optimal sizes associated with the intensity of production of two outputs, trips and vehicle revenue miles. The optimal trip intensive size corresponds to San Francisco (50-directional mile network) and the optimal vehicle-mile intensive size corresponds to St. Louis (35-directional mile network and 30 to 50-vehicle fleet). The analysis of returns to scale of heavy rail indicated that the optimal size is between a 300 to 600-vehicle fleet and a 100 to 200-directional mile network, with representative systems being Miami, Atlanta, and San Francisco. The other optimal size corresponds to New York, the largest system by far, consistent with the existence of increasing returns to scale in heavy rail.

Further evidence of the different techniques of production was demonstrated by grouping all agencies around two groups differentiated by the year of their opening. Traditional (older) systems use intensely their rail tracks while the newer systems use intensely their vehicles and their stations. Analysis of the substitutability of inputs found a slight difference between heavy rail and light rail. While in light rail most of the inputs are complementary, in heavy rail most of them are substitutable.

The linear production function provided a method for prioritizing the expansion of inputs, based on their marginal productivity and cost effectiveness. A list of the most cost effective ways to expand light rail includes the purchase of more vehicles in Portland and Baltimore, the hiring of more operators in Denver and St. Louis, and the expansion of the rail tracks in Denver and Newark, among others. The most cost effective ways to expand heavy rail includes the building of more stations in Washington and San Francisco, the purchasing of more vehicles in Los Angeles and Washington, the hiring of more operators in PATCO and Boston and the expansion of the rail tracks in Atlanta and Boston.

The indirect contribution of productivity analysis to transit operations planning provided more information on the techniques of production. There is evidence that the different production techniques of rail transit have their origin in the different characteristics of their demand. In the graphic of trips per household versus autos per household, traditional and newer light rail systems occupy two separate areas. Furthermore, the ratios of stops per track mile for traditional systems are not only higher, but they also increase with network length, while, for newer systems, these ratios are smaller and decrease with network length.

The analysis of the planned figures for systems under development, indicated that the Hudson-Bergen light rail may face operating conditions similar to traditional systems (high density of demand), and a supply similar to newer systems (low density of service). On the other hand, the San Juan heavy rail is planned like a newer system although some demand indicators are near those of traditional systems. Finally, 2F-DEA estimated achievable productivity benchmarks and advantage factors for the new rail projects. Hudson Bergen operates in less advantageous operating conditions for almost all inputs, while the San Juan heavy rail operates in more advantageous operating conditions.

Suggestions for Further Research

The application of 2F-DEA to a single output model using the output measure of passenger-miles would be the most desirable extension of this research. This is an immediate application possible for rail as well as for bus transit. Another research area is the application of Monte Carlo analyses to evaluate the empirical accuracy of 2F-DEA in comparison to other methods. An additional research area is the relaxation of the assumptions of 2F-DEA to allow for input-specific shifts in the production frontier and to allow for variable returns to scale in the relation between the productivity frontier and operating conditions. The new models will apply a generalized 2F-DEA.

A necessary research is the generation of a database of indicators of connectivity between the evaluated systems and the other transportation modes to ensure a higher level of comprehensiveness. Another area is the generation of a database of attributes of inputs (automation, right of way, train formation capabilities, etc.) and of characteristics of outputs (comfort, safety, security, reliability, on-time performance, etc.) Another research area is the managerial application of 2F-DEA to transit performance evaluation to satisfy the most immediate needs of transit practitioners for optimal allocation of internal resources among alternative routes, modes, capital projects, etc.

A final research area is the further extension of the managerial application of 2F-DEA to facilitate those decision-making processes that are complex. An example is the implementation and integration of intelligent transportation systems (ITS) in transit operations. Decisions in ITS for transit may involve simultaneous decisions on technology, customer satisfaction, operating conditions effect, labor-

APPENDIX A

MODIFICATIONS TO THE RAIL TRANSIT NETWORKS OF THE NATIONAL

TRANSPORTATION ATLAS

The National Transportation Atlas provided the geographic location of the rail networks and stations of rail systems, at the year 1997 or, in some cases, the future planned whole network. Before applying 2F-DEA, the networks were adapted to represent the operations at each of the years between 1984 and 1997. A special research traced the successive expansions and changes of each network that rendered the following list of modifications.

Heavy rail

New York-NYCT: Three stations opened in the Archer Avenue segment in 1988, two stations opened in the Long Island City CBD, and one in the Midtown area in 1989. In 1985, two stations closed in the Jamaica segment and one in 1995 in the Franklin Avenue segment.

Washington-WMATA: Eight stations did not operate during the period. Four stations opened in 1985, four in 1986, six in 1991, three in 1992, and four in 1994.

Chicago-CTA: In 1985 opened the O'Hare Airport station. In 1994 opened Orange line to Midway Airport. Green line closed during 1994-1995 for repairs. In the Loop, the Library station opened in 1997, in 1993 opened Lake Av. station linked with State station (red and blue lines), in 1995 opened Washington station, in 1989 opened Clark station, Madison station closed in 1995, and Quincy station closed 1985-1987 for renovations. A group of stations closed in the green line during 1994 for renovations of the line.

Boston-MBTA: In 1987 Orange line opened new alignment and stations to the south. In 1985 opened three stations of the red line to Harvard station. Add Mattapan high speed line.

Atlanta-MARTA: In 1985 opened five stations, one in 1987, three in 1988, four in 1993, and three in 1996.

Philadelphia-SEPTA: In 1986 Norristown High Speed line shut down for two months, operated limited and bus service for two months, and finally restored full service. In the early 1990's, the reconstruction program of the Frankford Elevated occurred during weekends. This dissertation considers 1986 and early 1990's as normal years (Vigrass 1990; Palmer 1998).

San Francisco-BART: Two stations opened in 1996 and three in 1997.

Miami-DCTA: Five stations opened in 1985 and one in 1989.

Los Angeles-LACMTA: Metro-rail began operations in 1993. Three stations opened in 1996.

Light Rail

Boston-MBTA: Add stops at street level. Modify branch to Arborway 1986 and 1989.

San Francisco-MUNI: Add stops at street level. J line extended to Balboa Park Transportation Center in

1990. Add F line and stations in 1995 with walking links to Market Street Tunnel stations.

Philadelphia-SEPTA: Add stops at street level to Green, Median, and Sharon Hill lines.

Los Angeles-LACMTA: Green line opened in 1996.

St. Louis-BSDA: Modify location of two stations at the Airport.

Portland-TCMTDO: Correct the number of stations.

Sacramento-RTD: Modify line.

Buffalo-NFTS: Add two stations in 1987.

Baltimore-MMTA: Exchange stations opened in 1998.

Pittsburgh-PAT: Add stops at street level. Overbrook line closed 1994. Allentown line closed 1992-1994.

New Orleans-RTA: Add stops at street level. Add link to River Front line opened since 1988.

Cleveland-GRTA: Extend Waterfront line to South Harbor in 1996.

Denver-RTD: Exclude a station.

Hudson Bergen Light Rail: Add line and stations.

San Diego Trolley: Add a stop in downtown to reproduce early operations. Four stations opened in 1985,

eight in 1987, four in 1989, three in 1990, one in 1994, three in 1995, and three in 1996.

APPENDIX B

ABBREVIATIONS FOR VARIABLES, AGENCIES, AND MODELS

Throughout the dissertation many abbreviations are used for variables, observations and models. Following is a list of those abbreviations.

Outputs

VRM = Annual vehicle revenue miles (000's) TRIPS = Annual unlinked passenger trips (000's)

Inputs

loper = Annual labor hours in operation and in administration (000's) lmain = Annual labor hours in maintenance (000's) ener = Annual kilowatt hours of electricity (000's) cars = Number of rail vehicles rails = Number of directional track miles stats = Number of stations (only for heavy rail)

Selected operating conditions

Stopsp = Stop spacing, average distance between stations Rushalf = Highest concentration of demand of motorized trips to go to work in half an hour PopCC = Population residing in center city IncoPC = Income per capita of the served area, around 0.3 miles of the stations Denserv = Density of service in vehicle revenue miles per track mile AutoPH = Number of autos per household of the served area ,around 0.3 miles of the stations EmpCCD = Density of employees residing in center city EmpDen = Density of employees residing in the served area, around 0.3 miles of the stations NetCom = Network complexity, ratio of number of links to number of stops

Agencies

Light Rail	Short name	Heavy Rail	Short name
Boston-MBTA	bos	New York-CTA	nyo
San Francisco-MUNI	sfr	Washington-WMTA	was
Philadelphia-SEPTA	phi	Chicago-CTA	chi
Los Angeles-LACMTA	lan	Boston-MBTA	bos
San Diego Trolley	sdi	Atlanta MARTA	atl
St. Louis-Bi-State	slo	Philadelphia-SEPTA	phi
Portland Tri-County MTD	por	San Francisco-BART	sfr
Dallas-DART	dal	New York-PATH	path
Sacramento-RTD	sac	Miami-Dade Cnty TA	mia
Pittsburgh-PAT	pit	Baltimore-MTA	bal
Buffalo-Niagara Frontier	buf	Los Angeles-LACMTA	lan
Baltimore-Maryland MTA	bal	Lindenwold-PATCO	patco
Santa Clara County TD	sjo	Cleveland-RTA	cle
New Orleans Public Svc	nor	Staten Island Rapid Trans	sta
Cleveland-RTA	cle	San Juan Heavy Rail	SJ
Denver-RTD	den		
Newark-NJT	new		
Hudson-Bergen Light Rail	HB		

Models of Data Envelopment Analysis

2F-DEA = Two Farrell Data Envelopment Analysis

DEA(1) = Data Envelopment Analysis Number One

DEA(2) = Data Envelopment Analysis Number Two

DEA-C = Data Envelopment Analysis Conventional

DEA-ND = Data Envelopment Analysis with Non Discretionary Factors

DEA-2S = Data Envelopment Analysis Two-Step

DEA-CL = Data Envelopment and Analysis Cluster Analysis

APPENDIX C

PLANNED PRODUCTIVITY OF NEW RAIL PROJECTS

Hudson-Bergen Light Rail

The assumptions are as follows.

- Energy consumption is comparable to the Dallas system that uses similar vehicles, 464 thousands Kwh per vehicle per year.
- VRM derives from the scheduled vehicle revenue miles of the first initial segment valid in May 22, 2000 and extrapolated to the length of the line of the other segments. Hudson-Bergen Light Rail plans for 683 thousands of VRM per year for the initial operational segment.
- 3) Published planned *TRIPS* for the other segments are the following; 18,000 daily unlinked trips for the initial operating segment to Exchange Place, 25,000 for the first segment to Hoboken, 72,360 for the second segment and 100,000 for the third. The first segment to Exchange Place considered two approaches, the optimistic assumes 18,000 trips for 365 days while the conservative assumes 50 percent for Saturdays and Sundays (conservative).
- 4) Published track length figures are the following; 8.1 miles in the initial segment to Exchange Place, 9.5 in the first segment, 15.4 in the second, and 20.1 in the third segment.
- 5) This dissertation assumed three approaches for the relation Labor/Vehicles, one similar to Newark system, other similar to Dallas system, and a third as the average of both.
- 6) Published number of vehicles are the following; 29 for the first segment, 43 for the second and 66 for the third. As a result, Table A presents fifteen cases with all the alternatives.

Table A H	ludson-Berge	en Light Rail - C	Cases
Case	Segment	Labor	Planned TRIPS on Weekends
3NJ	Third	Newark-like	Conservative
3DA	Third	Dallas-like	Conservative
3AV	Third	Average	Conservative
2NJ	Second	Newark-like	Conservative
2DA	Second	Dallas-like	Conservative
2AV	Second	Average	Conservative
1NJ	First	Newark-like	Conservative
1DA	First	Dallas-like	Conservative
1AV	First	Average	Conservative
0Njcon	Initial	Newark-like	Conservative
0Dacon	Initial	Dallas-like	Conservative
0Avcon	Initial	Average	Conservative
0Njop	Initial	Newark-like	Optimistic
0Daop	Initial	Dallas-like	Optimistic
0Avop	Initial	Average	Optimistic

Table A Hudson-Bergen Light Rail - Cases

San Juan Heavy Rail

San Juan Heavy Rail is to operate in Puerto Rico. Planned operational data for the San Juan system was collected from published data of San Juan Department of Transportation, Federal Transit Administration, Siemens, and other providers of the project (US-DOT-FTA 2000).

- VRM is calculated by using the track length of first segment and planned headway of 4 minutes in peak hour and 8 minutes during off-peak hours for a total of 20 daily hours and 50 percent during weekends.
- 2) Published planned TRIPS data from a low of 15,000 trips to a high of 100,000 trips on weekday.
- 3) Published average productivity of loper, Imain and ener (US-DOT-FTA 1992), Tables 2-5, 2.8.
- 4) Published number of cars, 14, 64 and 74.
- 5) Published track length 10.2 miles on each direction, a total of 20.4 miles on both.
- 6) Published number of stations, 15 for the first stage.

As a result Table B presents six cases.

Table B S	an Juan Heavy	Rail - Cases
Case	cars	TRIPS per weekday
14low	14	15,000
14high	14	100,000
64low	64	15,000
64high	64	100,000
74low	74	15,000
74high	74	100,000

Table B San Juan Heavy Rail - Cases

APPENDIX D

DATABASE OF RAIL TRANSIT PRODUCTIVITY ANALYSIS

Vehicle Revenue Miles

Weshington, D.CWMATA 1: Chicago-RTA-CTA 42: Boston-MBTA 11 Allarta-MARTA 1: San Francisco-BART 2: New York-PATHC 11 Mismi-MOTA 2: Balimora-MMTA 1: Los Angelia-LACMTA Philadelphia-NJ-PATC 2: Claveland-GRTA 2:	1984 78,089 17,336 15,552 16,828 5,943 15,282 29,560	1985 275,303 24,202 47,645 17,511 9,735 15,627	1986 290,493 26,859 46,401 17,543 11,741 15,572	1987 293,921 31,938 46,992 18,440 12,341	1988 306,431 32,120 55,087 20,078 13,256	1989 312,195 32,859 54,630 21,858	1990 308,342 33,212 56,582 23,186	1991 294,032 36.036 57,598	1992 295,548 38,749 51,122	1993 295,239 36,650 45,575	1994 300,167 40,202 45,745	1995 302,370 41,575 45,283	1996 299,291 41,429 49,734	1997 304,094 37,984 50,687
New York-MTA-NYCT 27,71 Washington, D.C-WMATA 11 Chicago-RTA-CTA 44 Boston-MBTA 11 Alianta-MARTA 11 Alianta-MARTA 11 Philadaphia-SEPTA 12 San Francisco-BART 22 New York-PATHC 11 Battimore-MMTA 105 Angel 24 Battimore-MMTA 105 Angel 24 Distribution 24 Angel	17,336 15,552 16,828 5,943 15,282 29,560	24,202 47,645 17,511 9,735 15,627	26,859 46,401 17,543 11,741	31,938 46,992 18,440 12,341	32,120 55,087 20,078	32,859 54,630	33,212 56,582	36,036 57,598	38,749 51,122	36,650	40,202	41,575	41,429	37,984
Chicago-RTA-CTA 44 Boston-MBTA 11 Alianta-MARTA 14 Philadaphia-SEPTA 19 San Francisco-BART 22 New York-PATHC 11 Mami-MDTA Battmore-MMTA Los Angelas-LACMTA Philadaphia-NJ-PATC 21 claveland-GRTA 21	15,552 16,828 5,943 15,282 29,560	47,645 17,511 9,735 15,627	46,401 17,543 11,741	46,992 18,440 12,341	55,087 20,078	54,630	56,582	57,598	51,122					
Chicego-RTA-CTA 44 Boston-MBTA 11 Allerthe-MARTA 12 Philadelphia-SEPTA 11 San Francisco-BART 22 New York-PATHC 11 Marmi-MDTA 12 Baltimore-MMTA Los Angeles-LACMTA 12 Philadelphia-NJ-PATC 22 Cleveland-GRTA 23	16,828 5,943 15,282 29,560	17,511 9,735 15,627	17,543 11,741	18,440 12,341	20,078					45,575	45,745	45,283	49,734	50,687
Boston-MBTA 11 Alienia-MARTA 21 Philadoiphia-SEPTA 11 San Francisco-BART 22 New York-PATHC 11 Miami-MDTA 28 Baltimora-MMTA Los Angeles-LACMTA 29 Philadoiphia-NJ-PATC 21 Claveland-GRTA 21	5,943 15,282 29,560	9,735 15,627	11,741	12,341		21,858	23 186							
Allania-MARTA Philadelphia-SEPTA 11 Philadelphia-SEPTA 12 San Francisco BART 22 New York-PATHC 11 Miami-MOTA Battimore-MMTA Los Angeles-LACMTA Philadelphia-NJ-PATC 22 Leveland-GCRTA 23	15,282 29,560	15,627			43.566		23,100	22,622	23,420	23,573	19,835	20,813	22,638	22,934
San Francisco-BART 2: New York-PATHC 11 Miami-MDTA Bailimore-MMTA Los Angeles-LACMTA Philadelphia-NJ-PATC 2: Cleveland-SCRTA 2:	29,560		15 572		13,200	14,619	15,609	15,633	15,795	16,938	20,854	21,879	22,622	27,101
San Francisco-BART 2: New York-PATHC 11 Miami-MDTA Bailimore-MMTA Los Angeles-LACMTA Philadelphia-NJ-PATC 2: Cleveland-SCRTA 2:	29,560			15,862	16,192	16,276	15,930	15,296	15,307	15,339	15,518	14,676	15,387	15,640
New York-PATHC 10 Miami-MDTA Baltimore-MMTA Los Angeles-LACMTA Philadeiphia-NJ-PATC 2 Cleveland-GCRTA		30,635	30,490	30,267	31,943	33,195	40,328	39,193	40,874	41,893	43,054	43,850	44,877	48,523
Baltimore-MMTA Los Angeles-LACMTA Philadelphia-NJ-PATC Cleveland-GCRTA	10,508	11,305	11,344	11,440	12,434	13,190	12,653	12,798	12,485	12,838	12,798	12,818	12,957	12,834
Baltimore-MMTA Los Angeles-LACMTA Philadelphia-NJ-PATC Cleveland-GCRTA	478	3,628	4,442	4,708	5,071	4,657	5,444	5,452	5,231	5,351	5,522	5,819	5,864	5,739
Los Angeles-LACMTA Philadelphia-NJ-PATC Cleveland-GCRTA	960	1,734	1,792	2,062	4,365	3,530	3,691	3,377	3,192	3,557	3,656	3,984	4,239	4,231
Philadelphia-NJ-PATC Cleveland-GCRTA										285	625	695	800	1,737
Cieveland-GCRTA	3,938	3,767	3,829	3,883	4,007	4,096	4,036	4,207	4,115	4,264	4,271	4,193	4,063	4,017
	2,136	2,113	2,065	2,069	1,986	1,952	1,828	2,010	2,134	1,908	1,910	1,989	2,015	2,046
New York-MTA-SIRTOA	2,360	2,289	2,311	2,078	2,081	2,089	2,091	2,061	1,761	1,819	1,887	1,843	1,928	2,104
TOTAL 42	28,970	445,492	464,880	475,999	505,051	515,145	522,932	510,314	509,731	505,229	516,044	521,784	527,844	539,670
LIGHT RAIL Annua			nue miles (00											1997
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994 5 5 2 9	1995 5 523	1996 5 471	1997

agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1335	1330	1331
Boston-MBTA	1,652	1,691	1,078	1,074	1,100	1,184	1,295	1,419	1,523	1,449	5,529	5,523	5,471	5,435
San Francisco-MUN	3,831	3,958	4,067	4,059	4,057	4,002	4,093	4,130	3,868	3,875	3,622	3,498	3,692	3,740
Philadelphia-SEPTA	5.927	5,117	5,532	5,050	4,873	4,832	4,756	4,471	4,172	2,878	2,813	2,943	3,069	3,049
Los Angeles-LACMTA								2,395	2,919	2,864	2,944	2,783	4,150	4,436
San Diego Trolley Inc.	1.672	1.672	1,861	2.041	2.034	2,367	4,015	4,588	4,508	4,433	4,176	4,049	4,215	5,059
St. Louis-BSDA											1,770	2,527	2,513	2,585
Portland-TCMTDO				1.094	1,406	1,400	1,333	1,408	1,446	1,503	1.554	1,538	1,534	1,579
Dailas-DARTA					.,								396	1,794
Sacramenio-RTD				237	936	1,060	1.373	1.493	1,678	1.671	1.776	1,748	1,791	1,852
Pittsburgh-PAT	985	1.094	1.335	1,396	2,192	1,988	2,120	2,186	1,946	2.043	1.651	1.625	1.657	1,718
	300	1.034	505	700	914	919	1.016	911	916	905	901	892	893	897
Buffalo-NFTS			505	700	314	313	1,010	31,	137	1.224	2.216	2.147	2,205	2,296
Ballimore-MMTA						534	553	981	2.080	1.724	1,715	1,662	1.868	1.898
San Jose-SCTD					225									
New Orleans-RTA	707	697	668	652	661	545	677	735	718	694	702	712	723	724
Cleveland-GCRTA	1,062	1,082	1,082	1,087	1,028	1,035	1,037	1,139	1,170	971	954	1,016	1,119	1,181
Denver-RTD											109	428	526	648
Newark-NJTC	442	545	575	590	596	622	634	647	645	644	664	654	654	656
TOTAL	16,278	15,855	16,702	17,961	20,021	20,486	22,899	26,502	27,745	26,876	33,094	33,743	36,477	39,534
	1													

Unlinked Passenger Trips

HEAVY RAIL	Annual uniini	ked passenge	er trips (000's)										
name	1984	1985	1986	1987	1968	1989	1990	1991	1992	1993	1994	1995	1996	1997
New York-MTA-NYCT	1,541,823	1,561,487	1,591,526	1,613,760	1,483,210	1,702,611	1,476,353	1,325,707	1,373,625	1,178,122	1,308,430	1,234,599	1,352,101	1,579,783
Washington, D.CWMATA	108,614	125,181	145,149	160,367	172,615	183,480	182,006	188,253	186,782	191,428	195,833	198,380	194,050	198,003
Chicago-RTA-CTA	153,421	155,479	145,348	148,213	174,436	168,659	165,733	147,608	137,373	135,370	143,579	135,462	142,041	151,010
Boston-MBTA	131,549	143,251	143,747	148,059	151,469	157,938	179,762	172,237	180,673	190,330	162,673	113,490	108,571	113,715
Atlanta-MARTA	49,427	57,688	65,548	66,098	65,908	65,603	68,947	67,117	64,078	65,005	69,855	70,351	72,434	90,991
Philadelphia-SEPTA	103,939	96,896	88,357	96,693	98,478	94,100	91,841	85,347	79,808	94,333	93,891	86,611	86,998	86,245
San Francisco-BART	62,471	66,036	63,959	60,304	61,160	64,065	74,762	76,099	77,247	78,302	77,530	76,332	76,807	80,490
New York-PATHC	59,769	53,619	53,795	70,451	60,905	60,495	60,678	60,108	60,143	61,815	64,606	64,734	66,222	67,998
Miami-MOTA	771	4,857	7,668	10,188	10,406	12,128	13,622	13,907	13,702	14,818	14,329	14,204	14,386	14,020
Baltimore-MMTA	3,363	9,565	11,567	11,883	13,424	13,984	13,612	12,820	11,997	11,114	10,470	10,557	11,605	12,600
Los Angeles-LACMTA										1,983	4,972	5,888	7,666	11,628
Philadelphia-NJ-PATC	10.212	10,231	10,367	10,822	11,103	11,025	11,405	11,373	11,151	11,232	11,134	10,881	10,658	10,660
Cleveland-GCRTA	5,982	5,543	5,671	5,295	4,615	7,860	7,596	6,414	5,557	6,563	6,908	6,949	8,459	7,695
New York-MTA-SIRTOA	6,164	6,050	6,450	6,442	6,228	6,223	6,026	5,355	5,089	5,141	5,150	5,069	4,897	4,618
TOTAL	2,237,524	2,295,880	2,339,152	2,408,575	2,313,954	2,548,169	2,352,342	2,172,342	2,207,222	2,045,554	2,169,359	2,033,506	2.156,894	2,429,455

LIGHT RAIL	Annuai uniink	ed passenge	r trips (000°s)											
name	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Boston-MBTA	20,907	26,809	16,235		19,895	20,500	23,355	22,736	24,937	26,704	108,509	71,519	69,033	67,000
San Francisco-MUNI	60,749	38,915	38,935	38,731	39,485	38,909	40,214	40,044	39,034	39,332	37,616	37,243	36,728	36,738
Philadelphia-SEPTA	47,287	43,030	41,887	34,738	42,759	46,594	43,748	42,488	41,558	38,066	40,054	38,066	37,941	25,003
Los Angeles-LACMTA								7,487	11,307	11,809	11,849	12,027	19,064	22,659
San Diego Trolley Inc.	5,382	5,382		8,947	9,281	11,217	15,934	18,030	17,163	16,505	14,888	15,624	16,770	18,287
St. Louis-BSDA											8,005	12,488	12,870	14,486
Portland-TCMTDO				4,962	5,586	6,185	6,414	6,982	7,703	7,771	8,482	7,780	10,048	10,432
Dallas-DARTA													1,482	7,972
Sacramento-RTD				611	3,582	4,011	5,703	6,593	6,781	6,571	6,958	7,064	7.654	7.862
Pittsburgh-PAT	4,131	2,527	6.041	5,398	8,185	9.044	9,890	9,987	8,728	8,837	7,943	7,996	7,361	7,421
Buffalo-NFTS			4.020	5,884	7.422	8.072	8,460	8,108	8,570	8,209	8,248	7,898	7,136	6,919
Ballimore-MMTA									208	3,457	6,229	5,812	6,287	6,772
San Jose-SCTD					196	2,008	2,432	3,981	6,135	6,245	6,133	5,659	6,168	6,728
New Orleans-RTA	6.381	6.277	7,258	6,230	8,161	5,079	8,347	8,209	6,912	6,440	7,258	7,069	5,305	5,605
Cleveland-GCRTA	4,589	4,581	4.642	3,904	3,929	5,110	5,498	5,459	5,044	4,114	4,260	4,445	5,428	5,337
Denver-RTD	.,										965	4,054	4,109	4,428
Newark-NJTC	2,672	3,163	3,805	3,521	3,847	4,065	3,838	3,283	3,057	2,987	3,813	3,933	4,091	4,294
TOTAL	152,097	130,683	122,822	112,925	152,325	160,793	173,851	183,386	187,135	187,047	281,210	248,676	257,494	257,942

Labor used in Maintenance Vehicles

HEAVY RAIL	Annuel Labor	Hours (000's)												
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
New York-MTA-NYCT	9,645	11,137	11,641	11,786	10,725	10,263	9,793	9,092	9,084	8,652	8,896	8,291	7,960	7,336
Washington, D.CWMATA	1,295	1,231	1,320	1,457	1,475	1,508	1,532	1,631	1,688	1,512	1,563	1,596	1,572	1,513
Chicago-RTA-CTA	972	1,283	1,421	1,499	1,554	1,591	1,444	1,347	1,357	1,275	1,287	1,037	1,185	1,012
Boston-MBTA		1,077	1,046	1,065	1,107	1,148	1,005	1,021	993	1,017	725	746	657	617
Atlania-MARTA	188	297	200	204	316	360	343	318	229	329	294	289	356	365
Philadelphia-SEPTA	668	835	1,109	919	1,068	1,106	1,061	1,473	704	657	588	623	686	656
San Francisco-BART	891	785	829	828	834	858	1,045	1,145	1,082	1,140	1,021	994	1,133	1,261
New York-PATHC	406	517	517	472	472	472	530	530		460	502	438	437	416
Miami-MDTA	91	222	240	307	309	319	245	232	156	183	170	171	156	165
Ballimore-MMTA	82	118	137	150	125	176	196	213	200	171	163	154	143	147
Los Angeles-LACMTA										72	82	89	102	102
Philadelphia-NJ-PATC	152	179	173	164	155	147	146	126	125	103	102	94	90	87
Cleveland-GCRTA	148	128	127	155	98	189	174	155	143	130	130	142	148	123
New York-MTA-SIRTOA	140	88	78	76	74	84	82	84	80	81	85	86	88	84
TOTAL	14,679	17,898	18,837	19,082	18,311	18,221	17,596	17,369	15,840	15,783	15,609	14,748	14,711	13,884
LIGHT RAIL	Annual Labor				4000	1000	1000	1001	1007	1993	1994	1995	1996	1997
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992					
Boston-MBTA		145	173	160	158	148	168	144	112	147	454	399	405 367	391 386
San Francisco-MUNI	591	603	568	524	593	607	607	406	392	372	500	395		
Philadelphia-SEPTA	413	485	705	632	484	489	469	528	493	396	348	358	376	347
Los Angeles-LACMTA								88	118	127	117	120	235	334
San Diego Trolley Inc.	38	70	79	90	90	101	126	121	125	106	109	108	110	115
St. Louis-BSDA											32	40	46	46
Portland-TCMTDO				94	98	64	78	85	109	92	118	140	156	163 112
Dallas-DARTA													71	
Sacramento-RTD				41	50	50	54	54	52	73 383	40 218	70 234	67	68 197
Pittsburgh-PAT	132	181	138	196	208	262	630	171	186				213	19/
Buffaio-NFTS			55	58	60	58	57	51	54	56	57	60 66	60 70	49
Baltimore-MMTA									19	48	62		123	121
	_			_	70	80	70	99	92	93	107	118		121
		49	83	84	93 55	98	110	155	48	36	185	39	54	
San Jose-SCTD New Orleans-RTA	52					102	99	94	77	70	71	77	89	89
New Orleans-RTA Cleveland-GCRTA	52 82	109	63	94	33		•••							
New Orleans-RTA Cleveland-GCRTA Denver-RTD	82	109		• •							29	35	41	40
New Orleans-RTA Cleveland-GCRTA			63 48 1.912	94 58 2.031	59 2,016	58 2,117	56 2,525	56 2.050	60 1.936	53 2.052	29 65 2.512	35 49 2,308	41 67 2.551	40 69 2,683

Labor used on Non-Vehicle Maintenance

HEAVY RAIL	Annual Labor	Hours (000's)												
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
New York-MTA-NYCT	13,175	19,460	19,965	20,576	16,549	18,321	18,042	17,034	16,521	16,716	17,270	16,620	16,038	15,455
Washington, D.CWMATA	1.845	2,159	2,265	2,393	2,447	2,547	2,536	2,669	2,738	2,846	2,974	3,105	3,072	3,088
Chicago-RTA-CTA	1.875	1,860	1,781	1,644	1,884	1,752	1,797	1,772	1,731	1,635	1,668	1,450	1,306	1,831
Boston-MBTA		1,577	1,441	1,496	1,333	1,277	1,350	1,448	1,469	1,668	1,142	908	1,109	967
Allanta-MARTA	90	549	668	774	362	412	599	595	416	525	368	440	454	492
Philadelphia-SEPTA	646	465	900	919	917	946	908	918	898	614	1,017	1,059	1,079	1,072
San Francisco-BART	766	999	1,005	982	989	977	1.090	1,117	1,060	1,057	1,014	986	1,057	1,215
New York-PATHC	708	799	799	745	745	728	851	851		895	778	774	740	719
Miami-MDTA	93	268	275	212	182	203	306	316	388	374	398	378	345	374
Baltimore-MMTA	126	254	251	280	344	334	350	342	349	329	303	296	302	301
Los Angeles-LACMTA										108	88	112	151	167
Philadelphia-NJ-PATC	196	191	187	190	199	196	200	172	170	170	171	159	164	167
Cleveland-GCRTA	173	152	168	187	238	173	187	167	175	169	168	185	188	65
New York-MTA-SIRTOA	82	156	196	196	218	224	230	224	112	132	149	120	139	126
TOTAL	19,774	28,889	29,902	30,593	26,407	28,089	28,446	27,626	26,027	27,238	27,509	26,593	26,144	26,039
LIGHT RAIL	Annual Labor	Hours (000's)												
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Boston-MBTA		212	214	196	168	204	150	112	139	171	521	452	414	459
San Francisco-MUNI	293	316	200	202	204	193	193	231	225	208	208	219	201	252
Philadelphia-SEPTA	335	261	982	959	749	774	743	784	352	247	282	272	273	269
Los Angeles-LACMTA								92	61	124	106	126	338	316
San Diego Trolley Inc.	19	6	12	23	31	40	110	102	95	124	137	143	178	209
St. Louis-BSDA											29	66	78	72
Portland-TCMTDO				4	4	52	53	40	29	44	56	120	158	183
Dallas-DARTA													53	109
Sacramento-RTD				19	29	26	31	33	44	52	51	51	49	56
Pittsburgh-PAT	256	183	207	333	354	196	60	292	294	296	319	215	236	224
Buffalo-NFTS			137	141	154	155	156	133	143	147	153	141	139	129
Baltimore-MMTA									21	73	95	109	117	125
San Jose-SCTD					75	64	80	104	87	64	81	88	89	105
New Orleans-RTA	70	82	75	76	65	64	65	67	14	10	8	2	20	17
Cleveland-GCRTA	125	137	83	107	140	99	108	104	94	90	92	100	113	46
Denver-RTD											23	30	30	33
Newark-NJTC	4	0	1	1	1	1	1	1	8	5	5	6	8	1
TOTAL	1,102	1,197	1.912	2,061	1,975	1,867	1,751	2,095	1,606	1,656	2,164	2,140	2,495	2,606

Labor used in General Administration

HEAVY RAIL	Annual Labor									1993	1994	1995	1996	1997
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992				3.371	3,249
New York-MTA-NYCT	13,084	21,218	21,868	21,179	18,345	17,331	17,337	19,428	3,473	3,175	3,439	3,698 807	3,371	3,249
Washington, D.CWMATA		1,345	1,314	1,452	1,288	1,294	1,364	1,404	680	723	738			513
Chicago-RTA-CTA	724	516	569	610	710	651	2,394	2,297	428	588	428	427	479	
Boston-MBTA		1,055	1,223	1,242	1,446	1,554	1,531	1,681	1,208	604	702	172	1,020	1,091
Allania-MARTA	200	268	501	283	266	304	1,005	1,044	402	573	491	346	481	487
Philadelphia-SEPTA	532	428	484	463	469	492	458	482	285	254	260	250	254	214
San Francisco-BART	895	991	968	996	998	971	1,132	1,158	784	756	718	679	729	769
New York-PATHC	286	550	550	391	391	374	391	408		220	94	27	22	54
Miami-MDTA	402	302	246	368	356	262	165	189	131	113	105	105	106	109
Baltimore-MMTA	162	230	182	243	215	238	232	213	55	66	60	67	47	50
Los Angeles-LACMTA										95	108	60	107	68
Philadelphia-NJ-PATC	147	175	173	172	180	184	180	165	62	64	76	79	76	76
Cleveland-GCRTA	147	67	33	145	139	144	152	174	57	51	49	47	123	81
New York-MTA-SIRTOA	84	92	94	96	98	98	96	94	45	47	53	60	63	62
TOTAL	18,042	27,237	28,206	27,639	24,900	23,896	26,437	28,737	7,612	7,328	7,320	6,824	7,662	7,588
LIGHT RAIL	Annual Labor	Hours (000's)												
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Boston-MBTA		142	96	89	127	100	108	81	66	68	386	53	208	136
San Francisco-MUNI	366	81	83	83	77	54	54	21	1	19	18	50	71	92
Philadelphia-SEPTA	350	235	365	367	372	389	373	379	70	97	89	99	99	87
Los Angeles-LACMTA								83	-	86	101	79	244	222
San Diego Trolley Inc.	29	28	29	42	30	35	56	64	33	68	47	56	62	97
SI. Louis-BSDA											3	30	35	40
Portland-TCMTDO				37	58	53	51	48	3	69	84	82	109	104
Dallas-DARTA													163	46
Sacramento-RTD				12	12	17	17	17	-	59	60	54	54	54
Pittsburgh-PAT	63	26	25	46	52	85	-	79	6	48	47	40	43	30
Buffalo-NFTS			54	54	54	43	42	31	29	8	9	9	13	9
Baltimore-MMTA									12	33	39	38	26	29
San Jose-SCTD					44	46	64	38	0	39	70	75	82	85
New Orleans-RTA	38	28	17	1	22	5	24	25	-	25	134	49	17	14
Cleveland-GCRTA	117	33	16	54	53	82	86	105	14	28	27	26	48	58
Denver-RTD											19	26	28	29
	12	9	10	10	10	11	12	11	-	9	13	8	10	12
Newark-NJTC				796	913	919	888	982	235	656	1,146	774	1.310	1,145

Labor used in Transportation also named Vehicle Operations

HEAVY RAIL	Annual Labor	Hours (000's)												
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
New York-MTA-NYCT	25,238	17,084	16,817	16,751	13,090	13,446	11,905	13,046	13,775	29,793	30,063	23,763	20,530	20,734
Washington, D.CWMATA	1,268	1,506	1,570	1,769	1,897	1,815	1,746	1,874	2,009	2,762	2,838	2,953	3.035	2,957
Chicago-RTA-CTA	4.377	4,356	4,563	4,559	4,828	4,758	3,297	3,187	3,313	4,547	4,138	3,921	4,374	4,411
Boston-MBTA		2.008	1,722	1,697	1,835	1,868	1,745	1,808	1,529	2,738	2,187	1,590	1,149	1,137
Allanta-MARTA	438	347	580	826	953	1,086	622	574	413		1,145	1,144	1,221	1,386
Philadelphia-SEPTA	2,124	1,600	1,568	1,537	1,562	1,611	1,542	1,288	891	1,533	1,571	1,549	1,566	1,488
San Francisco-BART	1,298	1.004	1.026	1.038	1,034	1,008	1,096	1,129	1,116	1,790	1,568	1,677	1,903	2,104
New York-PATHC	882	866	866	928	928	880	957	940		1,248	983	1,019	1,052	1,009
Miami-MDTA	148	278	226	210	166	232	225	214	191	227	234	247	256	251
Ballimore-MMTA	182	186	182	190	225	234	230	223	143	339	312	343	384	361
Los Angeles-LACMTA										77	174	155	201	253
Philadelphia-NJ-PATC	184	163	157	158	158	160	158	140	141	253	236	235	235	235
Cleveland-GCRTA	270	224	282	165	218	217	240	220	246	243	325	334	346	300
New York-MTA-SIRTOA	252	238	244	234	224	250	252	240	200	252	238	215	215	230
TOTAL	36,661	29,861	29,806	30,061	27,117	27,564	24,017	24,882	23,967	45,802	46.031	39,144	36,469	36,856
LIGHT RAL	Annual Labor	Hours (000's)												
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Boston-MBTA		274	191	193	162	179	270	191	165	237	1,065	911	813	865
San Francisco-MUNI	582	651	747	753	716	718	718	757	728	700	660	683	697	645
Philadelphia-SEPTA	981	1,038	1,005	1,004	1,096	916	879	904	889	570	615	624	614	551
Los Angeles-LACMTA								211	206	178	207	149	453	716
San Diego Trolley Inc.	71	84	100	127	115	132	176	204	237	245	245	228	228	242
SI. Louis-BSDA											125	164	160	173
Portland-TCMTDO				79	94	101	85	92	104	112	105	126	162	175
Dallas-DARTA													168	191
Sacramento-RTD				69	76	100	102	96	108	115	120	126	124	118
Pittsburgh-PAT	213	181	159	230	322	349	279	311	287	302	267	256	260	267
Buffalo-NFTS			74	79	85	85	78	80	84	125	109	110	107	101 260
Ballimore-MMTA									29	159	239	240	233 185	175
San Jose-SCTD					64	119	126	163	161	156	156	160		
New Orleans-RTA	92	109	100	92	95	116	124	129	100	106	199	72	117	123 196
Cleveland-GCRTA	178	146	142	117	142	129	132	127	162	87	178	182	222	196
Denver-RTD											46	80	84	86 57
Newark-NJTC	38	51	45	50	52	52	50	51	49	52	53	51	55	4.943
TOTAL	2,156	2,534	2,563	2,794	3,019	2,995	3,020	3,315	3,309	3,145	4,387	4,163	4,683	4,943

Labor used in Transportation and General Administration

1986 38,686 2,684 5,132 2,945 1,062 2,052 2,052 1,994 1,415 473 364 3316 336 336 56,013	1997 37,930 3.221 5.168 2.939 1.109 2.000 2.034 1.319 577 433 330 310 330 57,700	1988 31,435 3,164 5,538 3,280 1,219 2,032 1,219 2,032 1,219 2,032 1,219 2,032 441 338 336 322 52,016	1989 30,777 3,109 5,409 3,422 1,389 2,102 1,389 1,254 472 344 361 348 51,460	1990 29,243 3,110 5,552 3,276 1,627 2,000 2,228 1,348 390 463 390 463 392 346 50,454	1991 32,474 3,278 6,484 1,618 1,618 1,770 2,266 1,348 403 436 305 394 334 53,619	1992 34,248 3,412 4,965 3,618 1,316 1,894 2,359 343 408 306 329 294 53,493	1993 32,968 3,465 5,135 3,342 573 1,768 2,545 1,468 340 405 172 317 294 298 53,130	1994 33,502 3,575 4,566 1,636 1,630 2,306 1,077 339 372 282 312 374 291 53,351	1995 27,462 3,760 4,348 1,761 1,490 1,799 2,356 1,045 352 410 215 314 381 275 45,969	1996 23,901 3,820 4,853 2,169 1,702 1,821 2,632 1,074 362 432 306 311 469 278 44,131	1997 23,984 3,720 4,924 2,228 1,873 1,702 2,873 1,063 361 411 321 312 381 291 44,444
2,884 5,132 2,945 1,082 2,052 2,052 1,994 1,416 4,73 3,64 3,316 3,36 56,013 56,013	3.221 5.169 2.939 1.109 2.000 2.034 1.319 577 433 330 310 330 57.700	3,184 5,538 3,280 1,219 2,031 2,032 1,319 521 441 338 356 322	3,109 5,409 3,422 1,389 2,102 1,980 1,254 493 472 344 361 348	3,110 5,692 3,276 1,627 2,000 2,228 1,348 390 463 339 382 348	3,278 5,484 3,498 1,618 1,770 2,286 1,348 403 436 305 394 334	3,412 4,965 3,618 1,316 1,894 2,359 343 408 306 329 294	3,485 5,135 3,342 573 1,768 2,545 1,468 340 405 172 317 294 298	3,576 4,566 2,888 1,636 1,636 1,077 339 372 282 312 374 291	3,760 4,348 1,761 1,490 1,799 2,356 1,045 352 410 215 314 381 275	3,620 4,653 2,169 1,702 1,821 2,632 1,074 362 432 306 311 469 278	3,720 4,924 2,228 1,873 1,702 2,873 1,063 361 411 321 312 381 291
5,132 2,945 1,062 2,052 1,994 1,416 473 364 331 316 338 58,013	5,168 2,939 1,109 2,000 2,034 1,319 577 433 330 310 330 57,700	5,538 3,280 1,219 2,031 2,032 1,319 521 441 338 356 322	5,409 3,422 1,389 2,102 1,980 1,254 493 472 344 361 348	5,692 3,276 1,627 2,000 2,228 1,348 390 463 339 382 348	5,484 3,498 1,618 1,770 2,286 1,348 403 436 305 394 334	4,965 3,618 1,316 1,894 2,359 343 408 306 329 294	5,135 3,342 573 1,788 2,545 1,468 340 405 172 317 294 298	4,566 2,868 1,636 1,830 2,306 1,077 339 372 262 312 374 291	4,348 1,761 1,490 1,799 2,356 1,045 352 410 215 314 381 275	4,853 2,169 1,702 1,821 2,632 1,074 362 432 308 311 469 278	4,924 2,228 1,873 1,702 2,873 1,063 361 411 321 312 381 291
2,945 1,062 2,052 1,994 1,416 473 3,64 3,316 3,38 56,013	2,939 1,109 2,000 2,034 1,319 577 433 330 310 330 57,700	3,280 1,219 2,031 2,032 1,319 521 441 338 356 322	3,422 1,389 2,102 1,980 1,254 493 472 344 361 348	3,276 1,627 2,000 2,228 1,348 390 463 339 392 348	3,488 1,618 1,770 2,286 1,348 403 436 305 394 334	3,618 1,316 1,894 2,359 343 408 306 329 294	3,342 573 1,788 2,545 1,468 340 405 172 317 294 298	2,888 1,636 1,830 2,306 1,077 339 372 262 312 374 291	1,761 1,490 1,799 2,356 1,045 352 410 215 314 381 275	2,169 1,702 1,821 2,632 1,074 362 432 308 311 469 278	2.228 1.873 1.702 2.873 1.063 361 411 321 312 381 291
1,082 2,052 1,994 1,416 473 364 331 316 338 59,013	1.109 2.000 2.034 1.319 577 433 330 310 330 57,700	1,219 2,031 2,032 1,319 521 441 338 356 322	1,389 2,102 1,980 1,254 493 472 344 361 348	1,627 2,000 2,228 1,348 390 463 339 392 348	1,618 1,770 2,286 1,348 403 436 305 394 334	1,316 1,894 2,359 343 408 306 329 294	573 1,788 2,545 1,468 340 405 172 317 294 298	1,636 1,830 2,306 1,077 339 372 282 312 374 291	1,490 1,799 2,356 1,045 352 410 215 314 381 275	1,702 1,821 2,632 1,074 362 432 308 311 469 278	1,873 1,702 2,873 1,063 361 411 321 312 381 291
2.052 1.994 1.416 473 364 331 316 338 58,013	2,000 2,034 1,319 577 433 330 310 330 57,700	2,031 2,032 1,319 521 441 338 356 322	2,102 1,980 1,254 493 472 344 361 348	2,000 2,228 1,348 390 463 339 392 348	1,770 2,286 1,348 403 436 305 394 334	1,894 2,359 343 408 306 329 294	1,788 2,545 1,468 340 405 172 317 294 298	1,830 2,306 1,077 339 372 262 312 374 291	1,799 2,356 1,045 352 410 215 314 381 275	1,821 2,632 1,074 362 432 308 311 469 278	1,702 2,873 1,063 361 411 321 312 381 291
1,994 1,416 473 364 331 316 338 59,013	2,034 1,319 577 433 330 310 330 57,700	2,032 1,319 521 441 338 356 322	1,980 1,254 493 472 344 361 348	2,228 1,348 390 463 339 392 348	2,286 1,348 403 436 305 394 334	2,359 343 408 306 329 294	2,545 1,468 340 405 172 317 294 298	2 306 1 077 339 372 282 312 374 291	2,356 1,045 352 410 215 314 381 275	2,632 1,074 362 432 308 311 469 278	2,873 1,063 361 411 321 312 381 291
1,416 473 364 331 316 338 59,013	1.319 577 433 330 310 330 57,700	1,319 521 441 338 356 322	1,254 493 472 344 361 348	1,348 390 463 339 392 348	1,348 403 436 305 394 334	343 408 306 329 294	1,468 340 405 172 317 294 298	1,077 339 372 282 312 374 291	1,045 352 410 215 314 381 275	1,074 362 432 308 311 469 278	1,063 361 411 321 312 381 291
473 364 331 316 338 58,013	577 433 330 310 330 57,700	521 441 338 356 322	493 472 344 361 348	390 463 339 392 348	403 436 305 394 334	408 306 329 294	340 405 172 317 294 298	339 372 282 312 374 291	352 410 215 314 381 275	362 432 308 311 469 278	361 411 321 312 381 291
364 331 316 338 58,013	433 330 310 330 57,700	441 338 356 322	472 344 361 348	463 339 392 348	436 305 394 334	408 306 329 294	405 172 317 294 298	372 282 312 374 291	410 215 314 381 275	432 308 311 469 278	411 321 312 381 291
331 316 338 58,013	330 310 330 57,700	338 356 322	344 361 348	339 392 348	305 394 334	306 329 294	172 317 294 298	282 312 374 291	215 314 381 275	308 311 469 278	321 312 381 291
316 338 58,013 6) 1986	310 330 57,700	356 322	361 348	392 348	394 334	329 294	317 294 298	312 374 291	314 381 275	311 469 278	312 381 291
316 338 58,013 6) 1986	310 330 57,700	356 322	361 348	392 348	394 334	329 294	294 298	374 291	381 275	469 278	38
338 58,013 59,113	330 57,700	322	348	348	334	294	298	291	275	278	291
58,013 s) 1986	57,700										
s) 1986		52,016	51,460	50,454	53,619	53,493	53,130	53,351	45,969	44,131	44,444
1986	1987										
1986	1987										
		1968	1989	1990	1991	1992	1993	1994	1995	1996	1997
287	283	289	279	379	272	296	305	1,450	965	1.020	1,001
830	836	792	772	772	778	731	719	678	733	768	737
1.370	1.371	1,468	1,305	1,253	1,283	1.029	668	704	724	713	63
1,570	1.071	1,400	1,000	1,200	294	206	264	308	228	697	93
130	168	145	167	232	268	304	313	292	284	290	34
								128	194	195	21
	116	152	154	136	140	109	180	189	208	270	27
										331	23
	61	88	116	119	112	108	174	180	180	178	173
184	276	374	434	279	391	299	350	314	296	303	29
129	134	140	128	120	111	142	133	118	119	120	11
						53	192	278	278	259	28
		108	165	190	201	162	195	227	235	267	26
116	93		121	148	154	100	132	332	121	134	13
	171	196	210	219	232	190	114	204	207	270	25
								65	106	113	11
55	61	62	63	62	62	49	61	66	60	65	6
3,259	3.590	3,932	3,915	3,908	4,296	3,778	3,800	5,533	4,937	5,992	6,088
3	116 158 55 9.259	158 171 55 61	158 171 196 55 61 62	116 93 118 121 158 171 196 210 55 61 62 63	116 93 118 121 148 158 171 196 210 219 55 61 62 63 62	116 93 118 121 148 154 158 171 196 210 219 232 55 61 62 63 62 62	108 165 190 201 162 116 93 118 121 148 154 100 188 171 196 210 212 213 150 55 61 62 63 62 62 49	108 155 190 201 162 195 116 93 118 121 148 154 100 132 156 171 196 210 219 114 55 61 62 63 62 62 49 61	108 165 190 201 162 195 227 116 93 118 121 148 154 100 132 332 188 171 196 210 212 232 190 114 204 55 61 62 63 62 62 49 61 65	108 165 190 201 162 195 227 235 116 93 118 121 148 154 100 132 332 121 158 171 196 210 212 222 190 114 204 207 55 61 62 63 62 49 61 66 60	108 165 190 201 162 195 227 235 267 116 93 118 121 148 154 100 132 332 121 134 158 171 196 210 212 232 190 114 204 207 270 55 61 62 63 62 62 49 61 66 65

Total Labor

HEAVY RAIL	Annual Labor	Hours (000's)												
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
New York-MTA-NYCT	61,142	68,901	70,292	70,292	58,709	59,361	57,077	58,601	59,853	58,336	59,668	52,373	47,899	46,775
Washington, D.CWMATA	5,787	6,240	6,469	7,072	7,107	7,164	7,178	7,578	7,838	7,843	8,113	8,461	8,464	8,321
Chicago-RTA-CTA	7,947	8,016	8,333	8,311	8,976	8,752	8,932	8,603	8,053	8,045	7,521	6,835	7,344	7.767
Boston-MBTA		5,718	5,433	5,500	5,720	5,847	5,631	5,957	6,080	6,027	4,756	3,415	3,935	3,812
Atlanta-MARTA	916	1,462	1,949	2,086	1,897	2,161	2,569	2,531	1,961	1,427	2.298	2,220	2,512	2,730
Philadelphia-SEPTA	3,971	3,329	4,061	3,839	4,017	4,154	3,969	4,161	3,496	3.059	3,436	3,481	3,585	3,431
San Francisco-BART	3,851	3,779	3,828	3,844	3,854	3,814	4,363	4,548	4,501	4,743	4,342	4,336	4,822	5,349
New York-PATHC	2,282	2,732	2,732	2,536	2,536	2,454	2,729	2,729		2,822	2.357	2,257	2,251	2,199
Miami-MOTA	734	1,070	988	1,096	1,013	1,015	941	953	887	897	907	901	862	899
Baltimore-MMTA	552	787	752	862	910	982	1,009	990	956	905	838	860	877	859
Los Angeles-LACMTA										352	452	415	560	590
Philadelphia-NJ-PATC	678	708	691	684	692	688	685	603	601	590	585	567	565	566
Cleveland-GCRTA	738	571	611	652	692	723	753	716	647	594	671	708	805	569
New York-MTA-SIRTOA	558	574	612	602	614	656	660	642	486	511	525	481	505	502
TOTAL	89,155	103,886	106,751	107,375	96,735	97,770	96,496	98,614	95,360	96,151	96,469	87,310	84,987	84,368
LIGHT RAIL	Annual Labor	Hours (000's))											
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Boston-MBTA		773	674	639	616	630	697	528	548	623	2,425	1,816	1,839	1,852
San Francisco-MUNI	1,832	1,652	1,597	1,562	1,589	1,572	1,572	1,414	1,348	1,299	1,386	1,347	1,337	1,375
Philadelphia-SEPTA	2,079	2,020	3,057	2,962	2,701	2,568	2,465	2,595	1,874	1,310	1,333	1,353	1,362	1,254
Los Angeles-LACMTA								473	385	515	531	473	1,270	1,589
San Diego Trolley Inc.	157	188	221	281	266	308	468	491	523	543	538	535	578	663
SI. Louis-BSDA											189	300	319	331
Portland-TCMTDO				214	254	270	268	264	247	316	363	468	584	625
Dallas-DARTA													455	458
Sacramento-RTD				141	167	192	204	200	204	300	272	301	294	297
Piltsburgh-PAT	665	571	528	805	936	891	969	854	779	1,030	850	745	752	719
Buffelo-NFTS			321	333	353	341	333	295	339	336	327	320	319	288
Baltimore-MMTA									93	313	435	453	447	488
San Jose-SCTD					253	310	340	405	341	352	415	441	479	486
New Orleans-RTA	251	269	275	253	276	283	323	376	162	178	525	162	208	237
Cleveland-GCRTA	502	425	305	372	390	411	426	429	362	274	366	385	472	390
Denver-RTD											117	172	183	189
Newark-NJTC	84	113	104	120	122	123	119	118	116	118	136	115	140	138
TOTAL	5,569	6.010	7,082	7.682	7.923	7,899	8,184	8.442	7.321	7,508	10,209	9.385	11.038	11.376

Number of Vehicles

	Total Active Fleet	1094 ()/-		la far madmi	um condes 10	OE 1007	**							
HEAVY RAIL agency	1984	1984 / Ve	1986	1987	1988 19	1989 - 1997 - UN	ns 1990	1991	1992	1993	1994	1995	1996	1997
New York-MTA-NYCT	5,701	6,108	6,138	6,077	6,044	6,106	6,089	5,951	5,936	5,840	5,803	5,801	5,801	5,790
Washington, D.CWMATA		454	536	586	658	664	664	664	668	746	764	764	764	764
Chicago-RTA-CTA	1.202 284	1,211 304	1,201 350	1,263 350	1,208	1,217 579	1,214 404	1,205 400	1,204 402	1,236 402	1,230 432	1,134 408	1,152 408	1,150 408
Boston-MBTA Atlanta-MARTA	120	150	170	210	234	236	238	240	240	240	238	238	240	238
Philadelphia-SEPTA	383	386	381	380	386	383	378	368	375	376	373	358	358	358
San Francisco-BART	438	438	418	438	465	530	567	589	589	589	589	611	668	668
New York-PATHC	288	289	316	322	376	376	342	342	342	342	342	342	342	342
Miami-MDTA Ballimore-MMTA	40 58	96 72	130 72	130 100	130 100	134 100	136 100	136 100	136 100	136 100	136 100	136 100	136 100	136 100
Los Angeles-LACMTA							100			30	30	30	30	30
Philadelphia-NJ-PATC	119	119	121	121	121	121	121	121	121	121	121	121	121	121
Cleveland-GCRTA	87 52	133 52	83 52	45 52	57 52	60 52	60 72	60 72	59 64	60 64	60 64	59 64	59 64	59 64
New York-MTA-SIRTOA TOTAL	9,135	52 9,812	9,968	10,074	10,331	10,558	10,385	10,248	10,236	10,282	10,282	10,166	10,243	10,228
	Total Active Fleet 1984	1984 / Ve 1985	hicles avallai 1986	ble for maximu 1987	um service 19 1988	185-1997 - un 1989	iis 1990	1991	1992	1993	1994	1995	1996	1997
agency Boston-MBTA	146	229	225	211	57	1303	237	229	229	229	209	201	173	173
San Francisco-MUNI	133	130	146	142	143	143	128	128	128	128	128	127	138	136
Philadelphia-SEPTA	230	238	238	250	249	236	224	226	230	147	147	147	147	147
Los Angeles-LACMTA				~				40	54	54	54	54	69	69
San Diego Trolley Inc. St. Louis-BSDA	18	24	30	30	30	30	49	71	71	71	71 31	71 31	119 31	85 31
Portland-TCMTDO				26	26	26	26	26	26	26	26	26	26	30
Dallas-DARTA											-		36	40
Sacramento-RTD	**	55	56	15 97	26 97	26 70	26 71	35 71	35 71	35	36 71	36 71	36 60	36 59
Philsburgh-PAT Buffalo-NFTS	60	35	56 27	97 27	97 27	27	27	27	27	27	27	27	60 27	59 27
Baltimore-MMTA									18	34	35	35	35	35
San Jose-SCTD					32	50	53	55	53	54	54	55	54	53
New Orleans-RTA Cleveland-GCRTA	35 67	35 65	35 65	35 45	39 45	35 48	21 48	43 48	44 47	44 46	44 60	51 47	42 47	36 47
Denver-RTD	•,	65	65	40	45	40	40	40	47	40	11	11	17	17
Newark-NJTC	24	22	22	22	22	24	22	22	22	22	22	22	22	22
TOTAL	713	798	844	900	793	727	932	1,021	1,055	988	1,026	1.012	1,079	1.043
Track Length														
HEAVY RAIL	Directional Miles 1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
U		1985 481	1986 481	1987 481	1988 488	1989 493	1990 493	1991 493	1992 493	1993 493	1994 493	1 995 493	1996 493	1997 493
HEAVY RAIL agency New York-MTA-NYCT Washington, D.CWMATA	1984 483 93	481 121	481 139	481 139	488 139	493 139	493 139	493 156	493 162	493 162	493 178	493 178	493 178	493 185
HEAVY RAIL agency New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA	1984 483 93 191	481 121 191	481 139 191	481 139 191	488 139 191	493 139 191	493 139 191	493 156 191	493 162 191	493 162 220	493 178 208	493 178 208	493 178 206	493 185 206
HEAVY RAIL agency New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-WBTA	1984 483 93 191 76	481 121 191 76	481 139	481 139	488 139 191 77	493 139 191 77	493 139 191 77	493 156 191 77	493 162 191 77	493 162 220 76	493 178 208 76	493 178 208 76	493 178	493 185 206 76
HEAVY RAIL agency New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA	1984 483 93 191	481 121 191	481 139 191 77	481 139 191 76	488 139 191 77 67 77	493 139 191	493 139 191 77 67 76	493 156 191 77 67 76	493 162 191 77 67 76	493 162 220	493 178 208 76 81 76	493 178 208 76 81 76	493 178 206 76	493 185 206 76 92 76
HEAVY RAL agency New York-MTA-NYCT Washington, D. CWMATA Chicago-RTA-CTA Boston-MBTA Aliarate-MARTA Philadeiphia-SEPTA San Francisco BART	1984 483 191 76 34 76 142	481 121 191 76 52 80 142	481 139 191 77 52 80 142	481 139 191 76 55 80 142	486 139 191 77 67 77 142	493 139 191 77 67 76 142	493 139 191 77 67 76 142	493 156 191 77 67 76 142	493 162 191 77 67 76 142	493 162 220 76 81 76 142	493 178 208 76 81 76 142	493 178 208 76 81 76 142	493 178 206 76 92 76 152	493 185 206 76 92 76 190
HEAVY RAL agency New York-MTA-NYCT Washingion, D.CWMATA Chicage-RTA-CTA Boston-MBTA Aliante-MARTA Philadeiphia-SEPTA San Francisco-BART New York-PATHC	1984 483 93 191 76 34 76 142 28	481 121 191 76 52 80 142 28	481 139 191 77 52 80 142 28	481 139 191 76 55 80 142 28	486 139 191 77 67 77 142 28	493 139 191 77 67 76 142 28	493 139 191 77 67 76 142 28	493 156 191 77 67 76 142 29	493 162 191 77 67 76 142 29	493 162 220 76 81 76 142 29	493 178 208 76 81 76 142 29	493 178 208 76 81 76 142 29	493 178 206 76 92 76 152 29	493 185 206 76 92 76 190 29
HEAVY RAL agency New York-MTA-NYCT Washington, D. CWMATA Chicago-RTA-CTA Boston-MBTA Aliarate-MARTA Philadeiphia-SEPTA San Francisco BART	1984 483 191 76 34 76 142	481 121 191 76 52 80 142	481 139 191 77 52 80 142	481 139 191 76 55 80 142	486 139 191 77 67 77 142	493 139 191 77 67 76 142	493 139 191 77 67 76 142	493 156 191 77 67 76 142	493 162 191 77 67 76 142	493 162 220 76 81 76 142	493 178 208 76 81 76 142	493 178 208 76 81 76 142	493 178 206 76 92 76 152	493 185 206 76 92 76 190
HEAVY RAL agency New York-MTA-NYCT Washington, D. CWMATA Chicago-RTA-CTA Boston-MBTA Alianta-MARTA San Francisco-BART New York-PATHC Niami-MDTA Baltimore-MMTA Los Angeles-LACMTA	1984 483 191 76 34 76 142 28 21 15	481 121 191 76 52 80 142 28 40 14	461 139 191 77 52 80 142 28 40 14	481 139 191 76 55 80 142 28 40 14	488 139 191 77 67 77 142 28 42 27	493 139 191 77 67 76 142 28 42 27	493 139 191 77 67 76 142 28 42 27	493 156 191 77 67 76 142 29 42 27	493 162 191 77 67 76 142 29 42 27	493 162 220 76 81 76 142 29 42 27 6	493 178 208 76 81 76 142 29 42 27 6	493 178 208 76 81 76 142 29 42 29 6	493 178 206 76 92 76 152 29 42 29 6	493 185 206 76 92 76 190 29 42 29 42 29 10
HEAVY RAL agency New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-WBTA Alianta-MARTA Philadelphia-SEPTA San Francisco BART New York-PATHC Miami-MDTA Los Angeles-LACMTA Philadelphia-NJ-PATC	1984 483 93 191 76 34 76 142 28 21 15 32	481 121 191 76 52 80 142 28 40 14 31	481 139 191 77 52 80 142 28 40 14 31	481 139 191 76 55 80 142 28 40 14 31	488 139 191 77 67 77 142 28 42 27 31	493 139 191 77 67 76 142 28 42 27 32	493 139 191 77 67 76 142 28 42 27 32	493 156 191 77 67 76 142 29 42 27 32	493 162 191 77 67 76 142 29 42 27 32	493 162 220 76 81 76 142 29 42 27 6 32	493 178 208 76 81 76 142 29 42 27 6 32	493 178 208 76 81 76 142 29 42 29 42 29 6 32	493 178 206 76 92 76 152 29 42 29 6 32	493 185 206 92 76 190 29 42 29 10 32
HEAVY RAL agency New York-MTA-NYCT Washington, CWMATH Chicago-RTA-CTA Boston-MBTA Aliania-MARTA Philadeiphis-SEPTA New York-PATHC Miami-MCTA Baltimore-MMTA Los Angeles-LACMTA Philadeiphia-NJ-PATC Cleveland-SCRTA	1984 483 191 76 34 76 142 28 21 15	481 121 191 76 52 80 142 28 40 14 31 38	461 139 191 77 52 80 142 28 40 14 14 31 38	481 139 191 76 55 80 142 28 40 14	488 139 191 77 67 77 142 28 42 27 31 38	493 139 191 77 67 76 142 28 42 27 32 38	493 139 191 77 67 76 142 28 42 27 32 38	493 156 191 77 66 142 29 42 27 32 38	493 162 191 77 67 76 142 29 42 27 32 38	493 162 220 76 81 76 142 29 42 27 6 32 38	493 178 208 76 81 76 142 29 42 27 6 32 38	493 178 208 76 142 29 42 29 42 29 6 32 38	493 178 206 76 152 29 42 29 6 32 38	493 185 206 76 92 76 190 29 42 29 42 29 10 32 38
HEAVY RAL agency New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-WBTA Alianta-MARTA Philadelphia-SEPTA San Francisco BART New York-PATHC Miami-MDTA Los Angeles-LACMTA Philadelphia-NJ-PATC	1984 483 93 191 76 34 76 142 28 21 15 32 38	481 121 191 76 52 80 142 28 40 14 31	481 139 191 77 52 80 142 28 40 14 31	481 139 191 76 55 80 142 28 40 14 14 31 38	488 139 191 77 67 77 142 28 42 27 31	493 139 191 77 67 76 142 28 42 27 32	493 139 191 77 67 76 142 28 42 27 32	493 156 191 77 67 76 142 29 42 27 32	493 162 191 77 67 76 142 29 42 27 32	493 162 220 76 81 76 142 29 42 27 6 32	493 178 208 76 81 76 142 29 42 27 6 32	493 178 208 76 81 76 142 29 42 29 42 29 6 32	493 178 206 76 92 76 152 29 42 29 6 32	493 185 206 92 76 190 29 42 29 10 32
HEAVY RAL agency New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-MBTA Akirata-MARTA Philadelphia-SEPTA San Francisco BART New York-PATHC Miami-MDTA Baltimore-MMTA Los Angeles-LACMTA Cleveland-GCRTA New York-MTA-SIRTOA	1984 483 93 191 76 34 76 142 28 21 15 32 32 38 29	481 121 191 76 52 80 142 28 40 14 31 38 29	481 139 191 77 52 80 142 28 40 14 31 38 29	481 139 191 76 55 80 142 28 40 14 31 38 29	488 139 191 77 67 77 142 28 42 27 31 38 29	493 139 191 77 67 76 142 28 42 27 32 38 29	493 139 191 77 67 76 142 28 42 27 32 38 29	493 156 191 77 67 76 142 29 42 27 32 38 29	493 162 191 77 67 76 142 29 42 27 32 38 29	493 162 220 76 81 76 142 29 42 27 6 32 38 29	493 178 208 76 81 76 142 29 42 27 6 32 38 29	493 178 208 76 81 76 142 29 42 29 6 32 38 29 1,450	493 178 206 76 92 76 152 29 42 29 6 32 38 29	493 185 206 76 92 76 190 29 42 29 10 32 38 29
HEAVY RAL sigency New York-MTA-NYCT Weshington, D.CWMATA Chicago-RTA-CTA Boston-MBTA Alianta-MARTA Philedeiphia-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Baltimore-MMTA Los Angelse-LACMTA Philedeiphia-NJ-PATC Cleveland-CGRTA New York-MTA-SIRTOA TOTAL	1984 483 93 191 76 34 76 142 28 21 15 32 38 29 1.255 Directional Miles 1984	481 121 191 76 52 80 142 28 40 14 31 38 29 1,322	481 139 191 77 52 80 142 28 40 14 31 38 29 1,341	481 139 191 76 55 80 142 28 40 14 14 31 38 29 1,344	488 139 191 77 77 77 142 26 42 27 31 38 29 1,375	493 139 191 77 67 142 28 42 27 32 38 29 1.379	493 139 191 77 76 142 28 42 27 32 38 29 1,379	493 156 191 77 67 142 29 42 27 32 38 29 1,397	493 162 191 77 67 76 142 29 42 27 32 38 29 1,403	493 162 220 76 81 76 142 29 42 27 6 32 38 29 1.452	493 178 208 76 81 76 142 29 42 27 6 32 38 29 1,456	493 178 208 76 81 76 142 29 6 32 38 29 6 32 38 29 1,458	493 178 206 76 92 76 152 29 6 22 9 42 29 6 32 38 29 1.478	493 185 205 76 92 76 190 29 42 29 42 29 42 29 38 29 3.527
HEAVY RAL sgency New York-MTA-NYCT Westington, D.CWMAT/A Chicago-RTA-CTA Boston-WBTA Alianta-MARTA PhiladelphisSEPTA San Francisco-BART New York-PATHC Miami-MOTA Baltimorr-MMTA Los Angeles-LACMTA Philadelphis-N-PATC Cleveland-GCRTA New York-MTA-SIRTOA TOTAL LIGHT RAL sgency Boston-MBTA	1984 483 93 191 76 34 76 142 28 21 15 32 38 29 1.256 Directional Miles 56	481 121 191 76 52 80 142 28 40 14 14 31 38 29 1,322	481 139 191 77 52 80 142 28 40 14 31 38 29 1,341 1986 56	481 139 191 76 55 80 142 28 40 14 14 31 38 29 1,344 1987 56	488 139 191 77 67 77 142 28 42 27 31 38 29 1.375 1988 56	493 139 139 77 67 76 142 28 42 27 38 32 38 29 1,379 1,379	493 139 191 77 76 142 28 42 27 32 38 29 1,379 1,379	493 156 191 77 76 142 29 42 27 32 38 29 1,397 1,397	493 162 191 77 76 142 29 42 27 32 38 29 1,403	493 162 220 76 81 76 142 29 42 27 6 32 38 29 1,452 1,452	493 178 200 76 81 76 142 29 42 27 6 32 38 29 1,456 1994 56	1993 178 208 76 81 76 142 29 42 29 6 32 38 29 1,458	193 178 206 76 92 76 152 29 42 29 6 32 38 29 1.478	493 185 206 76 92 76 190 29 42 29 10 32 38 29 1.527 1.527
HEAVY RAL agency New York-MTA-NYCT Westington, D.CWMAT/A Chicago-RTA-CTA Boston-WBTA Allanta-MARTA PhiladeiphisSEPTA San Francisco-BART New York-PATHC Miami-MDTA Baltimore-MMTA Los Angeles-LACMTA Philadeiphis-N-PATC Cleveland-GCRTA New York-MTA-SIRTOA TOTAL LIGHT RAL agency Boston-MBTA San Francisco-MUNI Philadeiphis-SEPTA	1984 483 93 191 76 34 76 142 28 21 15 32 38 29 1.255 Directional Miles 1984	481 121 191 76 52 80 142 28 40 14 31 38 29 1,322	481 139 191 77 52 80 142 28 40 14 31 38 29 1,341	481 139 191 76 55 80 142 28 40 14 14 31 38 29 1,344	488 139 191 77 77 77 142 26 42 27 31 38 29 1,375	493 139 191 77 67 142 28 42 27 32 38 29 1.379	493 139 191 77 76 142 28 42 27 32 38 29 1,379	493 156 191 77 67 142 29 42 27 32 38 29 1,397	493 162 191 77 67 76 142 29 42 27 32 38 29 1,403	493 162 220 76 81 76 142 29 42 27 6 32 38 29 1.452	493 178 208 76 81 76 142 29 42 27 6 32 38 29 1,456	493 178 208 76 81 76 142 29 6 32 38 29 6 32 38 29 1,458	493 178 206 76 92 76 152 29 6 29 6 32 38 29 1.478	493 185 205 76 92 76 190 29 42 29 42 29 42 29 38 29 3.527
HEAVY RAL agency New York-MTA-NYCT Washington, D.CWMATH Chicago-RTA-CTA Boston-MBTA Alisaria-MARTA Philedeiphis-SEPTA New York-PATHC New York-PATHC Nami-MCTA Baltimore-MMTA Datadeiphis-NJ-PATC Cleveland-SCRTA New York-MTA-SIRTOA TOTAL	1984 483 93 191 76 34 76 142 28 21 15 38 29 1.256 Directional Miles 1984 56 41 179	401 121 191 76 52 80 142 28 40 14 31 38 29 1.322 1.322	481 139 191 77 52 80 142 28 40 14 31 38 29 1,341 1,341	481 139 191 76 55 80 142 28 40 14 31 38 29 1,344 1,344	488 139 191 77 67 77 142 28 42 27 31 38 29 1,375 1988 56 50 148	493 139 191 77 67 76 142 28 42 27 32 38 29 1,379 1,379 1,999 56 50 127	493 139 191 77 67 76 142 28 42 27 32 38 29 1,379 1,379	1993 1956 191 77 67 76 142 29 42 27 32 38 29 1,397 1,397 1,397	193 162 191 77 67 76 142 29 42 27 32 38 29 1,403	493 162 220 76 81 76 142 29 42 27 6 32 27 6 32 38 29 1.452 1993 56 50 69 43	493 178 208 76 81 76 142 29 42 27 6 32 27 6 32 29 1,456 1994 50 50 69 43	1983 178 208 76 81 76 142 29 42 29 6 32 29 6 32 38 29 1,458 1995 56 50 69 43	193 178 206 76 92 29 42 29 6 32 38 29 1.478 1995 56 50 69 82	4'93 185 206 76 190 29 42 29 10 32 29 10 32 29 10 32 29 1.527 1.527
HEAVY RAL sgency New York-MTA-NYCT Westington, D. CWMAT/A Chicago-RTA-CTA Boston-WBTA Allenta-MARTA Philadelphis-SEPTA San Francisco-BART New York-MTA-SIRTOA TOTAL Light RAL sgency Boston-MBTA San Francisco-MUNI Philadelphis-SEPTA Los Angeles-LACMTA San Diego Trolley Inc.	1984 483 93 191 76 34 76 142 28 21 15 32 38 29 1.255 Directional Miles 1984 66 41	481 121 191 76 52 80 142 28 40 14 31 38 29 1.322 1,322	481 139 191 77 52 80 142 28 40 14 31 38 29 1.341 1,341	481 139 191 76 55 80 142 28 40 14 31 38 39 1,344 1,344	488 1391 191 77 67 77 142 28 42 27 31 38 27 31 38 9 1,375 1988 56 50	493 139 191 77 67 76 142 28 42 27 32 38 29 1.379 1,379	493 139 191 77 76 142 28 42 27 32 38 29 1,379 1,379	433 156 191 77 67 76 142 29 42 27 32 38 29 1.397 1.397	493 162 191 77 76 142 29 42 27 38 29 1,403 1992 52 50 127	493 162 220 76 81 76 142 29 42 27 6 32 29 1,452 1,452 1993 56 50	493 178 208 76 81 76 142 29 42 27 6 32 38 29 1,456 1994 56 50 69 43	433 178 208 76 81 76 142 29 42 29 6 32 38 29 1,458 1995 56 50 69 43	493 178 206 92 92 76 152 29 6 32 38 29 1.478 1995 56 56 56 59 82	4'93 105 76 92 76 190 29 42 29 10 32 30 32 30 32 30 32 30 32 30 52 56 50 69 82 82 84 8
HEAVY RAL agency New York-MTA-NYCT Washington, D.CWMATT Chicago-RTA-CTA Boston-MBTA Atlanta-MARTA PhiladelphisSEPTA San Francisco-BART New York-PATHC Miami-MDTA Bailimore-MMTA Data Bailimore-MMTA Data Cleveland-SCRTA New York-MTA-SIRTOA TOTAL	1984 483 93 191 76 34 76 142 28 21 15 38 29 1.256 Directional Miles 1984 56 41 179	401 121 191 76 52 80 142 28 40 14 31 38 29 1.322 1.322	481 139 191 77 52 80 142 28 40 14 31 38 29 1,341 1,341	481 139 191 76 55 80 142 28 40 14 31 31 32 29 1,344 1987 56 47 166 41	488 139 191 77 67 77 142 28 42 27 31 38 29 1.375 1988 50 50 148 41	493 139 191 77 67 76 142 28 42 27 32 38 29 1.379 1989 56 50 127 41	493 139 191 77 67 76 142 28 42 27 32 38 29 1.379 1.379 1.990 52 50 127 41	433 156 191 77 67 76 142 29 42 27 32 38 29 1.397 1991 52 50 127 41	493 162 191 77 67 76 142 29 42 27 32 38 29 1.403 1992 52 50 127 32 38 29 1.403	493 162 220 76 81 76 142 29 42 27 6 32 38 29 1,452 1993 56 50 69 43 42	493 178 208 76 81 76 142 29 42 27 6 32 27 6 32 38 29 1,456 1994 56 50 69 43 43 42 28	493 178 208 76 142 29 42 29 42 29 42 29 1,458 1995 56 50 69 43 42 34	493 178 206 76 152 29 42 29 42 29 42 29 1478 1996 50 50 69 82 45 34	493 185 206 76 92 76 190 29 29 29 32 32 32 32 32 32 32 32 50 50 69 82 48 83 4
HEAVY RAL agency New York-MTA-NYCT Weshington, CWMATT Chicago-RTA-CTA Boston-MBTA Alianta-MARTA PhiladelphisSEPTA San Francisco-BART New York-PATHC Miami-MDTA Ballimore-MMTA Los Angeles-LACMTA Philadelphis-NJ-PATC Cleveland-CGRTA New York-MTA-SIRTOA TOTAL	1984 483 93 191 76 34 76 142 28 21 15 38 29 1.256 Directional Miles 1984 56 41 179	401 121 191 76 52 80 142 28 40 14 31 38 29 1.322 1.322	481 139 191 77 52 80 142 28 40 14 31 38 29 1,341 1,341	481 139 191 76 55 80 142 28 40 14 31 38 29 1,344 1,344	488 139 191 77 67 67 77 142 28 42 27 31 38 29 1.375 1968 56 50 148 41 30	493 139 191 77 76 142 28 29 1.379 1969 56 50 127 41 30	493 139 191 77 67 76 142 28 42 27 32 38 29 1,379 1,379	433 156 191 77 67 76 142 29 42 27 32 38 29 1.397 1,397 1,397	493 162 191 77 67 76 142 29 42 27 32 32 32 32 32 32 32 50 1.403	493 162 220 76 81 76 142 29 42 27 6 32 27 6 32 38 29 1.452 1993 56 50 69 43	493 178 208 76 81 76 142 29 42 27 6 32 38 29 1,456 1994 56 50 69 43	493 178 208 76 11 76 142 29 42 29 6 32 38 29 1,458 1995 56 50 69 43 42 34 30	493 178 206 92 92 76 152 29 42 29 6 32 38 29 1.478 1995 56 56 56 59 82	4'93 105 76 92 76 190 29 42 29 10 32 30 32 30 32 30 32 30 32 30 52 56 50 69 82 82 84 8
HEAVY RAL sigency New York-MTA-NYCT Weshington, D.CWMATA Chicago-RTA-CTA Boston-MBTA Allarta-MARTA Philadeiphia-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Baltimore-MMTA Los Angeles-LACMTA New York-MTA-SIRTOA TOTAL LIGHT RAL sigency Boston-MBTA San Francisco-MUNI Philadeiphia-SEPTA Los Angeles-LACMTA San Olago Trolley Inc. Si Louis-BSDA Portian-TCMTOO Dallas-DARTA Sacramento-RTD	1984 483 93 191 76 34 76 142 28 21 15 32 38 29 1.256 Directional Miles 56 41 179	481 121 191 76 52 80 142 28 40 14 14 31 38 29 1,322 1985 55 41 179 32	481 139 191 75 2 80 142 28 40 14 38 29 1.341 1986 56 47 166 41	481 139 191 75 80 142 28 40 14 31 38 29 1,344 1987 56 47 156 41 30 21	488 139 191 77 142 28 42 27 31 38 29 1.375 1968 56 56 148 41 30 37	493 139 191 77 67 76 142 28 42 27 32 38 29 1.379 1989 56 56 50 127 41 30 37	493 139 191 77 67 76 142 28 22 27 32 38 29 1.379 1.379 1.379 1.379 1.379 1.379 1.379 1.379 1.379	433 156 191 77 76 142 29 42 27 32 38 29 1.397 1.397 1.397 1.397 1.397 1.27 4.3 4.1 30 36	493 162 191 77 67 76 142 29 42 27 32 38 29 1,403 1992 52 52 52 52 52 52 52 52 52 52 52 52 52	493 162 220 76 81 76 142 29 42 27 6 32 32 32 32 32 32 32 32 32 32 35 56 50 56 50 59 43 342 30 35	493 178 208 76 81 76 142 29 42 27 6 6 32 38 29 1,456 56 56 56 56 56 56 50 43 42 28 33	493 178 208 76 81 76 142 29 42 29 6 6 32 38 29 1,456 1995 56 56 56 56 56 50 69 43 342 34 34 35	493 178 206 92 76 152 29 4 29 6 6 32 38 29 1.478 1996 56 56 56 56 56 56 56 34 30 23 336	493 105 75 92 76 190 29 32 29 32 30 32 36 29 1.527 1.527 1.527 56 50 69 82 48 34 30 34 30 34 36
HEAVY RAL agency New York-MA-NYCT Weshington, C. WMATT Chicago-RTA-CTA Boston-MBTA Alianta-MARTA PhiladephineSEPTA San Francisco-BART New York-MTA- Los Angeles-JACMTA Philadelphin-NJ-PATC Cleveland-SCRTA New York-MTA-SIRTOA TOTAL LIGHT RAL agency Boston-MBTA San Francisco-MUNI Philadelphia-SEPTA Los Angeles-LACMTA San Diago Trolley Inc. Si, Louis-BSDA Portiand-TCMTDO Dallas-DARTA Sacamento-RTD Philsburgh-PAT	1984 483 93 191 76 34 76 142 28 21 15 38 29 1.256 Directional Miles 1984 56 41 179	401 121 191 76 52 80 142 28 40 14 31 38 29 1.322 1.322	461 139 191 77 52 80 142 28 40 14 31 38 29 1.341 1985 56 47 156 41	481 139 191 76 55 80 142 28 40 14 31 38 29 1,344 1997 56 47 156 41 30 21	488 139 191 77 142 26 27 31 38 29 1.375 1998 56 50 148 41 30 37 7 41	493 139 191 77 76 142 28 29 1.379 1999 56 50 127 41 30 37 45	493 139 191 77 67 76 142 28 42 27 32 38 29 1,379 1,379 1990 52 50 127 41 30 37 60	433 156 191 77 67 76 142 29 29 29 32 38 29 1,397 1,397 1991 52 50 127 43 41 30 36 65	493 162 191 77 67 76 142 29 42 27 32 38 29 1.403 1992 52 50 127 50 127 43 42 30 36 45	493 162 220 76 81 76 142 29 29 1,452 1993 56 50 69 43 42 30 36 43 42 30	493 178 208 76 81 76 29 29 29 1,456 50 6 50 6 9 43 42 8 30 36 38	433 178 208 76 61 142 29 42 29 6 32 38 29 1,458 1995 56 50 69 43 42 43 42 36 35 50 69 43 34 30 36 38	433 178 206 76 92 29 42 29 6 32 38 29 1.478 1995 56 50 69 82 45 34 30 23 36 38	493 185 206 92 76 190 29 29 29 32 32 32 32 32 32 32 32 32 50 69 29 1.527 50 69 43 4 30 41 36 38
HEAVY RAL agency New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-MBTA Aliarta-MARTA Philedaiphia-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Ballimore-MMTA Los Angelse-LACMTA Philadeiphia-NJ-PATC Cleveland-GCRTA New York-MTA-SIRTOA TOTAL LIGHT RAL agency Boston-MBTA San Francisco-MUNI Philadeiphia-SEPTA Los Angelse-LACMTA San Diego Trolley Inc. SI. Louis-SEDA Portland-TCMTDO Dallas-DARTA Sacramento-RTD Philsburgh-PAT Burdio-RTS	1984 483 93 191 76 34 76 142 28 21 15 32 38 29 1.256 Directional Miles 56 41 179	481 121 191 76 52 80 142 28 40 14 14 31 38 29 1,322 1985 55 41 179 32	481 139 191 75 2 80 142 28 40 14 38 29 1.341 1986 56 47 166 41	481 139 191 75 80 142 28 40 14 31 38 29 1,344 1987 56 47 156 41 30 21	488 139 191 77 142 28 42 27 31 38 29 1.375 1968 56 56 148 41 30 37	493 139 191 77 67 76 142 28 42 27 32 38 29 1.379 1989 56 56 50 127 41 30 37	493 139 191 77 67 76 142 28 22 27 32 38 29 1.379 1.379 1.379 1.379 1.379 1.379 1.379 1.379 1.379	433 156 191 77 76 142 29 42 27 32 38 29 1.397 1.397 1.397 1.397 1.397 1.27 4.3 4.1 30 36	493 162 191 77 67 76 142 29 42 27 32 38 29 1,403 1992 52 52 52 52 52 52 52 52 52 52 52 52 52	493 162 220 76 81 76 142 29 42 27 6 32 32 32 32 32 32 32 32 32 32 35 56 50 56 50 59 43 342 30 35	493 178 208 76 81 76 142 29 42 27 6 6 32 38 29 1,456 56 56 56 56 56 56 50 43 42 28 33	493 178 208 76 81 76 142 29 42 29 6 6 32 38 29 1,456 1995 56 56 56 56 56 50 69 43 342 34 34 35	493 178 206 92 76 152 29 4 29 6 6 32 38 29 1.478 1996 56 56 56 56 56 56 56 34 30 23 336	493 105 75 92 76 190 29 32 29 32 30 32 36 29 1.527 1.527 1.527 56 50 69 82 48 34 30 34 30 34 36
HEAVY RAL agency New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-MBTA Aliania-MARTA Philadejhia-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Balimore-MMTA Diadejhia-NJ-PATC Cleveland-SCRTA New York-MTA-SIRTOA TOTAL LIGHT RAL agency Boston-MBTA San Francisco-MUNI Philadejhia-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. SiL Jouia-BSDA Portiend-TCMTDO Dalles-DARTA Secramento-RTD Philsburgh-PAT Buffalo-NFTS Balimore-MMTA	1984 483 93 191 76 34 76 28 21 15 32 38 29 1.256 Directional Miles 56 41 179 16	491 121 191 76 52 80 40 42 28 40 41 138 29 1,322 1985 56 41 179 32	461 139 191 77 52 80 142 28 40 14 31 38 29 1.341 1986 56 47 1566 41 30 10	481 139 191 75 55 80 142 28 40 14 31 38 29 1,344 1987 56 41 30 21 41 12	488 139 191 77 67 72 28 42 27 31 38 29 1.375 1988 56 50 148 41 30 37 41 12 17	493 139 191 77 67 76 142 28 42 27 32 38 29 1.379 1989 56 50 127 41 30 37 41 30 37 41 30	493 139 191 77 67 76 76 142 28 42 27 32 38 29 1.379 1,379 1,379 50 52 50 127 41 30 37 60 12 17	433 156 191 77 67 76 142 29 42 27 32 38 29 1,397 1,397 1991 52 50 127 43 41 30 36 65 12 39	493 162 191 191 77 67 76 142 29 22 27 32 38 29 1,403 1992 50 127 43 42 30 36 45 12 2 30 36 45 39	493 162 220 76 81 76 142 29 42 27 6 32 38 29 1.452 1993 56 50 69 43 42 30 36 43 42 30 36 43 42 30	493 178 208 76 81 76 142 29 42 27 6 32 38 29 1.456 50 50 6 9 43 42 28 30 36 336 336 336 336 336	433 178 208 76 81 76 142 29 29 6 6 29 1,458 1995 56 56 56 56 56 43 42 34 30 36 38 12 44 39	493 178 206 79 92 75 152 29 4 29 1.478 1996 50 50 89 82 45 34 30 23 36 336 32 336 336 336 336 336 336 33	493 105 76 92 29 76 29 29 32 29 1.527 1997 56 50 69 82 84 8 30 41 36 38 29 1.527
HEAVY RAL agency New York-MA-NYCT Westington, D.CWMAT/A Chicago-RTA-CTA Boston-MBTA Alianta-MARTA Philadephis-SEPTA San Francisco-BART New York-MTA-BARTA Philadeiphis-LACMTA Philadeiphis-LACMTA Philadeiphis-SEPTA Los Angelsa-LACMTA San Diego Trolley Inc. SL Losta-BSDA Portiand-Torley Inc. New Orteana-RTA	1984 483 93 191 76 34 76 142 28 21 15 32 38 29 1.256 Directional Miles 56 41 179 16	481 121 191 76 52 80 42 28 40 14 29 29 1,322 19965 56 41 177 32 29	481 139 191 77 52 80 142 28 40 14 14 31 38 29 1.341 1985 56 47 156 41 30 10	481 139 191 75 80 142 28 40 14 31 38 29 1,344 1987 56 47 156 41 30 21 41 12	488 139 191 77 67 77 142 28 42 27 31 38 29 1.375 1988 56 50 148 41 30 37 41 12 17 16	493 139 191 77 67 76 142 28 42 27 32 38 29 1,379 1,379 56 50 127 41 30 37 45 12 17 16	493 139 191 767 76 142 28 42 27 32 38 29 1.379 1.379 1.379 1.379 1.379 1.379 1.379 1.379 1.379 1.379 1.379 1.379	433 156 191 77 76 142 29 42 27 32 38 29 1.397 1.397 1991 52 50 127 43 127 43 43 41 30 36 65 12 12 39 127	493 162 191 77 67 76 142 29 42 27 32 38 29 1403 1403 1992 52 50 127 43 43 45 127 43 30 36 45 126 39 17	493 162 220 76 142 29 42 27 6 32 38 29 1.452 1993 56 50 50 43 40 43 40 43 40 41 12 47 39 16	493 178 208 76 81 76 142 29 42 27 6 32 38 29 1,456 50 59 43 42 28 30 36 38 122 8 30 36 38 144 39 15	433 178 208 208 76 81 76 142 29 6 32 38 29 1458 1995 56 50 69 43 42 34 36 38 125 36 38 125 44 39 36	193 178 206 92 76 152 29 42 29 6 32 38 29 1.478 1995 56 56 56 59 82 45 34 36 23 36 123 36 144 39 16	4'93 105 76 79 29 76 29 29 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 32 30 52 29 40 40 52 29 40 52 29 40 52 29 40 52 29 40 52 29 40 52 29 40 52 29 40 52 29 40 52 29 40 52 29 40 52 29 40 52 29 40 52 29 40 29 40 29 40 29 40 29 40 29 40 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 30 30 30 30 30 30 30 30 30 30 30 30
HEAVY RAL agency New York-MTA-NYCT Washington, D.CWMATH Chicago-RTA-CTA Boston-MBTA Alianta-MARTA Philadelphis:SEPTA San Francisco-BART New York-PATHC Miami-MOTA Baltimore-MMTA Data Miami-MOTA Baltimore-MMTA Data Cleveland-SCRTA New York-MTA-SIRTOA TOTAL LIGHT RAL agency Boston-MBTA San Francisco-MURI Philadelphis-SEPTA Los Angeles-LACMTA San Francisco-MURI Philadelphis-SEPTA Los Angeles-LACMTA San Diago Trolley Inc. SI, Louis-BSDA Portiand-TCMTDO Datas-DARTA Sacramento-RTD Philaburgh-PAT Burlako-NFTS Baltimore-MMTA San Jose-SCTD New Ordeans-RTA	1984 483 93 191 76 34 76 28 21 15 32 38 29 1.256 Directional Miles 56 41 179 16	491 121 191 76 52 80 40 42 28 40 41 138 29 1,322 1985 56 41 179 32	461 139 191 77 52 80 142 28 40 14 31 38 29 1.341 1986 56 47 1566 41 30 10	481 139 191 75 55 80 142 28 40 14 31 38 29 1,344 1987 56 41 30 21 41 12	488 139 191 77 67 72 28 42 27 31 38 29 1.375 1988 56 50 148 41 30 37 41 12 17	493 139 191 77 67 76 142 28 42 27 32 38 29 1.379 1989 56 50 127 41 30 37 41 30 37 41 30	493 139 191 77 67 76 76 142 28 42 27 32 38 29 1.379 1,379 1,379 50 52 50 127 41 30 37 60 12 17	433 156 191 77 67 76 142 29 42 27 32 38 29 1,397 1,397 1991 52 50 127 43 41 30 36 65 12 39	493 162 191 191 77 67 76 142 29 22 27 32 38 29 1,403 1992 50 127 43 42 30 36 45 12 2 30 36 45 39	493 162 220 76 81 76 142 29 42 27 6 32 38 29 1.452 1993 56 50 69 43 42 30 36 43 42 30 36 43 42 30	493 178 208 76 81 72 29 42 27 6 32 38 29 1,456 50 6 9 43 36 650 69 43 30 36 30 36 312 44 39 122 44 39 127	433 178 208 76 81 42 29 42 29 42 29 1,458 1995 56 50 69 43 42 44 43 30 36 38 12 44 439 16 27	493 178 206 79 92 29 29 429 6 32 38 29 1.478 1996 50 50 82 45 34 30 23 36 336 312 44 439 16 31	493 105 206 75 92 76 29 29 32 29 1.527 1.527 50 69 82 82 84 44 30 41 36 30 41 36 30 41 31
HEAVY RAL agency New York-MA-NYCT Westington, D.CWMAT/A Chicago-RTA-CTA Boston-MBTA Alianta-MARTA Philadephis-SEPTA San Francisco-BART New York-MTA-BARTA Philadeiphis-LACMTA Philadeiphis-LACMTA Philadeiphis-SEPTA Los Angelsa-LACMTA San Diego Trolley Inc. SL Losta-BSDA Portiand-Torley Inc. New Orteana-RTA	1984 483 93 191 76 34 76 142 28 21 15 32 38 29 1.256 Directional Miles 56 41 179 16	481 121 191 76 52 80 42 28 40 14 29 29 1,322 19965 56 41 177 32 29	481 139 191 77 52 80 142 28 40 14 14 31 38 29 1.341 1985 56 47 156 41 30 10	481 139 191 75 80 142 28 40 14 31 38 29 1,344 1987 56 47 156 41 30 21 41 12	488 139 191 77 67 77 142 28 42 27 31 38 29 1.375 1988 56 50 148 41 30 37 41 12 17 16	493 139 191 77 67 76 142 28 42 27 32 38 29 1,379 1,379 56 50 127 41 30 37 45 12 17 16	493 139 191 767 76 142 28 42 27 32 38 29 1.379 1.379 1.379 1.379 1.379 1.379 1.379 1.379 1.379 1.379 1.379 1.379	433 156 191 77 76 142 29 42 27 32 38 29 1.397 1.397 1991 52 50 127 43 127 43 43 41 30 36 65 12 12 39 127	493 162 191 77 67 76 142 29 42 27 32 38 29 1403 1403 1992 52 50 127 43 43 45 127 43 30 36 45 126 39 17	493 162 220 76 142 29 42 27 6 32 38 29 1.452 1993 56 50 50 43 40 43 40 43 40 41 12 47 39 16	493 178 208 76 81 76 142 29 42 27 6 32 38 29 1,456 50 59 43 42 28 30 36 38 122 8 30 36 38 124 44 39 15	433 178 208 208 76 81 76 142 29 6 32 38 29 1458 1995 56 50 69 43 42 34 36 38 125 36 38 125 44 39 36	193 178 206 92 76 152 29 42 29 6 32 38 29 1.478 1995 56 56 56 59 82 45 34 36 23 36 123 36 144 39 16	4'93 105 76 79 29 76 29 29 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 32 30 52 29 40 40 52 29 40 52 29 40 52 29 40 52 29 40 52 29 40 52 29 40 52 29 40 52 29 40 52 29 40 52 29 40 52 29 40 52 29 40 52 29 40 29 40 29 40 29 40 29 40 29 40 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 32 30 30 30 30 30 30 30 30 30 30 30 30 30
HEAVY RAL agency New York-MTA-NYCT Westington, D.CWMAT/A Chicago-RTA-CTA Boston-WBTA Allanta-MARTA Philadelphis-SEPTA San Francisco-BART New York-PATHC Miami-MOTA Ballimor-MMTA Ballimor-MMTA Ballimor-MMTA San Diego trolley inc. St. Louis-BSDA Portland-Torley Inc. St. Louis-BSDA Portland-Torley Inc. St. Louis-BSDA Portland-Torley Inc. St. Louis-BSDA Portland-Torley Inc. St. Louis-BSDA Dertain-Torley Inc. St. Louis-BSDA Dertain-Torley Inc. St. Louis-BSDA Dertain-Torley Inc. St. Ballimore-MMTA Ballimore-MMTA San Diego-PAT Duffabo-NFTS Ballimore-MMTA San Jose-SCTD New Orlean-RTA Duffabo-NFTS	1984 483 93 191 76 34 28 21 15 32 38 29 1.256 Directional Miles 56 41 179 16 33 33	481 121 191 76 52 80 42 28 40 14 29 29 1.322 1985 56 41 179 32 29 13 26	481 139 191 77 52 80 142 28 40 14 31 38 29 1.341 1986 56 56 41 156 41 30 10 10	481 139 191 75 80 142 28 40 14 31 38 29 1.344 1987 56 41 30 21 41 12 13 26	488 139 191 77 77 142 28 42 27 31 38 29 1.375 1988 56 50 148 41 30 37 41 12 17 16 26	493 139 191 77 67 76 142 28 42 27 32 38 29 9 1,379 1,379 1999 56 50 0 127 41 30 37 45 12 17 16 26	493 139 191 767 767 142 28 29 1.379 1.379 1.379 1.379 1.379 1.379 1.379 1.379 1.379 1.379 1.379 1.379 1.379	433 156 191 77 76 742 29 42 27 32 38 29 1.397	193 162 191 77 67 76 142 29 42 27 32 38 29 1,403 1992 52 52 50 0127 43 24 30 36 45 127 43 30 36 39 39 127 27	493 162 220 76 81 76 142 29 27 6 32 38 29 1.452 1993 56 50 69 43 42 30 36 48 127	493 178 208 76 81 76 142 29 27 6 32 38 29 1,456 50 50 69 43 42 28 30 69 43 42 28 30 36 38 16 27 71	433 178 208 76 81 76 142 29 6 32 38 29 1,458 1995 56 50 69 43 42 34 30 69 43 42 34 36 38 12 56 1458 1995 57 11	193 178 206 92 76 152 29 6 32 38 29 1.478 1995 56 56 69 82 45 34 30 23 38 23 38 144 39 16 31 31	4'93 105 76 29 79 29 29 29 30 32 30 32 30 32 30 32 30 32 30 32 33 30 56 50 69 82 84 84 34 34 34 33 81 22 44 31 31 11

Number of Stations

HEAVY RAIL														
agency	1984	1985	1986	1967	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
New York-MTA-NYCT	463	463	463	463	466	469	469	469	469	469	469	468	468	468
Washington, D.CWMATA	51	51	64	64	64	64	64	67	70	70	74	74	74	75
Chicago-RTA-CTA	143	143	143	143	143	143	143	143	137	145	145	145	140	141
Boston-MBTA	49	50	50	53	53	53	53	53	53	53	53	53	53	53
Aliania-MARTA	20	25	25	26	29	29	29	29	29	33	33	33	36	36
Philadelphia-SEPTA	74	74	74	74	74	76	76	76	76	76	76	76	76	76
San Francisco-BART	34	34	34	34	34	34	34	34	34	34	34	34	36	39
New York-PATHC	13	13	13	13	13	13	13	13	13	13	13	13	13	13
Miami-MDTA	10	20	20	20	20	21	21	21	21	21	21	21	21	21
Baltimore-MMTA	9	9	9	9	12	12	12	12	12	12	12	14	14	14
Los Angeles-LACMTA										5	5	5	5	8
Philadeiphia-NJ-PATC	12	12	12	12	12	13	13	13	13	13	13	13	13	13
Cleveland-GCRTA	18	18	18	18	18	18	18	18	18	18	18	18	18	18
New York-MTA-SIRTOA	22	22	22	22	22	22	22	22	22	22	22	22	22	22
TOTAL	918	934	947	951	960	967	967	970	967	984	988	989	989	997
LIGHT RAIL														
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Boston-MBTA	33	95	85	85	85	85	77	77	77	77	95	95	95	95
San Francisco-MUNI		• .	9	9	9	9	9	9	9	9	9	11	11	11
Philadelphia-SEPTA	15	9	9	9	9	60	64	64	64	64	64	64	64	64
Los Angeles-LACMTA	18							22 22	22	22 35	22 35	22	36	36
San Diego Trolley Inc. St. Louis-BSDA	18	18	22	22	22	22	22	22	24	35	30	35 18	38 18	41
Portland-TCMTDO				24	24	24	25	27	27	27	27	18	18	18 27
Dallas-DARTA				24	24	24	25	21	27	27	21	21	14	20
Sacramento-RTD				15	15	15	15	28	28	28	28	28	28	20
Philsburgh-PAT			6	13	13	13	14	14	14	28	13	13	13	28
Buffalo-NFTS	-	•	12	14	14	14	14	14	14	14	14	14	14	13
Baltimore-MMTA			12					14	15	24	24	24	24	24
San Jose-SCTD					20	20	20	33	33	33	33	33	33	34
New Orleans-RTA	-				20	20	20		55	33	2	2	2	9
Cleveland-GCRTA	29	29	29	29	29	29	29	29	29	29	29	29	33	33
Denver-RTD	23	23	23	25	23	23	25	23	23	23	15	15	15	15
Newerk-NJTC	11	11	11	11	11	11	11	11	11	11	11	11	11	11
TOTAL	106	162	183	230	251	302	300	350	367	387	438	441	476	493
				-30			200			207				

Density of service

			ies per Directi											
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
New York-MTA-NYCT	1,171	1,159	1,227	1,242	1,275	1,288	1,272	1,213	1,219	1,218	1,238	1,247	1,237	1,254
Washington, D.CWMATA	335	412	394	469	472	482	488	471	492	465	463	479	477	422
Chicago-RTA-CTA	495	511	498	504	591	586	607	618	549	488	538	536	488	498
Boston-MBTA	455	440	441	458	499	543	576	562	582	586	493	517	563	570
Alianta-MARTA	318	364	439	434	381	421	449	450	455	410	504	529	547	553
Philadelphia-SEPTA	414	414	414	414	414	414	414	414	414	414	414	414	414	414
San Francisco-BART	424	439	437	434	458	476	578	562	586	601	617	629	609	529
New York-PATHC	704	758	760	767	833	884	848	858	837	860	858	859	868	860
Miami-MDTA	45	165	202	214	231	212	248	248	238	244	251	265	267	261
Baltimore-MMTA	137	247	255	159	336	272	284	260	246	274	282	277	295	294
Los Angeles-LACMTA										97	213	236	161	350
Philadelphia-NJ-PATC	280	268	272	276	285	291	287	299	292	303	303	298	289	285
Cleveland-GCRTA	112	111	109	109	104	103	96	106	112	100	100	105	106	108
New York-MTA-SIRTOA	165	160	161	145	145	146	146	144	123	127	132	129	135	147
AVERAGE	389	419	432	433	463	471	484	477	473	442	458	466	461	468
	Annual Vehicle					1080	1990	1991	1997	1003	1994	1995	1996	1997
agency	1984	1985	1986	1987	1988	1989	1990	1991 62	1992	1993	1994 240	1995 240	1996 237	1997
agency Boston-MBTA	1984 66	1985 68	1986 48	1987 48	1988 49	53	56	62	66	63	240	240	237	236
sgency Boston-MBTA Sen Francisco-MUNI	1984 66 186	1985 68 192	1986 48 198	1987 48 197	1988 49 197	53 194	56 199	62 182	66 171	63 170	240 159	240 132	237 139	236 141
agency Boston-MBTA San Francisco-MUNI Philadelphia-SEPTA	1984 66	1985 68	1986 48	1987 48	1988 49	53	56	62 182 87	66 171 87	63 170 87	240 159 87	240 132 87	237 139 87	236 141 87
agency Boston-MBTA San Francisco-MUNI Philadelphia-SEPTA Los Angeles-LACMTA	1984 66 186 87	1985 68 192 87	1986 48 198 87	1987 48 197 87	1988 49 197 87	53 194 87	56 199 87	62 182 87 107	66 171 87 131	63 170 87 129	240 159 87 132	240 132 87 125	237 139 87 99	236 141 87 106
agency Boston-MBTA San Francisco-MUNI Philadelphia-SEPTA Los Angeles-LACMTA San Diego Trolley Inc.	1984 66 186	1985 68 192	1986 48 198	1987 48 197	1988 49 197	53 194	56 199	62 182 87	66 171 87	63 170 87	240 159 87 132 114	240 132 87 125 110	237 139 87 99 104	236 141 87 106 125
agency Boston-MBTA San Francisco-MUNN Philadelphia-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA	1984 66 186 87	1985 68 192 87	1986 48 198 87	1987 48 197 87 98	1988 49 197 87 98	53 194 87 77	56 199 87 122	62 182 87 107	66 171 87 131 136	63 170 87 129 134	240 159 87 132	240 132 87 125	237 139 87 99	236 141 87 106
agency Boston-MBTA Sen Francisco-MUNI Philadelphia-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA Portland-TCMTDO	1984 66 186 87	1985 68 192 87	1986 48 198 87	1987 48 197 87	1988 49 197 87	53 194 87	56 199 87	62 182 87 107 139	66 171 87 131	63 170 87 129	240 159 87 132 114 102	240 132 87 125 110 146	237 139 87 99 104 145	236 141 87 106 125 149
agency Boston-MBTA San Francisco-MUNN Philadeiphia-SEPTA Los Angeles-LACMTA San Diego Trollay Inc. St. Louis-BSDA Portland-TCMTDO Dellas-DARTA	1984 66 186 87	1985 68 192 87	1986 48 198 87	1987 48 197 87 98 67	1988 49 197 87 98	53 194 87 77	56 199 87 122	62 182 87 107 139	66 171 87 131 136	63 170 87 129 134	240 159 87 132 114 102	240 132 87 125 110 146	237 139 87 99 104 145 94	236 141 87 106 125 149 97 82
agency Baston-MBTA San Francisco-MUNI Philadelphia-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. Su Louis-BSDA Portland-TCMTDO Dellas-DARTA Sacrameric-RTD	1984 66 186 87	1985 68 192 87	1986 48 198 87	1987 48 197 87 98	1988 49 197 87 98 87	53 194 87 77 86	56 199 87 122 82	62 182 87 107 139 87	66 171 87 131 136 89	63 170 87 129 134 93	240 159 87 132 114 102 96	240 132 87 125 110 146 95	237 139 87 99 104 145 94 31	236 141 87 106 125 149 97
agency Boston-MBTA San Francisco-MUNN Philadeiphia-SEPTA Los Angeles-LACMTA San Diego Trollay Inc. St. Louis-BSDA Portland-TCMTDO Dellas-DARTA	1984 66 186 87 103	1985 68 192 87 103	1986 48 198 87 90	1987 48 197 87 98 67 13	1988 49 197 87 98 87 50	53 194 87 77 86 57	56 199 87 122 82 74	62 182 87 107 139 87 80	66 171 87 131 136 89 90	63 170 87 129 134 93 90	240 159 87 132 114 102 96 95	240 132 87 125 110 146 95 94	237 139 87 99 104 145 94 31 96	236 141 87 106 125 149 97 82 99
sgency Boston-MBTA Son Francisco-MUNI Philadelphia-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA Portland-TCMTDO Dellas-DARTA Sacramento-RTD Philaburgh-PAT	1984 66 186 87 103	1985 68 192 87 103	1986 48 198 87 90 57	1987 48 197 87 98 67 13 60	1988 49 197 87 98 87 50 93	53 194 87 77 86 57 85	56 199 87 122 82 74 90	62 182 87 107 139 87 80 93	66 171 87 131 136 89 90 92	63 170 87 129 134 93 90 96	240 159 87 132 114 102 96 95 88	240 132 87 125 110 146 95 94 86	237 139 87 99 104 145 94 31 96 88	236 141 87 106 125 149 97 82 99
agency Boston-MBTA Son Francisco-MUNI Son Francisco-MUNI Son Diego Trolley Inc. St. Louis-BSDA Portland-TCMTDO Datas-DARTA Sacramento-RTD Pittsburgh-PAT Suffalo-NFTS	1984 66 186 87 103	1985 68 192 87 103	1986 48 198 87 90 57	1987 48 197 87 98 67 13 60	1988 49 197 87 98 87 50 93	53 194 87 77 86 57 85	56 199 87 122 82 74 90	62 182 87 107 139 87 80 93	66 171 87 131 136 89 90 92 144	63 170 87 129 134 93 90 96 143	240 159 87 132 114 102 96 95 88 142	240 132 87 125 110 146 95 94 86 141	237 139 87 99 104 145 94 31 96 88 141	236 141 87 106 125 149 97 82 99 91 141
agancy Bostor-MBTA San Francisco-MUNi Philadalphia-SEPTA Cas Angelas-LACMTA San Diago Trollay Inc. Si Louiz-BSDA Portland-TCMTDO Delitas-DARTA Sacramento-RTD Builta-DART Builtan-NFTS Builtan-NFTS	1984 66 186 87 103	1985 68 192 87 103	1986 48 198 87 90 57	1987 48 197 87 98 67 13 60	1988 49 197 87 98 87 50 93 144	53 194 87 77 86 57 85 145	56 199 87 122 82 74 90 160	62 182 87 107 139 87 80 93 144	66 171 87 131 136 89 90 92 144 11	63 170 87 129 134 93 90 96 143 57	240 159 87 132 114 102 96 95 88 142 103	240 132 87 125 110 146 95 94 86 141 100	237 139 87 99 104 145 94 31 96 88 141 102	236 141 87 106 125 149 97 82 99 91 141
agency Bostor-MBTA Sen Francisco-MUNI Sen Francisco-MUNI Sen Diego Trolley Inc. St. Louis-BSDA Portland-TCMTDO Dellas-DARTA Secramento-RTD Pillsburgh-PAT Selfaburgh-PAT Sealimore-MMTA Seal Jose-CTD	1984 66 186 87 103 42	1985 68 192 87 103 47	1986 48 198 87 30 57 102	1987 48 197 87 98 67 13 60 110	1988 49 197 87 98 87 50 93 144 18	53 194 87 77 86 57 85 145 42	56 199 87 122 82 74 90 160 43	62 182 87 107 139 87 80 93 144 48	66 171 87 131 136 89 90 92 144 11 101	63 170 87 129 134 93 90 96 143 57 84	240 159 87 132 114 102 96 95 88 142 103 83	240 132 87 125 110 146 95 94 86 141 100 81	237 139 87 99 104 145 94 31 96 88 141 102 91	236 141 87 106 125 149 97 82 99 91 141 107 92
agency Bostor-MBTA San Francisco-MUNI Philadejnik-SEPTA Los Angelas-LACMTA San Diego Trolley Inc. San Louis-BSDA Portland-TCMTDO Delitas-DARTA Sacramento-RTD Delitaburgh-PAT Buffato-NFTS Belimore-MMTA San Joss-SCTD New Orleans-RTA	1984 66 186 87 103 42 96	1985 68 192 87 103 47 94	1986 48 198 87 90 57 102 90	1987 48 197 87 98 67 13 60 110 88	1988 49 197 87 98 87 50 93 144 18 89	53 194 87 77 86 57 85 145 42 58	56 199 87 122 82 74 90 160 43 72	62 182 87 107 139 87 80 93 144 48 78	66 171 87 131 136 89 90 92 144 11 101 76	63 170 87 129 134 93 90 96 143 57 84 74	240 159 87 132 114 102 96 95 88 142 103 83 74	240 132 87 125 110 146 95 94 86 141 100 81 75	237 139 87 99 104 145 94 31 96 88 141 102 91 77	236 141 87 106 125 149 97 82 99 91 141 107 92 77
agency Boston-MBTA San Francisco-MUNI San Francisco-MUNI San Date Content San Date Content San Date Content San Date Content Dates-DARTA San Jose SCTD Verson San Jose SCTD Searmer-RTA San Jose SCTD Server-RTD Derver-RTD	1984 66 186 87 103 42 96	1985 68 192 87 103 47 94	1986 48 198 87 90 57 102 90	1987 48 197 87 98 67 13 60 110 88	1988 49 197 87 98 87 50 93 144 18 89	53 194 87 77 86 57 85 145 42 58	56 199 87 122 82 74 90 160 43 72	62 182 87 107 139 87 80 93 144 48 78	66 171 87 131 136 89 90 92 144 11 101 76	63 170 87 129 134 93 90 96 143 57 84 74	240 159 87 132 114 102 96 95 88 142 103 83 74 65	240 132 87 125 110 146 95 94 86 141 100 81 75 70	237 139 87 99 104 145 94 31 96 88 141 102 91 77 77	236 141 87 106 125 149 97 82 99 91 141 107 92 77 71
agency Boston-MBTA San Francisco-MUNi Philadelphia-SEPTA Loc Angelez-LACMTA San Diego Trolley Inc. St. Louis-BSDA Portland-TCMTDO Delias-DARTA Secramento-RTD Philaburgh-PAT Buffaio-NFTS Ballimors-MMTA San Joss-SCTD New Orleans-RTA Lieveland-SCRTA	1984 66 186 87 103 42 96 73	1985 68 192 87 103 47 47 94 74	1986 48 198 87 90 57 102 90 74	1987 48 197 87 98 67 13 60 110 88 88 74	1988 49 197 87 98 87 50 93 144 18 89 70	53 194 87 77 86 57 85 145 42 58 71	56 199 87 122 82 74 90 160 43 72 71	62 182 87 107 139 87 80 93 144 48 78 78	66 171 87 131 136 89 90 92 144 11 101 76 80	63 170 87 129 134 93 90 96 143 57 84 74 66	240 159 87 132 114 102 96 95 88 142 103 83 74 65 18	240 132 87 125 110 146 95 94 86 141 100 81 75 70 71	237 139 87 99 104 145 94 31 96 88 141 102 91 77 77 88	236 141 87 106 125 149 97 82 99 91 141 107 92 77 71 108

Available Circuits

HEAVY RAIL	Number of obsi	erved paths / i	Maximum pos	sibie number	ofpaths									
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	199
New York-MTA-NYCT	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Washington, D.CWMATA	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
Chicago-RTA-CTA	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.04	0.03
Boston-MBTA	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Alienta-MARTA		-	-	-	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03
Philadelphia-SEPTA	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
San Francisco-BART	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.04
New York-PATHC	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Miami-MDTA		-	-	-	-	-	-	-	-	-	-	•	-	-
Baltimore-MMTA		-	-		•		-	-	-		-		-	-
Los Angeles-LACMTA										-	-	-		-
Philadelphia-NJ-PATC		-	-	-	-		-	-	-	-		-	-	-
Cleveland-GCRTA			-		-			-	-	-	-	-	-	
New York-MTA-SIRTOA		-	-		-		-	-	-	-	-	-	-	-
AVERAGE	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
LIGHT RAIL	Number of obsi	erved paths /i	Maximum pos	sible number	ofpaths									
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
agency Boston-MBTA	1964 0.01	1985 0.01	1986 0.01	1987 0.01	1988 0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
agency Boston-MBTA San Francisco-MUNI	1984 0.01 0.01	1985 0.01 0.01	1986 0.01 0.01	1987 0.01 0.01	1988 0.01 0.01	0.01 0.01	0.01 0.01	0.01 0.02	0.01 0.02	0.01 0.02	0.01 0.02	0.01 0.05	0.01 0.05	0.0
agency Boston-MBTA San Francisco-MUNI Philadelphia-SEPTA	1964 0.01	1985 0.01	1986 0.01	1987 0.01	1988 0.01	0.01	0.01	0.01 0.02 0.01	0.01 0.02 0.01	0.01 0.02 0.01	0.01 0.02 0.01	0.01 0.05 0.01	0.01 0.05 0.01	0.0
agency Bosion-MBTA San Francisco-MUNI Philadelphia-SEPTA Los Angeles-LACMTA	1984 0.01 0.01	1985 0.01 0.01	1986 0.01 0.01	1987 0.01 0.01	1988 0.01 0.01	0.01 0.01	0.01 0.01 0.01	0.01 0.02 0.01 0.05	0.01 0.02 0.01 0.05	0.01 0.02	0.01 0.02 0.01 0.05	0.01 0.05 0.01 0.05	0.01 0.05 0.01 0.03	0.0 0.0 0.0
agency Boston-MBTA San Francisco-MUNI Philadeliphia-SEPTA Los Angeles-LACMTA San Diego Trolley Inc.	1984 0.01 0.01	1985 0.01 0.01	1986 0.01 0.01	1987 0.01 0.01 0.01	1988 0.01 0.01 0.01	0.01 0.01 0.01	0.01 0.01	0.01 0.02 0.01	0.01 0.02 0.01	0.01 0.02 0.01 0.05	0.01 0.02 0.01	0.01 0.05 0.01	0.01 0.05 0.01	0.0 0.0 0.0
agency Boston-MBTA San Francisco-MUNI Philadelphia-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA	1984 0.01 0.01	1985 0.01 0.01	1986 0.01 0.01	1987 0.01 0.01 0.01	1988 0.01 0.01 0.01	0.01 0.01 0.01	0.01 0.01 0.01	0.01 0.02 0.01 0.05	0.01 0.02 0.01 0.05	0.01 0.02 0.01 0.05	0.01 0.02 0.01 0.05	0.01 0.05 0.01 0.05	0.01 0.05 0.01 0.03 0.01	0.0 0.0 0.0 0.0
agency Boston-MBTA San Francisco-MUNI Philadelphila-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA Portland-TCMTDO	1984 0.01 0.01	1985 0.01 0.01	1986 0.01 0.01	1987 0.01 0.01 0.01	1988 0.01 0.01 0.01	0.01 0.01 0.01	0.01 0.01 0.01 0.02	0.01 0.02 0.01 0.05 0.02	0.01 0.02 0.01 0.05 0.02	0.01 0.02 0.01 0.05 0.02	0.01 0.02 0.01 0.05 0.01	0.01 0.05 0.01 0.05 0.01	0.01 0.05 0.01 0.03 0.01	0.0
agency Boston-MBTA San Francisco-MUNI Philadelphia-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA Portland-TCMTDO Dallas-DARTA	1984 0.01 0.01	1985 0.01 0.01	1986 0.01 0.01	1987 0.01 0.01 0.01	1988 0.01 0.01 0.01	0.01 0.01 0.01	0.01 0.01 0.01 0.02	0.01 0.02 0.01 0.05 0.02	0.01 0.02 0.01 0.05 0.02	0.01 0.02 0.01 0.05 0.02	0.01 0.02 0.01 0.05 0.01	0.01 0.05 0.01 0.05 0.01	0.01 0.05 0.01 0.03 0.01 -	0.0° 0.0° 0.0° 0.0° 0.0°
agency Boston-MBTA San Francisco-MUNI Philadelphia-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA Portland-TCMTDO Dallas-DARTA Sacramendo-RTD	1984 0.01 0.01	1985 0.01 0.01	1986 0.01 0.01	1987 0.01 0.01 0.01 - 0.04	1988 0.01 0.01 0.01 - 0.04	0.01 0.01 0.01 - 0.04	0.01 0.01 0.01 0.02 0.04	0.01 0.02 0.01 0.05 0.02 0.04	0.01 0.02 0.01 0.05 0.02 0.04	0.01 0.02 0.01 0.05 0.02 0.04	0.01 0.02 0.01 0.05 0.01	0.01 0.05 0.01 0.05 0.01 -	0.01 0.05 0.01 0.03 0.01 - 0.04 0.04	0.0 0.0 0.0 0.0 0.0 - - - 0.0 0.0
agency	1984 0.01 0.01 0.01	1985 0.01 0.01 0.01	1986 0.01 0.01 0.01 0.01	1987 0.01 0.01 0.01 - 0.04 0.02	1988 0.01 0.01 - 0.04 0.02	0.01 0.01 0.01 - 0.04 0.02	0.01 0.01 0.01 0.02 0.04 0.02	0.01 0.02 0.01 0.05 0.02 0.04 0.02	0.01 0.02 0.01 0.05 0.02 0.04 0.02	0.01 0.02 0.01 0.05 0.02 0.04 0.02	0.01 0.02 0.01 0.05 0.01 - 0.04 0.02	0.01 0.05 0.01 0.05 0.01 - 0.04 0.02	0.01 0.05 0.01 0.03 0.01 - - 0.04 0.04 0.04 0.02	0.01 0.05 0.01 0.03 0.01 - - - - - - - - - - - - - - - - - - -
agency Boston-MBTA San Francisco-MUNI Philadelphile-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA Portland-TCMTDO Dallas-DARTA Sacramento-RTD Pittsburgh-PAT Bittsburgh-PAT	1984 0.01 0.01 0.01	1985 0.01 0.01 0.01	1996 0.01 0.01 0.01 -	1987 0.01 0.01 0.01 - 0.04 0.02 0.01	1988 0.01 0.01 0.01 - 0.04 0.02 0.01	0.01 0.01 0.01 - 0.04 0.02 0.01	0.01 0.01 0.02 0.04 0.02 0.04	0.01 0.02 0.01 0.05 0.02 0.04 0.02 0.01	0.01 0.02 0.01 0.05 0.02 0.04 0.02	0.01 0.02 0.01 0.05 0.02 0.04 0.02	0.01 0.02 0.01 0.05 0.01 - - 0.04 0.02 0.01	0.01 0.05 0.01 0.05 0.01 - 0.04 0.02 0.01	0.01 0.05 0.01 0.03 0.01 	0.0 0.0 0.0 0.0 0.0 - - - 0.0 0.0 0.0
agency Boston-MBTA San Francisco-MUNI Philadelphia-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA Porliand-TCMTDO Dallas-DARTA Sacramento-RTD Patisburgh-PAT Buffaio-NFTS Beltimore-MMTA	1984 0.01 0.01 0.01	1985 0.01 0.01 0.01	1996 0.01 0.01 0.01 -	1987 0.01 0.01 0.01 - 0.04 0.02 0.01	1988 0.01 0.01 0.01 - 0.04 0.02 0.01	0.01 0.01 0.01 - 0.04 0.02 0.01	0.01 0.01 0.02 0.04 0.02 0.04	0.01 0.02 0.01 0.05 0.02 0.04 0.02 0.01	0.01 0.02 0.01 0.05 0.02 0.04 0.04	0.01 0.02 0.01 0.05 0.02 0.04 0.04	0.01 0.02 0.01 0.05 0.01 - 0.04 0.02 0.01	0.01 0.05 0.01 0.05 0.01 0.04 0.02 0.01	0.01 0.05 0.01 0.03 0.01 0.04 0.04 0.04 0.02 0.01	0.01
agency Boston-MBTA San Francisco-MUNI Philadelphila-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA Portland-TCMTDO Dallas-DARTA Sacramento-RTD Dallas-DARTA Sacramento-RTD Baltmore-MMTA San Jose-SCTD	1984 0.01 0.01 0.01	1985 0.01 0.01 0.01	1996 0.01 0.01 0.01 -	1987 0.01 0.01 0.01 - 0.04 0.02 0.01	1988 0.01 0.01 0.01 - 0.04 0.02 0.01	0.01 0.01 0.01 - 0.04 0.02 0.01	0.01 0.01 0.02 0.04 0.02 0.01	0.01 0.02 0.01 0.05 0.02 0.04 0.04 0.02 0.01	0.01 0.02 0.01 0.05 0.02 0.04 0.02 - -	0.01 0.02 0.01 0.05 0.02 0.04 0.02 -	0.01 0.02 0.01 0.05 0.01 - 0.04 0.02 0.01 -	0.01 0.05 0.01 0.05 0.01 - - - 0.04 0.02 0.01	0.01 0.05 0.01 0.03 0.01 - - - - - - - -	0.01
agency Boston-MBTA San Francisco-MUNI Philadaphia-SEPTA Los Angeles-LACMTA San Diego Troley Inc. Si Louis-BSDA Porliand-TCMTDO Dallas-DARTA Sacramento-RTD Pultisburgh-PAT Buffaic-NFTS Buffaic-NFTS Baltimore-MMTA San Jose-SCTD New Orleans-RTA	1984 0.01 0.01 0.01 -	1985 0.01 0.01 0.01 -	1986 0.01 0.01 0.01 - 0.01	1987 0.01 0.01 - 0.04 0.02 0.01 -	1988 0.01 0.01 - 0.04 0.02 0.01 - 0.03	0.01 0.01 0.01 - 0.04 0.02 0.01 - 0.09	0.01 0.01 0.02 0.04 0.02 0.04 - 0.01 -	0.01 0.02 0.01 0.05 0.02 0.04 0.02 0.04 0.02 0.01 - 0.07	0.01 0.02 0.01 0.05 0.02 0.04 0.02 - - - 0.07	0.01 0.02 0.01 0.05 0.02 0.04 0.02 - - - 0.07	0.01 0.02 0.01 0.05 0.01 - 0.04 0.02 0.01 - - 0.07 0.02 -	0.01 0.05 0.01 0.05 0.01 0.04 0.02 0.01 - - 0.07 0.07	0.01 0.05 0.01 0.03 0.01 0.04 0.04 0.02 0.01 	0.0° 0.00 0.00 0.00 0.00 0.00 0.00 0.00
agency Boston-MBTA San Francisco-MUNI Philadaphia-SEPTA Los Angeles-LACMTA San Diego Troley Inc. Si Louis-BSDA Porliand-TCMTDO Dallas-DARTA Satcamento-RTD Bulfact-NFTS Bulfact-NFTS Belimore-MMTA San Jose-SCTD New Orisans-RTA Cleveland-GCRTA Denver-RTD	1984 0.01 0.01 - 0.01 0.01	1985 0.01 0.01 0.01 - 0.01	1986 0.01 0.01 0.01 - 0.01 -	1987 0.01 0.01 0.01 - 0.04 0.02 0.01 - 0.02	1988 0.01 0.01 - 0.04 0.02 0.01 - 0.02 0.01 - 0.09 0.02	0.01 0.01 0.01 - 0.04 0.02 0.01 - 0.09 0.02	0.01 0.01 0.02 0.04 0.02 0.01 - 0.01 - 0.09 0.02	0.01 0.02 0.01 0.05 0.02 0.04 0.02 0.01 - 0.07 0.02	0.01 0.02 0.01 0.05 0.02 0.04 0.02 - - - - 0.07 0.02	0.01 0.02 0.01 0.05 0.02 0.04 0.02 - - - - - - - - - - - - - - - - - - -	0.01 0.02 0.01 0.05 0.01 - 0.04 0.02 0.01 - - 0.01 - 0.07 0.02	0.01 0.05 0.01 0.05 0.01 - 0.04 0.02 0.01 - - 0.07 0.02	0.01 0.05 0.01 0.03 0.01 - 0.04 0.04 0.02 0.01 - - 0.07 0.02	0.01 0.05 0.01 0.03 0.01 - - - - - - - - - - - - - - - - - - -
agency Boston-MBTA San Francisco-MUNI Philadaphia-SEPTA Los Angeles-LACMTA San Diego Troley Inc. Si Louis-BSDA Porliand-TCMTDO Dallas-DARTA Satcamento-RTD Bulfact-NFTS Bulfact-NFTS Belimore-MMTA San Jose-SCTD New Orisans-RTA Cleveland-GCRTA Denver-RTD	1984 0.01 0.01 - 0.01 0.01	1985 0.01 0.01 0.01 - 0.01	1986 0.01 0.01 0.01 - 0.01 -	1987 0.01 0.01 0.01 - 0.04 0.02 0.01 - 0.02	1988 0.01 0.01 - 0.04 0.02 0.01 - 0.02 0.01 - 0.09 0.02	0.01 0.01 0.01 - 0.04 0.02 0.01 - 0.09 0.02	0.01 0.01 0.02 0.04 0.02 0.04 - 0.01 - 0.09 0.02	0.01 0.02 0.01 0.05 0.02 0.04 0.02 0.01 - 0.07 0.02	0.01 0.02 0.01 0.05 0.02 0.04 0.02 - - - - 0.07 0.02	0.01 0.02 0.01 0.05 0.02 0.04 0.02 - - - - - - - - - - - - - - - - - - -	0.01 0.02 0.01 0.05 0.01 - 0.04 0.02 0.01 - - 0.07 0.02 -	0.01 0.05 0.01 0.05 0.01 0.04 0.02 0.01 - - 0.07 0.07	0.01 0.05 0.01 0.03 0.01 0.04 0.04 0.02 0.01 0.01 0.07 0.07	0.01 0.05 0.01 0.03 0.01 - - - - - - - - - - - - - - - - - - -
sgency Bostor-MBTA San Francisco-MUNI Philadelphia-SEPTA Los Angeles-LACMTA San Diego Trolley inc. St. Louis-BSDA Porliand-TCMTDO Dallas-DARTA Sacramento-RTD Pilitsburgh-PAT	1984 0.01 0.01 - - 0.01 0.01	1985 0.01 0.01 0.01 - 0.01	1986 0.01 0.01 0.01 - 0.01 -	1987 0.01 0.01 0.01 - 0.04 0.02 0.01 - 0.02	1988 0.01 0.01 - 0.04 0.02 0.01 - 0.02 0.01 - 0.09 0.02 -	0.01 0.01 0.01 - 0.04 0.02 0.01 - 0.09 0.02 -	0.01 0.01 0.02 0.04 0.02 0.04 0.02 0.01 - 0.09 0.02 -	0.01 0.02 0.01 0.05 0.02 0.04 0.04 0.02 0.01 - 0.07 0.02 -	0.01 0.02 0.01 0.05 0.02 0.04 0.02 - - - - 0.07 0.02	0.01 0.02 0.01 0.05 0.02 0.04 0.02 - - - - - - - - - - - - - - - - - - -	0.01 0.02 0.01 0.05 0.01 - 0.04 0.02 0.01 - - 0.07 0.07 0.02 - - 0.04	0.01 0.05 0.01 0.05 0.01 - 0.04 0.02 0.01 - - 0.07 0.07 0.02 - - 0.04	0.01 0.05 0.01 0.03 0.01 - 0.04 0.04 0.02 0.01 - - - 0.07 0.07 0.02 - - 0.04	0.03 0.02 0.01 0.05 0.02

Circuitry Index

space 1964 1985 1986 1987 1981 1992 1933 1944 1995 1996 1997 Wearhington, D.CWMATA 1.37 1.37 1.33 1.33 1.33 1.33 1.33 1.33 1.34 1.36 1.31 1.33	HEAVY RAIL	Average of ratio	(Node-node	Distance on	ihe network /	Node-node /	Virline Distan	:•)							
New York-MTA-NYCT 1.37 1.37 1.37 1.37 1.36 1.36 1.36 1.36 1.36 1.36 1.36 1.36	agency								1991	1992	1993	1994	1995	1996	1997
Chicoge PTM-CTA 1.41 1.40 1.41 1.34		1.37	1.37	1.37	1.37	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36
Display Autor LMPTA 1.30 1.32 1.32 1.34 1.33 1.33 1.33 1.33 1.33 1.33 1.33 1.33 1.33 1.33 1.33 1.33 1.33 1.33 <th1.33< th=""> 1.33 1.33</th1.33<>	Washington, D.CWMATA	1.36	1.33	1.33	1.33	1.33	1.33	1.33	1.36	1.36	1.36	1.39	1.39	1.39	1.40
Boston-MeTA 1.30 1.32 1.34 1.33 1.33 1.33 1.33 1.33	Chicago-RTA-CTA	1.41	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.39	1.43	1.43	1.43
Description SEPTA 1.33		1.30	1.32	1.32	1.34	1.34	1.34	1.34	1.34	1.34	1.34	1.34	1.34	1.34	1.34
Sam Function-BART 1.23 <th1.23< th=""> 1.23 1.23</th1.23<>	Atlanta-MARTA	1,19	1.24	1.24	1.24	1.22	1.22	1.22	1.22	1.22	1.24	1.24	1.24	1.24	1.25
Light Part Partic 1.25 <th1.25< th=""> 1.25 1.25</th1.25<>	Philadelphia-SEPTA	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33
Numeric MOTA 1.06 1.39 1.39 1.39 1.39 1.30 1.40		1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1,23	1.23	1.23	1.23	1.25	1.27
Baltmore-MUTA 1.09 1.09 1.09 1.08 1.01 1.15	New York-PATHC	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Destinger-MMTA 1.09 1.09 1.09 1.08 1.01 1.22 1.22 1.23 1.11 1.11 1.15 1.20 1.20 1.20 1.20 1.20 1.20 <th1.20< th=""> 1.20 1.20</th1.20<>	Miami-MOTA	1.05	1.39	1.39	1.39	1.39	1.39	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
Lips Angeles-LACMTA 1.22 1.22 1.22 1.13 1.13 Philadelphi-LPATC 1.15					1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.11	1.11	1.11
Philediphin-NL-PATC 1.15 <th1.15< th=""> 1.15 1.15<th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th>1.22</th><th>1.22</th><th>1.22</th><th>1.13</th><th>1.13</th></th1.15<>											1.22	1.22	1.22	1.13	1.13
Cisual mund GCRTA 1.20 <th1.20< th=""> 1.20 1.20<th></th><th>1.15</th><th>1.15</th><th>1.15</th><th>1.15</th><th>1.15</th><th>1.15</th><th>1.15</th><th>1.15</th><th>1.15</th><th>1.15</th><th>1.15</th><th>1.15</th><th>1.15</th><th>1.15</th></th1.20<>		1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
New York-MTA-SIRTOA 1.05 </th <th></th> <th></th> <th></th> <th></th> <th></th> <th>1.20</th> <th></th> <th></th> <th></th> <th>1.20</th> <th>1.20</th> <th>1.20</th> <th>1.20</th> <th>1.20</th> <th>1.20</th>						1.20				1.20	1.20	1.20	1.20	1.20	1.20
AVERAGE 1.37 1.37 1.37 1.37 1.36 <th1.36< th=""> 1.36 1.36 <</th1.36<>				1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
Light RALL Average of ratio Node-node Distance state state <th< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></th<>															
sgarcy 1994 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 Boston-MBTA 1.81 1.81 1.67 1.67 1.67 1.67 1.75															
Boston-MBTA 1.81 1.87 1.87 1.87 1.87 1.87 1.87 1.87 1.87 1.87 1.75 1.76 1.75	LIGHT RAIL														
San Franctice-MUNI 1.79 1.79 1.79 1.79 1.79 1.79 1.79 1.79 1.79 1.79 1.79 1.79 1.79 1.79 1.79 1.79 1.79 1.69 1.69 1.69 1.69 1.48 1.48 1.48 Philadophine-SEPTA 1.71															
Philadeliphie-SEPTA 1.71 </th <th></th>															
Los Argeies-LACMTA 1.07 1.07 1.20 1.20 1.20 1.38 1.51 1.51 1.51 1.51 1.51 1.51 1.51 1.5															
Sam Diego Trolley Inc. 1.07 1.07 1.20 1.20 1.38 1.51 1.51 1.51 1.51 1.53 1.52 1.74 1.49 StL outs-BSDA 1.90 1.20 1.20 1.38 1.51 1.40 1.40 1.40 1.40 1.40 1.40 1.40 1.40 1.40 <		1.71	1.71	1.71	1.71	1.71	1.71	1.71							
St. Louis-DDA Desise-DATA 1.12 1.12 1.12 1.12 1.12 1.12 1.12 1.12 1.13 1.19 1.10 <th1< th=""><th></th><th></th><th>_</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></th1<>			_												
Portiand-TGMTDO 1.22 1.23 1.21 1.21 1.21 1.21 <th1.21< th=""> 1.21 1.21</th1.21<>		1.07	1.07	1.20	1.20	1.20	1.38	1.51	1.51	1.51	1.51				
Datas-DARTA 140 1.41 1.21 1.21 1.21 1.21 1.21 1.21 1.21 1.21 1.21 1.21 1.21 1.21 1.21 1.21 1.12 1.12 1.12 1.12 1.12 1.22 1.22															
Sacramento-RTD 140 121 121					1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22		
PHIBurgh-PAT 1.21 1.12 1.12 1.12 1.12 1.12 1.12 1.12 1.12 1.12 1.12 1.21															
Buffalo-NFTS 1.01 1.02															
Distinguished 1.0 1.10 <t< th=""><th></th><th>1.21</th><th>1.21</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></t<>		1.21	1.21												
San Jose-SCTD 1.15 1.15 1.15 1.15 1.12 <th1.12< th=""> 1.12 1.12</th1.12<>				1.01	1.02	1.02	1.02	1.02	1.02						
New Orleans-RTA 1.26 1.26 1.26 1.26 1.26 1.32 <th1.32< th=""> 1.32 1.32</th1.32<>															
Cleveland-GCRTA 1.32 <th1.32< th=""> 1.32 1.32</th1.32<>															
Derwer-RTD 1.22 1.21 1.17															
Newark-NJC 1.17 1.17 1.17 1.17 1.17 1.17 1.17 1.1		1.32	1.32	1.32	1.32	1.52	1.32	1.32	1.32	1.32	1.32				
Hudson-Bergen LRT 1.45															
riddson Dolgen Litt		1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	
AVERAGE 1.49 1.49 1.45 1.43 1.43 1.43 1.46 1.41 1.42 1.41 1.43 1.39 1.39 1.49													4.30	4.20	
	AVERAGE	1.49	1.49	1.45	1.43	1.43	1.43	1.46	1.41	1.42	1/41	1,45	1.39	1.39	1.49

Network Complexity

HEAVY RAIL	Ralic: (Number	of Links / Nu	mber of acce	ts noints)										
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
New York-MTA-NYCT	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
Washington, D.CWMATA	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Chicago-RTA-CTA	1.01 1.02	1.02 1.02	1.02 1.02	1.02	1.01 1.02	1.00	1.00 1.02	1.00	1.01	1.01 1.02	1.00 1.02	1.02 1.02	1.06 1.02	1.06 1.02
Boston-MBTA Atlanta-MARTA	0.95	0.96	0.96	0.97	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Philadelphia-SEPTA	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
San Francisco-BART	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.05
New York-PATHC	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
Miami-MOTA	0.90	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Baltimore-MMTA Los Angeles-LACMTA	0.89	0.89	0.89	0.92	0.92	0.92	0.92	0.92	0.92	0.92 0.80	0.92	0.93	0.93 0.88	0.93
Philadelphia-NJ-PATC	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Cleveland-GCRTA	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
New York-MTA-SIRTOA	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
AVERAGE	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.99	0.99	1.00	1.00
LIGHT RAIL	Ratio: (Number 1984	of Links / Nu 1985	mber of acce: 1986	ss points) 1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
agency Boston-MBTA	1.00	1,00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
San Francisco-MUNI	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.02	1.02	1.02	1.02	1.09	1.09	1.09
Philadelphia-SEPTA	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Los Angeles-LACMTA								1.05	1.05	1.05	1.05	1.05	1.03	1.03
San Diego Trolley Inc.	0.94	0.95	0.95	0.95	0.95	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SI. Louis-BSDA Portland-TCMTDO Dallas-DARTA				1.03	1.03	1.03	1.03	1.03	1.03	1.03	0.94 1.03	0.94 1.03	0.94 1.03 1.00	0.94 0.97 1.00
Sacremento-RTD				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Pittsburgh-PAT	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	0.99	0.99	1.01	1.01	1.01	1.01
Buffalo-NFTS			0.92	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Ballimore-MMTA					1.10	1.10	1,10	1.09	0.93	0.96	0.96	0.96 1.09	0.96	0.96
San Jose-SCTD New Orleans-RTA	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.03	1.02	1.02	1.02	1.03	1.03	1.00
Cleveland-GCRTA	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Denver-RTD											1.00	1.00	1.00	1.00
Newark-NJTC Hudson-Bergen LRT	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91 0.97
AVERAGE	0.98	0.98	0.97	0.98	0.99	0.99	1.00	1.00	0.99	1.00	1.00	1.00	1.00	0.99
Connectivity Ir	ıdex													
Connectivity Ir			- / • •											
HEAVY RAIL	Ratio: (Actual n					1989	1990	1991	1992	1993	1994	1995	1996	1997
HEAVY RAIL agency	Ratio: (Actual ni 1984	1985	1986	1987	1988	1989 0.36	1990 0.36	1991 0.36	1992 0,36	1993 0.36	1994 0.36	1995 0,36	1996 0.36	1997 0.36
HEAVY RAIL agency New York-MTA-NYCT Weshington, D.CWMATA	Ratio: (Actual ni 1984 0.36 0.35	1985 0.36 0.35	1986 0.36 0.35	1987 0.36 0.35	1988 0.36 0.35	0.36 0.35	0.36 0.35	0.36 0.35	0.36 0.35	0.36 0.35	0.36 0.35	0.36 0.35	1996 0.36 0.35	0.36 0.35
HEAVY RAIL agency New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA	Ratio: (Actual n 1984 0.36 0.35 0.34	1985 0.36 0.35 0.35	1986 0.36 0.35 0.35	1987 0.36 0.35 0.35	1988 0.36 0.35 0.34	0.36 0.35 0.34	0.36 0.35 0.34	0.36 0.35 0.34	0.36 0.35 0.34	0.36 0.35 0.34	0.36 0.35 0.34	0.36 0.35 0.34	0.36 0.35 0.36	0.36 0.35 0.36
HEAVY RAIL agency New York MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Esston-META	Ratio: (Actual ni 1964 0.36 0.35 0.34 0.35	1985 0.36 0.35 0.35 0.35	1986 0.36 0.35 0.35 0.35	1987 0.36 0.35 0.35 0.35	1988 0.36 0.35 0.34 0.35	0.36 0.35 0.34 0.35	0.36 0.35 0.34 0.35	0.36 0.35 0.34 0.35	0.36 0.35 0.34 0.35	0.36 0.35 0.34 0.35	0.36 0.35 0.34 0.35	0.36 0.35 0.34 0.35	0.36 0.35 0.36 0.35	0.36 0.35 0.36 0.35
HEAVY RAIL agency New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-WBTA Aliania-MWRTA	Ratio: (Actual m 1984 0.36 0.35 0.34 0.35 0.35	1985 0.36 0.35 0.35 0.35 0.35	1986 0.36 0.35 0.35 0.35 0.35	1987 0.36 0.35 0.35 0.35 0.35	1988 0.36 0.35 0.34 0.35 0.35	0.36 0.35 0.34 0.35 0.35	0.36 0.35 0.34 0.35 0.35	0.36 0.35 0.34 0.35 0.35	0.36 0.35 0.34 0.35 0.35	0.36 0.35 0.34 0.35 0.36	0.36 0.35 0.34 0.35 0.36	0.36 0.35 0.34 0.35 0.35	0.36 0.35 0.36 0.35 0.35	0.36 0.35 0.36 0.35 0.35
HEAVY RAIL agency New York MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Esston-META	Ratio: (Actual ni 1964 0.36 0.35 0.34 0.35	1985 0.36 0.35 0.35 0.35	1986 0.36 0.35 0.35 0.35	1987 0.36 0.35 0.35 0.35	1988 0.36 0.35 0.34 0.35	0.36 0.35 0.34 0.35	0.36 0.35 0.34 0.35	0.36 0.35 0.34 0.35	0.36 0.35 0.34 0.35	0.36 0.35 0.34 0.35	0.36 0.35 0.34 0.35	0.36 0.35 0.34 0.35	0.36 0.35 0.36 0.35	0.36 0.35 0.36 0.35
HEAVY RAIL New York-MTA-NYCT Washington, D.CVWATA Chicago-RTA-CTA Boston-MBTA Allanda-MRRTA Philadelphia-SEPTA San Francisco-BART New York-PATHC	Ratio: (Actual m 1984 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.38 0.45	1985 0,36 0.35 0.35 0.35 0.35 0.35 0.35 0.38 0.38	1986 0,36 0.35 0.35 0,35 0,35 0,35 0,35 0,38 0,45	1987 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.38 0.38 0.45	1988 0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.38 0.45	0.36 0.35 0.34 0.35 0.35 0.35 0.38 0.45	0.36 0.35 0.34 0.35 0.35 0.35 0.36 0.38 0.45	0.36 0.35 0.34 0.35 0.35 0.35 0.38 0.45	0.36 0.35 0.34 0.35 0.35 0.35 0.38 0.45	0.36 0.35 0.34 0.35 0.36 0.35 0.38 0.38 0.45	0.36 0.35 0.34 0.35 0.36 0.35 0.38 0.45	0.36 0.35 0.34 0.35 0.36 0.35 0.38 0.38 0.45	0.36 0.35 0.36 0.35 0.36 0.35 0.37 0.45	0.36 0.35 0.35 0.36 0.35 0.35 0.37 0.45
HEAVY RAIL agency New York-MTA-NYCT Washington, D. C. VWAATA Chicago-RTA-CTA Oston-MBTA Allania-MARTA Philadeiphia-SEPTA San Francisco-BART New York-PATHC Miami-MDTA	Ratio: (Actual m 1984 0.36 0.35 0.35 0.35 0.35 0.35 0.38 0.45 0.38	1985 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.38 0.45 0.35	1986 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.38 0.45 0.35	1987 0.36 0.35 0.35 0.35 0.35 0.35 0.38 0.45 0.35	1988 0.36 0.35 0.34 0.35 0.35 0.35 0.38 0.38 0.45 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.38 0.45 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.38 0.45 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.38 0.45 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.38 0.45 0.35	0.36 0.35 0.34 0.35 0.36 0.35 0.38 0.45 0.35	0.36 0.35 0.34 0.35 0.36 0.35 0.38 0.45 0.35	0.36 0.35 0.34 0.35 0.36 0.35 0.38 0.45 0.35	0.36 0.35 0.36 0.35 0.36 0.35 0.35 0.37 0.45 0.35	0.36 0.35 0.36 0.35 0.36 0.35 0.37 0.45 0.35
HEAVY RAIL agency New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-MBTA Allanta-MARTA Philadelpha-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Baltimore-MMTA	Ratio: (Actual m 1984 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.38 0.45	1985 0,36 0.35 0.35 0.35 0.35 0.35 0.35 0.38 0.38	1986 0,36 0.35 0.35 0,35 0,35 0,35 0,35 0,38 0,45	1987 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.38 0.38 0.45	1988 0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.38 0.45	0.36 0.35 0.34 0.35 0.35 0.35 0.38 0.45	0.36 0.35 0.34 0.35 0.35 0.35 0.36 0.38 0.45	0.36 0.35 0.34 0.35 0.35 0.35 0.38 0.45	0.36 0.35 0.34 0.35 0.35 0.35 0.38 0.45	0.36 0.35 0.34 0.35 0.36 0.35 0.38 0.45 0.35 0.35 0.37	0.36 0.35 0.34 0.35 0.36 0.35 0.38 0.45 0.35 0.35 0.37	0.36 0.35 0.34 0.35 0.36 0.35 0.38 0.45 0.35 0.35 0.36	0.36 0.35 0.36 0.35 0.36 0.35 0.35 0.37 0.45 0.35 0.35 0.36	0.36 0.35 0.36 0.35 0.36 0.35 0.35 0.37 0.45 0.35 0.35
HEAVY RAIL agency New York-MTA-NYCT Washington D.C.VWMATA Okcage-RTA-CTA Boston-MBTA Aliaria-MARTA Philadebins-SEPTA San Francisco-BART New York-PATHC Miarri-MDTA Baltimore-MMTA Los Angeles-LACMTA	Ratio: (Actual m 1984 0.36 0.35 0.35 0.35 0.35 0.35 0.36 0.45 0.38	1985 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.38 0.45 0.35	1986 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.38 0.45 0.35	1987 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.38 0.45 0.35 0.35 0.37	1988 0.36 0.35 0.34 0.35 0.35 0.35 0.38 0.38 0.45 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.38 0.45 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.38 0.45 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.38 0.45 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.38 0.45 0.35	0.36 0.35 0.34 0.35 0.36 0.35 0.38 0.45 0.35	0.36 0.35 0.34 0.35 0.36 0.35 0.38 0.45 0.35 0.35 0.37 0.44	0.36 0.35 0.34 0.35 0.36 0.35 0.38 0.45 0.35	0.36 0.35 0.36 0.35 0.36 0.35 0.35 0.37 0.45 0.35	0.36 0.35 0.36 0.35 0.36 0.35 0.37 0.45 0.35
HEAVY RAIL agency New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-MBTA Allanta-MARTA Philadelpha-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Baltimore-MMTA	Ratio: (Actual n 1984 0.35 0.35 0.35 0.35 0.35 0.38 0.45 0.38 0.38	1985 0.36 0.35 0.35 0.35 0.35 0.35 0.38 0.45 0.35 0.38	1986 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.38 0.45 0.35 0.38	1987 0.36 0.35 0.35 0.35 0.35 0.35 0.38 0.45 0.35	1988 0.36 0.35 0.35 0.35 0.35 0.35 0.38 0.45 0.35 0.35 0.37	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.38 0.45 0.35 0.37	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.38 0.45 0.35 0.37	0.36 0.35 0.34 0.35 0.35 0.35 0.38 0.35 0.38 0.35 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.38 0.45 0.35 0.37	0.36 0.35 0.34 0.35 0.36 0.35 0.38 0.45 0.35 0.37 0.44	0.36 0.35 0.34 0.35 0.36 0.35 0.38 0.45 0.35 0.35 0.37	0.36 0.35 0.34 0.35 0.36 0.35 0.38 0.45 0.35 0.36 0.36	0.36 0.35 0.36 0.35 0.36 0.35 0.37 0.45 0.35 0.35 0.36 0.39	0.36 0.35 0.36 0.35 0.36 0.35 0.37 0.45 0.35 0.35 0.36 0.39
HEAVY RAIL agency New York-MTA-NYCT Washington D.CWMATA Chicago-RTA-CTA Boston-MBTA Aliania-MKRTA Aliania-MKRTA Aliania-MKRTA Saf Francisco-BART New York-PATHC Miami-MDTA Balimora-MMTA Los Angeles-LACMTA Philadelphis-NJ-PATC Cleveland-GCRTA New York-MTA-SiRTOA	Ratio: (Actual m 1984 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.38 0.38 0.38 0.38 0.38 0.35	1985 0.36 0.35 0.35 0.35 0.35 0.35 0.38 0.45 0.35 0.38 0.36 0.35 0.35	1986 0.36 0.35 0.35 0.35 0.35 0.35 0.38 0.45 0.38 0.36 0.36 0.35 0.35	1987 0.36 0.35 0.35 0.35 0.35 0.35 0.38 0.45 0.35 0.37 0.36 0.35 0.35	1988 0.36 0.34 0.35 0.35 0.35 0.35 0.38 0.45 0.35 0.37 0.36 0.35 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.38 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.36 0.35 0.37 0.36 0.35 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.38 0.35 0.36 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.38 0.35 0.38 0.35 0.37 0.36 0.35 0.35	0.36 0.35 0.34 0.35 0.36 0.35 0.38 0.35 0.35 0.37 0.44 0.36 0.35 0.35	0.36 0.35 0.34 0.35 0.36 0.35 0.38 0.35 0.35 0.37 0.44 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.36 0.35 0.38 0.35 0.35 0.36 0.44 0.36 0.35 0.35	0.36 0.35 0.36 0.35 0.36 0.35 0.37 0.45 0.35 0.35 0.36 0.39 0.36 0.35 0.35	0.36 0.35 0.36 0.35 0.36 0.35 0.37 0.45 0.35 0.36 0.39 0.36 0.35 0.35
HEAVY RAIL agency New York-MTA-NYCT Washington D.C. VWART Obstor-MBTA Aliaria-MARTA Philadebphis-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Baltimors-MMTA Los Angeles-LACMTA Philadebphis-NJ-PATC Cleveland-GCRTA	Ratio: (Actual m 1994 0.36 0.35 0.35 0.35 0.35 0.38 0.45 0.38 0.38 0.38 0.36 0.35	1985 0.36 0.35 0.35 0.35 0.35 0.35 0.38 0.45 0.36 0.36 0.35	1986 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.38 0.45 0.35 0.38 0.36 0.35	1987 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.38 0.45 0.35 0.37 0.36 0.35	1966 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.38 0.45 0.35 0.37 0.36 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.38 0.45 0.35 0.37 0.36 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.38 0.45 0.35 0.37 0.36 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.38 0.45 0.35 0.37 0.36 0.35	0.36 0.35 0.34 0.35 0.36 0.35 0.38 0.45 0.35 0.37 0.37 0.36 0.35	0.36 0.35 0.34 0.35 0.36 0.35 0.38 0.45 0.35 0.37 0.37 0.36 0.35	0.36 0.35 0.34 0.35 0.36 0.35 0.38 0.45 0.35 0.36 0.44 0.36 0.35	0.36 0.35 0.36 0.35 0.36 0.35 0.37 0.45 0.35 0.36 0.39 0.36 0.35	0.36 0.35 0.36 0.35 0.36 0.35 0.37 0.45 0.35 0.36 0.39 0.36 0.35
HEAVY RAIL agency New York-MTA-NYCT Washington D.CWMATA Chicago-RTA-CTA Boston-MBTA Aliania-MKRTA Aliania-MKRTA Aliania-MKRTA Saf Francisco-BART New York-PATHC Miami-MDTA Balimora-MMTA Los Angeles-LACMTA Philadelphis-NJ-PATC Cieveland-GCRTA New York-MTA-SiRTOA	Ratio: (Actual m 1984 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.38 0.38 0.38 0.38 0.38 0.35	1995 0.36 0.35 0.35 0.35 0.35 0.35 0.45 0.45 0.36 0.36 0.35 0.35 0.37	1996 0.35 0.35 0.35 0.35 0.35 0.38 0.45 0.38 0.38 0.36 0.35 0.35 0.37	1987 0.35 0.35 0.35 0.35 0.35 0.38 0.45 0.37 0.36 0.37 0.36 0.35 0.35 0.35	1988 0.35 0.35 0.35 0.35 0.35 0.35 0.38 0.45 0.37 0.36 0.37 0.36 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.38 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.36 0.35 0.37 0.36 0.35 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.38 0.35 0.36 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.38 0.35 0.38 0.35 0.37 0.36 0.35 0.35	0.36 0.35 0.34 0.35 0.36 0.35 0.38 0.35 0.35 0.37 0.44 0.36 0.35 0.35	0.36 0.35 0.34 0.35 0.36 0.35 0.38 0.35 0.35 0.37 0.44 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.36 0.35 0.38 0.35 0.35 0.36 0.44 0.36 0.35 0.35	0.36 0.35 0.36 0.35 0.36 0.35 0.37 0.45 0.35 0.35 0.36 0.39 0.36 0.35 0.35	0.36 0.35 0.36 0.35 0.36 0.35 0.37 0.45 0.35 0.35 0.36 0.35 0.35 0.35
HEAVY RAIL agency New York-MTA-NYCT Washington, D.C.VWMATA Chicago-RTA-CTA Boston-WBTA Aliaria-MARTA Philadelphis-SEPTA San Francisco-BART New York-PATHC Miarri-MDTA Baltimora-MMTA Los Angeles-LACMTA Hisadelphis-NJ-PATC Clevaland-SCRTA New York-MTA-SIRTOA AVERAGE	Ratio: (Actual m 1984 0.36 0.34 0.35 0.35 0.35 0.35 0.38 0.38 0.38 0.36 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.37	1986 0.36 0.35 0.35 0.35 0.35 0.36 0.38 0.45 0.38 0.36 0.36 0.35 0.37	1996 0.35 0.35 0.35 0.35 0.35 0.35 0.38 0.45 0.38 0.36 0.36 0.35 0.37 0.37	1987 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.38 0.45 0.37 0.36 0.35 0.35 0.35 0.36	1986 0.35 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.37 0.36 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.37 0.36 0.35 0.35 0.35 0.36	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.37 0.36 0.35 0.35 0.35 0.35	0.35 0.34 0.34 0.35 0.35 0.35 0.35 0.45 0.45 0.35 0.37 0.36 0.35 0.35 0.35	0.36 0.35 0.35 0.35 0.35 0.35 0.45 0.45 0.45 0.37 0.36 0.35 0.36 0.35 0.36	0.36 0.35 0.34 0.35 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.37 0.44 0.36 0.35 0.37	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.35 0.35 0.35 0.35 0.36 0.35 0.36 0.44 0.36 0.35 0.35 0.35 0.37	0.36 0.35 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.36 0.39 0.36 0.35 0.36 0.35 0.35 0.37	0.36 0.35 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.36 0.39 0.36 0.35 0.35 0.35 0.37
HEAVY RAIL agency New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-MBTA Aliaria-MARTA Philadelphia-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Baitmora-MATA Baitmora-MATA Baitmora-MATA Baitmora-MATA Distance-CRTA New York-MTA-SIRTOA AVERAGE	Ratio: (Actual m 1984 0.36 0.34 0.35 0.35 0.35 0.35 0.38 0.38 0.38 0.33 0.33 0.33 0.33 0.33	1986 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.38 0.35 0.38 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	1986 0.35 0.35 0.35 0.35 0.35 0.35 0.36 0.35 0.38 0.35 0.38 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	1987 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.45 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.3	1986 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.45 0.45 0.35 0.35 0.35 0.35 0.35 0.35 0.36 0.35 0.36 0.35 0.36	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.45 0.45 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.3	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.45 0.35 0.35 0.35 0.35 0.35 0.36 0.35 0.36 0.35 0.36	0.36 0.35 0.34 0.35 0.36 0.35 0.45 0.45 0.45 0.45 0.37 0.44 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.36 0.35 0.45 0.45 0.45 0.37 0.44 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.38 0.45 0.35 0.36 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.37	0.36 0.35 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.33 0.36 0.39 0.36 0.35 0.35 0.35 0.35 0.35 0.37	0.36 0.35 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35
HEAVY RAIL agency New York-MTA-NYCT Washington, D.C.VWARTA Chicago-RTA-CTA Boston-MBTA Aliaria-MARTA Philadebhis-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Ballimore-MMTA Datadebhis-NJ-PATC Cleveland-SCRTA New York-MTA-SIRTOA AVERAGE	Ratio: (Actual m 1984 0.36 0.34 0.35 0.35 0.35 0.38 0.38 0.38 0.38 0.38 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.37 Ratio: (Actual m 1984 0.34	1986 0.36 0.35 0.35 0.35 0.35 0.36 0.45 0.38 0.36 0.35 0.36 0.35 0.37 0.37	1996 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.45 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	1987 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.38 0.45 0.35 0.37 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	1986 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.45 0.45 0.45 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.3	0.36 0.35 0.34 0.35 0.35 0.35 0.45 0.45 0.45 0.35 0.37 0.36 0.35 0.35 0.35 0.36	0.36 0.35 0.34 0.35 0.35 0.36 0.36 0.37 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.35 0.34 0.35 0.35 0.35 0.35 0.36 0.45 0.45 0.37 0.36 0.35 0.36 0.36	0.36 0.34 0.35 0.35 0.35 0.36 0.45 0.37 0.36 0.35 0.35 0.36	0.35 0.34 0.35 0.35 0.35 0.35 0.38 0.45 0.37 0.44 0.36 0.35 0.37 0.36 0.37	0.36 0.34 0.35 0.35 0.35 0.38 0.38 0.37 0.44 0.35 0.37 0.35 0.37	0.36 0.35 0.35 0.36 0.35 0.36 0.45 0.36 0.36 0.36 0.36 0.35 0.37	0.36 0.35 0.35 0.35 0.37 0.35 0.37 0.45 0.37 0.45 0.36 0.36 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.37	0.36 0.35 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.37
HEAVY RAL agency New York-MTA-NYCT Washington D.C-WMATA Chicago-RTA-CTA Boston-MBTA Allenias-MARTA Philadelphia-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Baltimora-MMTA Los Angeles-LACMTA Philadelphia-NJ-PATC Cityotaind-GCRTA New York-MTA-SIRTOA AVERAGE	Ratio: (Actual m 1984 0.36 0.34 0.35 0.35 0.35 0.35 0.38 0.38 0.38 0.33 0.33 0.33 0.33 0.33	1986 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.38 0.35 0.38 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	1986 0.35 0.35 0.35 0.35 0.35 0.35 0.36 0.35 0.38 0.35 0.38 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	1987 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.45 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.3	1986 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.45 0.45 0.35 0.35 0.35 0.35 0.35 0.35 0.36 0.35 0.36 0.35 0.36	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.36 0.35 0.45 0.45 0.45 0.45 0.37 0.44 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.36 0.35 0.45 0.45 0.45 0.37 0.44 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.45 0.45 0.44 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.37	0.36 0.35 0.36 0.35 0.35 0.35 0.35 0.35 0.36 0.39 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.37	0.36 0.35 0.36 0.35 0.35 0.37 0.45 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.3
HEAVY RAIL agency New York-MTA-NYCT Washington, D.C.VWARTA Chicago-RTA-CTA Boston-MBTA Aliaria-MARTA Philadebhis-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Ballimore-MMTA Datadebhis-NJ-PATC Cleveland-SCRTA New York-MTA-SIRTOA AVERAGE	Ratio: (Actual m 1984 0.36 0.34 0.35 0.35 0.35 0.38 0.38 0.38 0.38 0.38 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.37 Ratio: (Actual m 1984 0.34	1986 0.36 0.35 0.35 0.35 0.35 0.36 0.45 0.38 0.36 0.35 0.36 0.35 0.37 0.37	1996 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.45 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	1987 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.38 0.45 0.35 0.37 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	1986 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.45 0.45 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.3	0.36 0.35 0.34 0.35 0.35 0.35 0.45 0.45 0.45 0.35 0.37 0.36 0.35 0.35 0.35 0.36	0.36 0.35 0.34 0.35 0.35 0.36 0.36 0.37 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.35 0.34 0.35 0.35 0.35 0.35 0.36 0.45 0.45 0.37 0.36 0.35 0.36 0.36	0.36 0.34 0.35 0.35 0.35 0.36 0.45 0.37 0.36 0.35 0.35 0.36	0.36 0.35 0.34 0.35 0.36 0.35 0.38 0.45 0.35 0.37 0.44 0.36 0.35 0.37 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.36 0.35 0.38 0.45 0.37 0.44 0.36 0.37 0.44 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.35 0.36 0.35 0.36 0.45 0.36 0.36 0.36 0.36 0.35 0.37	0.36 0.35 0.35 0.35 0.37 0.35 0.37 0.45 0.37 0.36 0.36 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.37	0.36 0.35 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.37
HEAVY RAIL agency New York-MTA-NYCT Washington D.CWMATA Chicago-RTA-CTA Boston-MBTA Allanias-MRRTA Philadelphia-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Baitmors-MMTA Los Angeles-LACMTA Philadelphia-NJ-PATC Citvoland-GCRTA New York-MTA-SIRTOA AVERAGE	Ratio: (Actual m 1964 0.36 0.34 0.35 0.35 0.35 0.38 0.38 0.38 0.36 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	1986 0.36 0.35 0.35 0.35 0.35 0.35 0.45 0.45 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.3	1996 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	1987 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	1986 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.45 0.45 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.3	0.35 0.34 0.35 0.35 0.35 0.35 0.36 0.45 0.37 0.36 0.35 0.36 0.35 0.36 0.35 0.36	0.35 0.34 0.35 0.35 0.35 0.36 0.45 0.37 0.36 0.35 0.37 0.36 0.35 0.36	0.35 0.34 0.35 0.35 0.35 0.35 0.36 0.45 0.45 0.37 0.36 0.36 0.35 0.36 0.36	0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.45 0.37 0.36 0.35 0.36 0.36 0.36	0.35 0.34 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.37 0.45 0.35 0.37 0.36 0.35 0.37	0.35 0.34 0.35 0.36 0.35 0.35 0.38 0.45 0.37 0.44 0.35 0.37 0.37 0.44 0.35 0.37	0.36 0.35 0.34 0.35 0.35 0.35 0.45 0.45 0.36 0.45 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.36 0.36 0.38 0.37 0.35 0.35 0.35 0.36 0.36 0.36 0.36 0.35 0.35 0.37	0.36 0.35 0.36 0.36 0.37 0.37 0.35 0.35 0.36 0.35 0.35 0.35 0.35 0.37 0.34 0.34 0.38 0.34
HEAVY RAIL agency New York-MTA-NYCT Washington, D.C. VWART Obston-MBTA Aliaria-MARTA Philadelphis-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Balimora-MMTA Balimora-MMTA Balimora-MMTA Balimora-MMTA Balimora-MMTA Balimora-MMTA Claveland-SCRTA New York-MTA-SIRTOA AVERAGE	Ratio: (Actual m 1964 0.36 0.34 0.35 0.35 0.35 0.38 0.38 0.38 0.36 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	1986 0.36 0.35 0.35 0.35 0.35 0.35 0.45 0.45 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.3	1996 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	1987 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	1986 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.35 0.34 0.35 0.35 0.35 0.35 0.38 0.45 0.35 0.37 0.36 0.35 0.35 0.35 0.36 0.35 0.36 0.34 0.34 0.34 0.34 0.34 0.34 0.35	0.35 0.35 0.34 0.35 0.35 0.35 0.38 0.45 0.35 0.35 0.35 0.35 0.35 0.36	0.36 0.35 0.34 0.35 0.35 0.35 0.38 0.45 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.3	0.35 0.34 0.35 0.35 0.35 0.35 0.38 0.45 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.3	0.36 0.35 0.34 0.35 0.35 0.38 0.45 0.33 0.35 0.35 0.35 0.35 0.35 0.35 0.3	0.36 0.35 0.34 0.35 0.35 0.38 0.45 0.35 0.37 0.37 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.37	0 35 0 35 0 34 0 35 0 .36 0 .36 0 .35 0 .35 0 .35 0 .35 0 .35 0 .35 0 .35 0 .35 0 .37 0 .34 0 .37 0 .34 0 .35 0 .37 0 .38 0 .35 0 .37	0.35 0.35 0.35 0.35 0.37 0.37 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.36 0.35 0.35 0.37 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35
HEAVY RAIL agency New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-MBTA Aliaria-MARTA Philadelphia-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Baltimora-MMTA Los Angeise-LACMTA Philadelphia-NJ-PATC Clavaland-SCRTA New York-MTA-SIRTOA AVERAGE LIGHT RAL agency Boston-MBTA San Francisco-MUNI Philadelphia-SEPTA Los Angeise-LACMTA San Diago Trolley Inc. S1. Louz-BSDA Portiani-TCMTOD Datas-DARTA Sacrametin-RTD	Ratio: (Actual m 1984 0.36 0.35 0.35 0.35 0.35 0.35 0.38 0.36 0.38 0.38 0.38 0.38 0.38 0.38 0.35 0.33 0.35 0.35 0.35 0.35 0.35 0.35	1986 0.36 0.35 0.35 0.35 0.35 0.35 0.45 0.45 0.45 0.35 0.35 0.36 0.35 0.37 0.37	1996 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	1987 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.45 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.3	1986 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.45 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.3	0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.37 0.36 0.35 0.36 0.35 0.36 0.36 0.36 0.36 0.36 0.36 0.36 0.36	0.35 0.35 0.34 0.35 0.35 0.35 0.38 0.35 0.36 0.35 0.35 0.35 0.35 0.36	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.37 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.37 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.35 0.34 0.35 0.36 0.35 0.35 0.35 0.35 0.37 0.44 0.35 0.37 0.37 0.37 0.37 0.33 0.33 0.33 0.33	0.36 0.35 0.34 0.35 0.36 0.38 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.35 0.34 0.35 0.36 0.35 0.35 0.35 0.35 0.35 0.36 0.44 0.36 0.35 0.37 0.37 0.37 0.34 0.35 0.37 0.37 0.34 0.35 0.37	0.36 0.36 0.36 0.36 0.37 0.35 0.35 0.35 0.36 0.39 0.36 0.35 0.35 0.35 0.37 0.34 0.34 0.35 0.37 0.34 0.35 0.35 0.37 0.34	0.36 0.35 0.36 0.36 0.37 0.37 0.35 0.35 0.36 0.35 0.35 0.35 0.37 0.37 0.37 0.37 0.37 0.37 0.34 0.35 0.35 0.35
HEAVY RAIL agency New York-MTA-NYCT Washington, D.C. VWART Obston-MBTA Aliaria-MARTA Philadelphis-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Balimora-MMTA Balimora-MMTA Balimora-MMTA Balimora-MMTA Balimora-MMTA Balimora-MMTA Claveland-SCRTA New York-MTA-SIRTOA AVERAGE	Ratio: (Actual m 1964 0.36 0.34 0.35 0.35 0.35 0.38 0.38 0.38 0.36 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	1986 0.36 0.35 0.35 0.35 0.35 0.35 0.45 0.45 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.3	1986 0.36 0.35 0.35 0.35 0.35 0.35 0.45 0.45 0.35 0.35 0.35 0.36 0.35 0.37 1986 0.34 0.34 0.34 0.34 0.34 0.35	1987 0.36 0.35 0.35 0.35 0.35 0.35 0.45 0.45 0.45 0.35 0.35 0.36 0.36 0.36 0.35 0.36 0.36 0.36 0.34 0.34 0.34 0.34 0.34 0.35 0.35	1986 0.36 0.36 0.34 0.34 0.35 0.35 0.35 0.45 0.45 0.45 0.35 0.36 0.35 0.36 0.35 0.36 0.35 0.36 0.35 0.36 0.34 0.34 0.34 0.34 0.34 0.35	0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.37 0.36 0.35 0.35 0.35 0.36	0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.37 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.34 0.34 0.34 0.34 0.35 0.37 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.38 0.45 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.3	0.35 0.34 0.35 0.35 0.35 0.35 0.38 0.45 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.3	0.36 0.35 0.34 0.35 0.38 0.35 0.35 0.35 0.37 0.36 0.35 0.37 0.34 0.35 0.35 0.37 0.35	0.36 0.35 0.34 0.35 0.35 0.38 0.45 0.35 0.37 0.37 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.37	0 35 0 35 0 34 0 35 0 .36 0 .36 0 .35 0 .35 0 .35 0 .35 0 .35 0 .35 0 .35 0 .35 0 .37 0 .34 0 .37 0 .34 0 .35 0 .37 0 .38 0 .35 0 .37	0.35 0.35 0.35 0.35 0.37 0.37 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.36 0.35 0.35 0.37 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35
HEAVY RAIL agency New York-MTA-NYCT Washington, D.C. VWAT- Chicago-RTA-CTA Boston-MBTA Aliaria-MARTA Philadelphis-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Ballimore-MMTA Los Angeles-LACMTA Philadelphis-SEPTA Light RAIL egency Boston-MBTA San Francisco-MUNI Philadelphia-SEPTA Los Angeles-LACMTA San Francisco-MUNI Philadelphia-SEPTA Los Angeles-LACMTA San Francisco-MUNI Philadelphia-SEPTA San Diego Trolley Inc. Si, Louiz-BSDA Portion-TCMTDO Dalias-DARTA Sacamento-RTD Philaburgh-PAT	Ratio: (Actual m 1984 0.36 0.35 0.35 0.35 0.35 0.35 0.38 0.36 0.38 0.38 0.38 0.38 0.38 0.38 0.35 0.33 0.35 0.35 0.35 0.35 0.35 0.35	1986 0.36 0.35 0.35 0.35 0.35 0.35 0.45 0.45 0.45 0.35 0.35 0.36 0.35 0.37 0.37	1996 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	1987 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	1986 0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.36 0.36 0.36 0.36 0.36 0.36 0.36 0.36	0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.38 0.45 0.37 0.36 0.35 0.35 0.35 0.36 0.34 0.34 0.34 0.37 0.36 0.37	0.35 0.35 0.34 0.35 0.35 0.35 0.35 0.36 0.45 0.37 0.36 0.35 0.35 0.35 0.36 0.34 0.34 0.34 0.37 0.36 0.37	0.36 0.33 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.35 0.35 0.34 0.35 0.35 0.38 0.45 0.35 0.37 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.35 0.34 0.34 0.35 0.35 0.38 0.45 0.35 0.37 0.37 0.36 0.35 0.35 0.35 0.37 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.35 0.38 0.45 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.3	0 35 0 34 0 35 0 34 0 35 0 36 0 35 0 35 0 35 0 35 0 34 0 37 0 34 0 37 0 34 0 37 0 34 0 37 0 34 0 37 0 34 0 37 0 38 0 35 0 37 0 34 0 35 0 35 0 37 0 34 0 35 0 35 0 34 0 35 0 35 0 34 0 35 0 35 0 35 0 35 0 35 0 35 0 35 0 35	0.35 0.35 0.35 0.35 0.37 0.35 0.37 0.35 0.35 0.35 0.35 0.35 0.35 0.37 0.35 0.35 0.37 0.34 0.37 0.34 0.37 0.34 0.37 0.34 0.37 0.34 0.35 0.35 0.35	0.36 0.36 0.35 0.35 0.37 0.35 0.35 0.35 0.35 0.35 0.35 0.37 0.37 0.34 0.37 0.34 0.37 0.34 0.37 0.34 0.37 0.34 0.35
HEAVY RAIL agency New York-MTA-NYCT Washington, D.C.VWATA Chicago-RTA-CTA Boston-MBTA Aliaria-MARTA Philadebhis-SEPTA San Francisco-BART New York-PATHC Miamt-MDTA Baltimore-MMTA Baltimore-MMTA Baltimore-MATA Clavaland-SCRTA New York-MTA-SIRTOA AVERAGE LIGHT RAIL agency Boston-MBTA San Francisco-MUNI Philadebhis-SEPTA Los Angeise-LACMTA San Diego Trolley Inc. S1, Louis-BSDA Portland-TCMTDO Dallas-DARTA Secamento-RTD Philaburgh-PAT Buffalo-NTS Baltimore-MMTA San Jose SCTD	Ratio: (Actual m 1984 0.36 0.34 0.35 0.35 0.35 0.38 0.38 0.38 0.38 0.38 0.36 0.35 0.35 0.35 0.37 7 Ratio: (Actual m 1984 0.34 0.34 0.34 0.35	1986 0.36 0.35 0.35 0.35 0.35 0.35 0.45 0.45 0.35 0.36 0.35 0.36 0.35 0.37 0.37 0.34 0.34 0.34 0.34	1986 0.36 0.35 0.35 0.35 0.35 0.35 0.45 0.45 0.35 0.35 0.36 0.35 0.35 0.37 x / Maximum 1986 0.34 0.34 0.34 0.34 0.35	1987 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.45 0.35 0.35 0.36 0.35 0.36 0.35 0.36 0.35 0.36 0.35 0.36 0.34 0.34 0.34 0.34 0.34	1988 0.36 0.35 0.34 0.34 0.35 0.35 0.35 0.35 0.45 0.35 0.36 0.35 0.36 0.36 0.36 0.36 0.36 0.36 0.36 0.34 0.34 0.34 0.36 0.34 0.34 0.34 0.35	0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.37 0.36 0.35 0.35 0.35 0.36 0.36 0.34 0.34 0.34 0.35 0.34 0.34 0.35	0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0 35 0 34 0 35 0 34 0 35 0 35 0 35 0 35 0 37 0 36 0 35 0 35 0 35 0 35 0 35 0 35 0 35 0 35	0.36 0.35 0.34 0.35 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.35 0.34 0.35 0.36 0.36 0.35 0.39 0.45 0.35 0.35 0.35 0.35 0.35 0.37 1994 0.34 0.35 0.35 0.37 0.34 0.35 0.35 0.35 0.37	0.35 0.34 0.35 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.35 0.36 0.35 0.36 0.37 0.37 0.35 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.37 0.37 0.37 0.34 0.35 0.35 0.37 0.37 0.34 0.35 0.35 0.35 0.37 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.36 0.35 0.35 0.37 0.45 0.35 0.35 0.35 0.36 0.35 0.35 0.35 0.37 0.37 0.37 0.37 0.37 0.37 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35
HEAVY RAIL agency New York-MTA-NYCT Washington D.C-WWATA Chicago-RTA-CTA Boston-MBTA Allarita-MARTA Philadelphis-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Baltimora-MMTA Baltimora-MMTA Baltimora-MMTA San Diego Trolley Inc. Si Louiz-BSDA Portland-Toroley Inc. Si Louiz-BSDA Portland-Toroley Inc. Si Louiz-BSDA Portland-NTS Beltimora-MMTA San Jose-SCTD New OriseMTA San Scottor MIA San Chego Trolley Inc. Si Louiz-BSDA Portland-Toroley Inc. Si Louiz-BSDA Portland-NTS Beltimora-MMTA San Scottor MIA San Scottor MIA San Scottor New Orisen-RTA	Ratio: (Actual m 1994 0.36 0.34 0.35 0.35 0.38 0.38 0.38 0.38 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	1986 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.36 0.35 0.36 0.35 0.37 0.37 0.37 0.34 0.34 0.34 0.35	1996 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.36 0.36 0.36 0.36 0.36 0.37 1996 0.34 0.34 0.35 0.35	1987 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	1986 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.38 0.38 0.35 0.36 0.36 0.36 0.36 0.36 0.36 0.36 0.36	0.35 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.35 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.35 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.35 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.37 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.37 0.44 0.35 0.35 0.37 0.44 0.35 0.35 0.37 0.35 0.37 0.34 0.35 0.35 0.35 0.35 0.35 0.35	0.35 0.34 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.36 0.44 0.36 0.35 0.35 0.37 0.37 0.37 0.34 0.35 0.35 0.35 0.35	0.35 0.35 0.35 0.35 0.37 0.45 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.3	0.36 0.36 0.36 0.36 0.37 0.37 0.35 0.35 0.36 0.39 0.36 0.35 0.35 0.35 0.37 0.34 0.34 0.34 0.36 0.34 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35
HEAVY RAIL agency New York-MTA-NYCT Washington, D.C.VWMATA Chicago-RTA-CTA Boston-MBTA Aliaria-MARTA Philadebhis-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Ballimore-MMTA Datadebhis-SEPTA Los Angeles-LACMTA New York-MTA-SIRTOA AVERAGE LIGHT RAIL agency Boston-MBTA San Francisco-MUNI Philadebhis-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. Si. Louis-BSDA Portland-TCMTDO Delias-DARTA Sacamento-RTD Philaburgh-PAT Buffalo-NFTS Bellimore-MMTA San Jose-SCTD New Orieans-RTA Cleveland-CRTA	Ratio: (Actual m 1984 0.36 0.34 0.35 0.35 0.35 0.38 0.38 0.38 0.38 0.38 0.36 0.35 0.35 0.35 0.37 7 Ratio: (Actual m 1984 0.34 0.34 0.34 0.35	1986 0.36 0.35 0.35 0.35 0.35 0.35 0.45 0.45 0.35 0.36 0.35 0.36 0.35 0.37 0.37 0.34 0.34 0.34 0.34	1986 0.36 0.35 0.35 0.35 0.35 0.35 0.45 0.45 0.35 0.35 0.36 0.35 0.35 0.37 x / Maximum 1986 0.34 0.34 0.34 0.34 0.35	1987 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.45 0.35 0.35 0.36 0.35 0.36 0.35 0.36 0.35 0.36 0.35 0.36 0.34 0.34 0.34 0.34 0.34	1988 0.36 0.35 0.34 0.34 0.35 0.35 0.35 0.35 0.45 0.35 0.36 0.35 0.36 0.36 0.36 0.36 0.36 0.36 0.36 0.34 0.34 0.34 0.36 0.34 0.34 0.36	0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.37 0.36 0.35 0.35 0.35 0.36 0.36 0.34 0.34 0.34 0.35 0.34 0.34 0.35	0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0 35 0 34 0 35 0 34 0 35 0 35 0 35 0 35 0 37 0 36 0 35 0 35 0 35 0 35 0 35 0 35 0 35 0 35	0.36 0.35 0.34 0.35 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.36 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0 35 0 35 0 34 0 35 0 36 0 35 0 35 0 35 0 35 0 35 0 35 0 35 0 35	0.35 0.35 0.35 0.36 0.35 0.37 0.45 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.3	0.36 0.36 0.35 0.35 0.37 0.45 0.35 0.35 0.35 0.35 0.36 0.35 0.35 0.35 0.37 0.37 0.37 0.37 0.37 0.37 0.37 0.37
HEAVY RAIL agency New York-MTA-NYCT Washington D.C-WMATA Chicago-RTA-CTA Boston-MBTA Aliaria-MARTA Philadelphia-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Bailmora-MMTA Bailmora-MMTA Bailmora-MMTA San Diego Torley Inc. Si. Louiz-BSDA Portland-Torley Inc. Si. Doigo Torley Inc. Si. Course-SI. Buffalo-NFTS Bailmora-MMTA San Diego Torley Inc. Si. Louiz-BSDA Portland-Torley Inc. Si. Louiz-BSDA Portland-Torley Inc. Si. Louiz-BSDA Portland-Torley Inc. Si. Louiz-BSDA Portland-Torley Inc. Si. Josi-SCTD New Orleam-FMTA San Josi-SCTD New Orleam-FTA	Ratio: (Actual m 1964 0.35 0.34 0.35 0.35 0.35 0.38 0.38 0.38 0.38 0.33 0.35 0.37 Ratio: (Actual m 1964 0.34 0.34 0.34 0.35 0.35 0.35	1986 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.45 0.36 0.36 0.36 0.36 0.37 0.37 0.34 0.34 0.34 0.35 0.34 0.35	1986 0.36 0.35 0.35 0.35 0.35 0.35 0.45 0.45 0.35 0.35 0.36 0.36 0.35 0.37 1986 0.34 0.34 0.34 0.35 0.35	1987 0.36 0.35 0.35 0.35 0.35 0.35 0.45 0.45 0.35 0.36 0.35 0.36 0.36 0.36 0.36 0.36 0.36 0.36 0.36	1986 0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.36 0.35 0.36 0.36 0.36 0.36 0.36 0.36 0.36 0.36	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.37 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.35 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.37 0.36 0.35 0.35 0.35 0.35 0.34 0.34 0.34 0.34 0.34 0.34 0.35 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.37 0.36 0.35 0.35 0.35 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.37 0.36 0.35 0.35 0.35 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.36 0.35 0.35 0.35 0.37 0.34 0.35 0.37 0.34 0.35 0.37 0.34 0.35 0.37 0.35 0.37 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.36 0.36 0.35 0.35 0.35 0.37 0.36 0.35 0.37 0.37 0.36 0.35 0.37 0.37 0.35 0.37 0.35 0.37 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.36 0.35 0.36 0.37 0.34 0.37 0.34 0.37 0.34 0.35 0.37 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.36 0.36 0.38 0.37 0.37 0.35 0.36 0.36 0.36 0.35 0.35 0.37 0.37 0.34 0.34 0.35 0.35 0.37 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.36 0.36 0.36 0.37 0.37 0.35 0.36 0.35 0.36 0.35 0.35 0.37 0.34 0.36 0.37 0.34 0.36 0.35 0.37 0.34 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35
HEAVY RAIL agency New York-MTA-NYCT Washington, D.C.VWMATA Chicago-RTA-CTA Boston-MBTA Aliaria-MARTA Philadebhis-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Ballimore-MMTA Datadebhis-SEPTA Los Angeles-LACMTA New York-MTA-SIRTOA AVERAGE LIGHT RAIL agency Boston-MBTA San Francisco-MUNI Philadebhis-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. Si. Louis-BSDA Portland-TCMTDO Delias-DARTA Sacamento-RTD Philaburgh-PAT Buffalo-NFTS Bellimore-MMTA San Jose-SCTD New Orieans-RTA Cleveland-CRTA	Ratio: (Actual m 1994 0.36 0.34 0.35 0.35 0.38 0.38 0.38 0.38 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	1986 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.36 0.35 0.36 0.35 0.37 0.37 0.37 0.34 0.34 0.34 0.35	1996 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.36 0.36 0.36 0.36 0.36 0.37 1996 0.34 0.34 0.35 0.35	1987 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	1986 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.38 0.36 0.36 0.36 0.36 0.36 0.36 0.36 0.36	0.35 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.35 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.35 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.35 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.37 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.36 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0 35 0 35 0 34 0 35 0 36 0 35 0 35 0 35 0 35 0 35 0 35 0 35 0 35	0.35 0.35 0.35 0.36 0.35 0.37 0.45 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.3	0.36 0.36 0.35 0.35 0.37 0.45 0.35 0.35 0.35 0.35 0.36 0.35 0.35 0.35 0.37 0.37 0.37 0.37 0.37 0.37 0.37 0.37
HEAVY RAIL agency New York-MTA-NYCT Washington, D.C. VMARTA Chicago-RTA-CTA Boston-MBTA Aliaria-MARTA Philadebhis-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Baltimora-MMTA Los Angeles-LACMTA Baltimora-MMTA Claveland-SCRTA New York-MTA-SIRTOA AVERAGE LIGHT RAIL agency Boston-MBTA San Francisco-MUNI Philadebhis-SEPTA Los Angeles-LACMTA San Drancisco-MUNI Philadebhis-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. Si. Louis-BSDA Portiand-TCMTDO Delias-DARTA Sar-amento-RTD Philaburgh-PAT Bultimora-MMTA San Joss-SCTD New Orieans-RTA Claveland-SCRTA Dervier-RTD Newark-NITC	Ratio: (Actual m 1964 0.35 0.34 0.35 0.35 0.35 0.38 0.38 0.38 0.38 0.33 0.35 0.37 Ratio: (Actual m 1964 0.34 0.34 0.34 0.35 0.35 0.35	1986 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.45 0.36 0.36 0.36 0.36 0.37 0.37 0.34 0.34 0.34 0.35 0.34 0.35	1996 0.36 0.35 0.35 0.35 0.35 0.35 0.45 0.45 0.35 0.35 0.36 0.36 0.35 0.37 1996 0.34 0.34 0.34 0.35 0.35 0.35	1987 0.36 0.35 0.35 0.35 0.35 0.35 0.45 0.45 0.35 0.36 0.35 0.36 0.36 0.36 0.36 0.36 0.36 0.36 0.36	1986 0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.36 0.35 0.36 0.36 0.36 0.36 0.36 0.36 0.36 0.36	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.37 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.35 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.37 0.36 0.35 0.35 0.35 0.35 0.34 0.34 0.34 0.34 0.34 0.34 0.35 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.37 0.36 0.35 0.35 0.35 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.37 0.36 0.35 0.35 0.35 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.36 0.35 0.35 0.35 0.37 0.34 0.35 0.37 0.34 0.35 0.37 0.34 0.35 0.37 0.35 0.37 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.36 0.36 0.35 0.35 0.37 0.36 0.35 0.37 0.35 0.37 0.37 0.35 0.37 0.35 0.37 0.35 0.37 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.35 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.36 0.35 0.36 0.37 0.34 0.37 0.34 0.37 0.34 0.35 0.37 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.36 0.36 0.38 0.38 0.37 0.45 0.36 0.35 0.36 0.36 0.35 0.37 0.37 0.34 0.34 0.35 0.35 0.37 0.34 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35	0.36 0.36 0.36 0.35 0.37 0.37 0.35 0.35 0.35 0.35 0.35 0.37 0.37 0.37 0.34 0.35 0.35 0.37 0.37 0.34 0.35 0.35 0.35 0.37 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35

Stop Spacing

HEAVY RAIL	Miles per link													
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	199
New York-MTA-NYCT	0.47	0.47	0.47	0.47	0.48	0.48	0.48	0.48	0,48	0.48	0.48	0.48	0.48	0.46
Washington, D.CWMATA	0.96	1.01	1.10	1.10	1.10	1.10	1.10	1.13	1,11	1.11	1.16	1.16	1,16	1.16
Chicago-RTA-CTA	0.65	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.65	0.65	0.70	0.69	0.68	0.68
Boston-MBTA	0.71	0.72	0.72	0.69	0.69	0.69	0.69	0.69	0,69	0.69	0.69	0.69	0.69	0.69
Allanta-MARTA	0.89	1.03	1.03	1.02	1.05	1.05	1.05	1.05	1.05	1.09	1.09	1.09	1.09	1.19
Philadelphia-SEPTA	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51
San Francisco-BART	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	2.24
New York-PATHC	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Miam-MDTA	1.19	1.16	1.16	1.16	1.16	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Baltimore-MMTA	0.88	0.86	0.88	1.18	1.18	1.18	1.18	1.18	1,18	1,18	1.18	1.11	1.11	1.11
Los Angeles-LACMTA										0.74	0.74	0.74	0.71	0.71
Philadelphia-NJ-PATC	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17
Cleveland-GCRTA	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12
New York-MTA-SIRTOA	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0,68	0.68	0.68	0.68	0.68
AVERAGE	0.66	0.68	0.69	0.69	0.69	0.69	0.69	0.70	0.70	0,70	0.71	0.71	0.71	0.72
LIGHT RAIL	Miles per link													
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	199
Boston-MBTA	0.33	0.33	0.34	0.34	0.34	0.34	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
San Francisco-MUNI	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.23	0.23	0.23	0.23	0.21	0.21	0.21
Philadelphia-SEPTA	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Los Angeles-LACMTA								0.97	0.97	0.97	0.97	0.97	1.16	1.16
San Diego Trolley Inc.	0.95	0.90	0.99	0.99	0.99	1.06	0.97	0.97	0.97	0.97	0.99	0.97	0.99	0.99
St. Louis-BSDA											1.02	1.02	1.02	1.02
Portland-TCMTDO				0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52
Dallas-DARTA													0.92	1.09
Sacramento-RTD				0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
Pittsburgh-PAT	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.25	0.25	0.26	0.26	0.26	0.26
Buffalo-NFTS			0.45	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
Ballimore-MMTA									0.90	0.94	0.94	0.94	0.94	0.94
San Jose-SCTD					0.58	0.58	0.58	0.57	0.57	0.57	0.57	0.57	0.57	0.57
New Orleans-RTA	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Cieveland-GCRTA	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52
Denver-RTD			• · · ·								0.40	0.40	0.40	0.40
Newark-NJTC	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
Hudson-Bergen LRT														0.65
AVERAGE	0.31	0.30	0.32	0.36	0.37	0.38	0.38	0.41	0.42	0.43	0.46	0.44	0.48	0.41

Density of Network

HEAVY RAIL	Miles of track is	nath ear sau	are miles of a	netropolijan a										
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
New York-MTA-NYCT	1.17	1.17	1.17	1.17	1.18	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Washington, D.CWMATA	0.33	0.27	0.31	0.31	0.31	0.31	0.31	0.34	0.35	0.35	0.39	0.39	0.39	0.34
Chicago-RTA-CTA	0.56	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.63	0.59	0.54	0.63	0.63
Boston-MBTA	0.45	0.44	0.45	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44
Allanta-MARTA	0.26	0.32	0.32	0.33	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.25	0.25
Philadelphia-SEPTA	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
San Francisco-BART	0.19	0.19	0.19	0,19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0,19	0.20
New York-PATHC	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Miami-MDTA	0.36	0.33	0.33	0.33	0.36	0.36	0.36	0.36	0.36	0.36	0.35	0.36	0.36	0.36
Ballimore-MMTA	0.37	0.37	0.37	0.11	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.19	0.19	0.19
Los Angeles-LACMTA										0.88	0.88	0.88	0.35	0.58
Philadelphia-NJ-PATC	0.27	0.26	0.26	0.26	0.26	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
Cleveland-GCRTA	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
New York-MTA-SIRTOA	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
AVERAGE	0.41	0.41	0.41	0.39	0.39	0.40	0.40	0.40	0.40	0.45	0.44	0.44	0.41	0.41
	Miles of track le	ondin ner sau	are miles of a	neimpoiten e										
agency	1984	1985 1985	1986	1967	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Boston-MBTA	0.62	0.62	0.62	0.62	0.62	0.62	0.58	0.58	0.58	0.62	0.62	0.62	0.62	0.62
San Francisco-MUNI	1.03	1.03	1.19	1.19	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Philadelphia-SEPTA	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57
Los Angeles-LACMTA	0.07	0.07	0.07	0.01	0.01	0.01	0.07	0.13	0.13	0.13	0.13	0.13	0.25	0.25
San Diego Trolley Inc.	0.11	0.21	0.27	0.27	0.27	0.17	0.17	0.17	0.17	0.17	0.13	0.13	0.13	0.14
St. Louis-BSDA											0.17	0.21	0.21	0.21
Portland-TCMTDO				0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.17
Dallas-DARTA									-				0.55	0.26
Sacramenio-RTD				0.29	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51
Pillsburgh-PAT	0.29	0.26	0.27	0.36	0.37	0.40	0.54	0.58	0.41	0.43	0.34	0.34	0.34	0.34
Buffalo-NFTS			0.46	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Baltimore-MMTA									0.29	0.16	0.15	0.15	0.15	0.15
San Jose-SCTD					0.25	0.25	0.25	0.19	0.19	0.19	0.19	0.19	0.19	0.19
New Orleans-RTA	0.81	0.81	0.81	0.81	1.00	0.73	0.75	0.75	0.75	0.71	0.71	0.71	0.71	0.71
Cleveland-GCRTA	0.35	0.35	0.35	0.35	0.35	0.35	0.36	0.36	0.36	0.36	0.36	0.36	0.41	0.41
Denver-RTD											0.57	0.57	0.57	0.57
Newark-NJTC	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
Hudson-Bergen LRT										• • •				0.33
AVERAGE	0.56	0.57	0.58	0.51	0.53	0.50	0.51	0.48	0.45	0.44	0.42	0.43	0.45	0.43

Density of Access

HEAVY RAIL	Square miles o	f served area	per access p											
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	199
New York-MTA-NYCT	0.88	0.88	0.88	0.88	0.87	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.87	0.87
Washington, D.CWMATA	5.35	7.97	7.45	7.45	7.45	7.45	7.45	6.78	6.55	6.55	6.20	6.20	6.20	7.29
Chicago-RTA-CTA	2.45	2.52	2.52	2.52	2.50	2.46	2.46	2.46	2.46	2.46	2.88	3.20	2.32	2.31
Boston-MBTA	3.34	3.18	3.18	3.03	3.03	3.03	3.03	3.03	3.03	3.03	3.03	3.03	3.03	3.03
Allanta-MARTA	6.10	5.68	5.88	5.83	9.28	9.28	9.28	9.28	9.28	9.78	9.78	9.78	9.78	9.36
Philadelphia-SEPTA	3.43	3.43	3.43	3.43	3.43	3.43	3.43	3.43	3.43	3.43	3.43	3.43	3.43	3.43
San Francisco-BART	21.58	21.58	21.58	21.58	21.58	21.58	21.58	21.58	21.58	21.58	21.58	21.58	22.03	24.25
New York-PATHC	4.87	4.87	4.87	4.87	4.87	4.87	4.87	4.87	4.87	4.87	4.87	4.87	4.87	4.87
Miami-MDTA	5.83	5.95	5.95	5.95	5.95	5.65	5.65	5.65	5.65	5.65	5.65	5.65	5.65	5.65
Ballimore-MMTA	4.32	4.32	4.32	10.57	10.57	10.57	10.57	10.57	10.57	10.57	10.57	10.96	10.96	10.96
Los Angeles-LACMTA										1.36	1.36	1.36	2.14	2.14
Philadelphia-NJ-PATC	8.88	8.88	8.88	8.88	8.88	8.86	8.88	8.88	8.88	8.66	8.88	8.88	8.88	8.88
Cleveland-GCRTA	7.63	7.63	7.63	7.63	7.63	7.63	7.63	7.63	7.63	7.63	7.63	7.63	7.63	7.63
New York-MTA-SIRTOA	4.36	4.36	4.36	4.36	4.36	4.36	4.36	4.36	4.36	4.36	4.36	4.36	4.36	4.36
AVERAGE	6.30	6.50	6.46	6.96	7.25	7.22	7.22	7.16	7.14	6.74	6.74	6.80	6.82	6.79
	Square miles o	f served area 1985	per access p 1986	ooint 1987	1988	1989	1990	1991	1992	1993	1994	1995	1000	100
agency	1984		1986 0.62	1987	1988	1989	1990 0.58	1991 0.58			1994 0.62		1996	199
Boston-MBTA San Francisco-MUNI	0.62	0.62 1.03	1.19	1.19	1.25	1.25	1.25	1.25	0.58 1.25	0.62 1.25	1.25	0.62	0.62 1.25	0.62
San Francisco-WUNI Philadelphia-SEPTA	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	1.25	1.25
Los Angeles-LACMTA	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.5
San Diego Trolley Inc.	0.11	0.21	0.27	0.27	0.27	0.17	0.17	0.13	0,13	0.13	0.13	0.13	0.25	0.2
San Diego iroley inc. St. Louis-BSDA	0.11	0.23	0.27	0.27	0.27	0.17	0.17	0.17	0.17	0.17				
				0.00	0.00	0.00			0.00	0.00	0.17	0.21	0.21	
Portland-TCMTDO				0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.17 0.20	0.21	0.20	0.1
Portland-TCMTDO Dallas-DARTA											0.20	0.20	0.20 0.55	0.1
Portland-TCMTDO Dellas-DARTA Sacramento-RTD	• ••	0.76		0.29	0.51	0.51	0.51	0.51	0.51	0.51	0.20 0.51	0.20	0.20 0.55 0.51	0.1 0.2 0.5
Portland-TCMTDO Dellas-DARTA Sacramento-RTD Pittsburgh-PAT	0.29	0.26	0.27	0.29	0.51 0.37	0.51 0.40	0.51	0.51	0.51 0.41	0.51 0.43	0.20 0.51 0.34	0.20 0.51 0.34	0.20 0.55 0.51 0.34	0.1 0.2 0.5
Portland-TCMTDO Dellas-DARTA Sacramento-RTD Pittsburgh-PAT Buffelo-NFTS	0.29	0.26	0.27 0.46	0.29	0.51	0.51	0.51	0.51	0.51 0.41 0.34	0.51 0.43 0.34	0.20 0.51 0.34 0.34	0.20 0.51 0.34 0.34	0.20 0.55 0.51 0.34 0.34	0.11 0.26 0.51 0.34 0.34
Portland-TCMTDO Dellas-DARTA Secremento-RTD Pittsburgh-PAT Buffelo-NFTS Baltimore-MMTA	0.29	0.26		0.29	0.51 0.37 0.34	0.51 0.40 0.34	0.51 0.54 0.34	0.51 0.58 0.34	0.51 0.41 0.34 0.29	0.51 0.43 0.34 0.16	0.20 0.51 0.34 0.34 0.15	0.20 0.51 0.34 0.34 0.15	0.20 0.55 0.51 0.34 0.34 0.15	0.1 0.2 0.5 0.3 0.3
Porliand-TCMTDO Dallas-DARTA Sacramenio-RTD Philsburgh-PAT Buffelo-NFTS Baltimore-MMTA San Jose-SCTD			0,46	0.29 0.36 0.34	0.51 0.37 0.34 0.25	0.51 0.40 0.34 0.25	0.51 0.54 0.34 0.25	0.51 0.58 0.34 0.19	0.51 0.41 0.34 0.29 0.19	0.51 0.43 0.34 0.16 0.19	0.20 0.51 0.34 0.34 0.15 0.19	0.20 0.51 0.34 0.34 0.15 0.19	0.20 0.55 0.51 0.34 0.34 0.15 0.19	0.11 0.21 0.5 0.34 0.34 0.15
Porland-TCMTDO Delias-DARTA Sacramenio-RTD Philsburgh-PAT Buffalo-NFTS Baltimore-MMTA San Jose-SCTD New Orleans-RTA	0.81	0.81	0.46	0.29 0.36 0.34 0.81	0.51 0.37 0.34 0.25 1.00	0.51 0.40 0.34 0.25 0.73	0.51 0.54 0.34 0.25 0.75	0.51 0.58 0.34 0.19 0.75	0.51 0.41 0.34 0.29 0.19 0.75	0.51 0.43 0.34 0.16 0.19 0.71	0.20 0.51 0.34 0.34 0.15 0.19 0.71	0.20 0.51 0.34 0.34 0.15 0.19 0.71	0.20 0.55 0.51 0.34 0.34 0.15 0.19 0.71	0.11 0.20 0.5 0.34 0.34 0.19 0.19 0.71
Portland-TCMTDO Dellas-DARTA Secramento-RTD Phttsburgh-PAT Buffalc-NFTS Baltimore-MMTA San Jose-SCTD New Orleans-RTA Cloveland-GCRTA			0,46	0.29 0.36 0.34	0.51 0.37 0.34 0.25	0.51 0.40 0.34 0.25	0.51 0.54 0.34 0.25	0.51 0.58 0.34 0.19	0.51 0.41 0.34 0.29 0.19	0.51 0.43 0.34 0.16 0.19	0.20 0.51 0.34 0.34 0.15 0.19 0.71 0.36	0.20 0.51 0.34 0.34 0.15 0.19 0.71 0.36	0.20 0.55 0.51 0.34 0.34 0.15 0.19 0.71 0.41	0.11 0.20 0.5 0.34 0.34 0.19 0.71 0.41
Portland-TCMTDO Dallas-DARTA Sacramento-RTD Phttsburgh-PAT Buffalo-NFTS Baltimore-MMTA San Jose-SCTD New Orieans-RTA Cleveland-GCRTA Deriver-RTD	0.81 0.35	0.81 0.35	0,46 0,81 0,35	0.29 0.36 0.34 0.81 0.35	0.51 0.37 0.34 0.25 1.00 0.35	0.51 0.40 0.34 0.25 0.73 0.35	0.51 0.54 0.34 0.25 0.75 0.36	0.51 0.58 0.34 0.19 0.75 0.36	0.51 0.41 0.34 0.29 0.19 0.75 0.36	0.51 0.43 0.34 0.16 0.19 0.71 0.36	0.20 0.51 0.34 0.34 0.15 0.19 0.71 0.36 0.57	0.20 0.51 0.34 0.34 0.15 0.19 0.71 0.36 0.57	0.20 0.55 0.51 0.34 0.34 0.15 0.19 0.71 0.41 0.57	0.17 0.26 0.51 0.34 0.34 0.15 0.71 0.41 0.57
Portland-TCMTDO Dellas-DARTA Sacramento-RTD Phtsburgh-PAT Buffalo-NFTS Bailmore-MMTA San Jose-SCTD New Orleans-RTA Cleveland-GCRTA Derver-RTD Newark-NJTC	0.81	0.81	0.46	0.29 0.36 0.34 0.81	0.51 0.37 0.34 0.25 1.00	0.51 0.40 0.34 0.25 0.73	0.51 0.54 0.34 0.25 0.75	0.51 0.58 0.34 0.19 0.75	0.51 0.41 0.34 0.29 0.19 0.75	0.51 0.43 0.34 0.16 0.19 0.71	0.20 0.51 0.34 0.34 0.15 0.19 0.71 0.36	0.20 0.51 0.34 0.34 0.15 0.19 0.71 0.36	0.20 0.55 0.51 0.34 0.34 0.15 0.19 0.71 0.41	0.21 0.17 0.26 0.51 0.34 0.34 0.15 0.71 0.41 0.57 0.57
Portland-TCMTDO Dellas-DARTA Sacramento-RTD Pittsburgh-PAT Buffalo-NFTS Baltimore-MMTA San Jose-SCTD New Orieans-RTA Cleveland-GCRTA Derwer-RTD	0.81 0.35	0.81 0.35	0,46 0,81 0,35	0.29 0.36 0.34 0.81 0.35	0.51 0.37 0.34 0.25 1.00 0.35	0.51 0.40 0.34 0.25 0.73 0.35	0.51 0.54 0.34 0.25 0.75 0.36	0.51 0.58 0.34 0.19 0.75 0.36	0.51 0.41 0.34 0.29 0.19 0.75 0.36	0.51 0.43 0.34 0.16 0.19 0.71 0.36	0.20 0.51 0.34 0.34 0.15 0.19 0.71 0.36 0.57	0.20 0.51 0.34 0.34 0.15 0.19 0.71 0.36 0.57	0.20 0.55 0.51 0.34 0.34 0.15 0.19 0.71 0.41 0.57	0.1 0.2 0.5 0.3 0.3 0.1 0.1 0.1 0.1 0.1 0.1

Comprehensive Accessibility

HEAVY RAIL	Square mile of :	terved eres r	er souere mi	a of Metrono	lian area									
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
New York-MTA-NYCT	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0,19	0.19	0.19	0.19	0.19	0.19
Washington, D.CWMATA		0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Chicago-RTA-CTA	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.08	0.07	0.10	0.10
Boston-MBTA	0.07	0.07	0.07	0.08	0.06	0.08	0.08	0.06	0.08	0.08	0.08	0.08	0.08	0.08
Alianta-MARTA	0.04	0.04	0.04	0.05	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Philadelphia-SEPTA	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
San Francisco-BART	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
New York-PATHC	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Miami-MDTA	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Baltimore-MMTA	0.06	0.06	0.06	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Los Angeles-LACMTA										0.19	0.19	0.19	0.12	0.12
Philadelphia-NJ-PATC	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Cleveland-GCRTA	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
New York-MTA-SIRTOA	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
AVERAGE	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
LIGHT RAIL	Square mile of													
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Boston-MBTA	0.12	0.12	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
San Francisco-MUNI	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.27	0.27	0.27	0.27	0.27	0.27	0.27
Philadelphia-SEPTA	0.14	0.14	0,14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Los Angeles-LACMTA								0.02	0.02	0.02	0.02	0.02	0.03	0.03
San Diego Trolley Inc.	0.03	0.03	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
St. Louis-BSDA											0.03	0.03	0.03	0.03
Portland-TCMTDO				0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.03
Dellas-DARTA Sacramenio-RTD				0.09	0.09						0.09		0.08	0.03
Pittsburgh-PAT	0.11	0.11	0.11	0.09	0.09	0.09	0.09	0.09	0.09	0.09 0.10	0.09	0.09	0.09	0.09
Buffalo-NFTS	0.11	0.11	0.10	0.08	0.08	0.08	0.08	0.11	0.10 0.08	0.08	0.09	0.09	0.09	0.09
Baltimore-MMTA			0.10	0.00	0.08	0.08	0.08	0.08	0.06	0.08	0.08	0.08	0.08	0.08
San Jose-SCTD					0.06	0.06	0.06	0.04	0.04	0.02	0.02	0.02	0.02	0.02
New Orleans-RTA	0.25	0.25	0.25	0.25	0.06	0.23	0.08	0.23	0.23	0.23	0.04	0.23		
Cleveland-GCRTA	0.25	0.08	0.25	0.25	0.25	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Denver-RTD	0.00	0.06	0.08	0.00	0.00	0.00	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.09
Newark-NJTC	0.19	0.19	0,19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.12	0.12	0.12	0.12
Hudson-Bergen LRT	0.19	0.19	0.19	0.19	0.13	0.19	0.19	0.19	0.15	0.13	0.13	0.19	0.19	0.19
AVERAGE	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.06	0.06	0.05	0.05	0.05	0.05	0.05
ALLINGE	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.00	0.06	0.00	0.05	0.05	0.05	0.05

Employment Density

HEAVY RAIL	Number of em	ployees resid	ing per squa	e mile of ser	ved area									
agency	1,984	1,985	1,986	1,987	1,988	1,989	1,990	1,991	1,992	1,993	1,994	1,995	1,996	1,997
New York-MTA-NYCT	21,080	21,080	21,125	21,125	21,064	20,990	20,990	20,990	20,990	20,990	20,990	21,009	20,982	20,982
Washington, D.CWMATA	5,000	4,779	4,582	4,582	4,582	4,582	4,582	4,688	4,676	4,676	4,630	4,630	4,630	4,577
Chicago-RTA-CTA	7,699	7,629	7,629	7,629	7,629	7,629	7,629	7,629	7,629	7,629	8,083	8,115	7,527	7,527
Boston-MBTA	6,046	6,344	6,344	6,854	6,854	6,854	6,854	6,854	6,854	6,854	6,854	6,854	6,854	6,854
Allanta-MARTA	1,751	1,864	1,864	1,830	1,737	1,737	1,737	1,737	1,737	1,720	1,720	1,720	1,720	1,663
Philadelphia-SEPTA	5,906	5,906	5,906	5,906	5,906	5,906	5,906	5,906	5,906	5,906	5,906	5,906	5,906	5,906
San Francisco-BART	5,446	5,446	5,446	5,446	5,446	5,446	5,446	5,446	5,446	5,446	5,446	5,446	5,338	5,076
New York-PATHC	19,455	19,455	19,455	19,455	19,455	19,455	19,455	19,455	19,455	19,455	19,455	19,455	19,455	19,455
Miami-MDTA	3,279	2,937	2,892	2,892	2,892	2,872	2,872	2,872	2,872	2,872	2.872	2,872	2.872	2,872
Ballimore-MMTA	4,929	4,929	4.929	4.061	4,081	4.081	4,081	4,081	4.081	4.081	4.081	4,142	4,142	4.142
Los Angeles-LACMTA										6.562	6.562	6.562	11,750	11.750
Philadelphia-NJ-PATC	5,778	5,778	5,778	5,778	5,778	5,778	5,778	5,778	5,778	5,778	5,778	5,778	5,778	5,778
Cleveland-GCRTA	2.362	2,362	2 362	2,362	2.362	2.362	2 362	2,362	2.362	2.362	2,362	2.362	2.362	2.362
New York-MTA-SIRTOA	3,619	3,619	3.619	3,619	3,619	3,619	3,619	3,619	3.619	3,619	3,619	3,619	3,619	3,619
AVERAGE	7.204	7,185	7,169	7,138	7,125	7.117	7,117	7,126	7,125	7.080	7,112	7,120	7.464	7.326
LIGHT RAIL	Number of em	ployees resid	ling per squa	e mile of ser	ved area									
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	199
Boston-MBTA	9,437	9,437	9,677	9,677	9.677	9,677								
San Francisco-MUNI	9.699					3,677	9,654	9,654	9,654	9,654	9,654	9,654	9,654	9,654
		9,699	9,699	9,699	9,699	9,699	9,699	9,661	9,661	9,654 9,661	9,661	9,675	9,654 9,675	9,675
Philadelphia-SEPTA	5,987	9,699 5,987	9,699 5,987	9,699 5,987										9,675
	5,987	5,987			9,699	9,699	9,699	9,661	9,661	9,661	9,661	9,675	9,675	9,675 5,987
Los Angeles-LACMTA					9,699	9,699	9,699	9,661 5,987	9,661 5,987	9,661 5,987	9,661 5,987	9,675 5,987	9,675 5,987	9,675 5,987 3,650
Philadeiphia-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA	5,987	5,987	5,987	5,987	9,699 5,987	9,699 5,987	9,699 5,987	9,661 5,987 4,125	9,661 5,987 4,125	9,661 5,987 4,125	9,661 5,987 4,125	9,675 5,987 4,125	9,675 5,987 3,650	9,675 5,987 3,650 2,081
Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA	5,987	5,987	5,987	5,987	9,699 5,987	9,699 5,987	9,699 5,987	9,661 5,987 4,125	9,661 5,987 4,125	9,661 5,987 4,125	9,661 5,987 4,125 2,128	9,675 5,987 4,125 2,113	9,675 5,987 3,650 2,081	9,675 5,987 3,650 2,081 1,361
Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA Portland-TCMTDO	5,987	5,987	5,987	5,987 2,188	9,699 5,987 2,188	9,699 5,987 2,259	9,699 5,987 2,212	9,661 5,987 4,125 2,212	9,661 5,987 4,125 2,212	9,661 5,987 4,125 2,212	9,661 5,987 4,125 2,128 1,361	9,675 5,987 4,125 2,113 1,361	9,675 5,987 3,650 2,081 1,361	9,675 5,987 3,650 2,081 1,361 2,620
Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA Portland-TCMTDO Dallas-DARTA	5,987	5,987	5,987	5,987 2,188	9,699 5,987 2,188	9,699 5,987 2,259	9,699 5,987 2,212	9,661 5,987 4,125 2,212	9,661 5,987 4,125 2,212	9,661 5,987 4,125 2,212	9,661 5,987 4,125 2,128 1,361	9,675 5,987 4,125 2,113 1,361	9,675 5,987 3,650 2,081 1,361 2,604	9,675 5,987 3,650 2,081 1,361 2,620 1,903
Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA Portland-TCMTDO Dallas-DARTA Sacramento-RTD	5,987	5,987	5,987 2,188 2,437	5,987 2,188 2,604 2,117 2,437	9,699 5,987 2,188 2,604	9,699 5,987 2,259 2,604	9,699 5,987 2,212 2,604	9,661 5,987 4,125 2,212 2,604	9,661 5,987 4,125 2,212 2,604	9,661 5,987 4,125 2,212 2,604	9,661 5,987 4,125 2,128 1,361 2,604	9,675 5,987 4,125 2,113 1,361 2,604	9,675 5,987 3,650 2,081 1,361 2,604 1,251	9,675 5,987 3,650 2,081 1,361 2,620 1,903 2,117
Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA Portland-TCMTDO Daltas-DARTA Sacramento-RTD PWsburgh-PAT	5,987 1,798	5,987 1,772	5,987 2,188	5,987 2,188 2,604 2,117	9,699 5,987 2,188 2,604 2,117	9,699 5,987 2,259 2,604 2,117	9,699 5,987 2,212 2,604 2,117	9,661 5,987 4,125 2,212 2,604 2,117	9,661 5,987 4,125 2,212 2,604 2,117	9,661 5,987 4,125 2,212 2,604 2,117	9,661 5,987 4,125 2,128 1,361 2,604 2,117	9,675 5,987 4,125 2,113 1,361 2,604 2,117	9,675 5,987 3,650 2,081 1,361 2,604 1,251 2,117	9,675 5,987 3,650 2,081 1,361 2,620 1,903 2,117 2,442
Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA Porlland-TCMTDO Dallas-DARTA Sacramento-RTD PWisburgh-PAT Buffalo-NFTS	5,987 1,798	5,987 1,772	5,987 2,188 2,437	5,987 2,188 2,604 2,117 2,437	9,699 5,987 2,188 2,604 2,117 2,437	9,699 5,987 2,259 2,604 2,117 2,437	9,699 5,987 2,212 2,604 2,117 2,437	9,661 5,987 4,125 2,212 2,604 2,117 2,437	9,661 5,987 4,125 2,212 2,604 2,117 2,339	9,661 5,987 4,125 2,212 2,604 2,117 2,339	9,661 5,987 4,125 2,128 1,361 2,604 2,117 2,442	9,675 5,987 4,125 2,113 1,361 2,604 2,117 2,442	9,675 5,987 3,650 2,081 1,361 2,604 1,251 2,117 2,442	9,675 5,987 3,650 2,081 1,361 2,620 1,903 2,117 2,442 2,836
Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA Portland-TCMTDO Dallas-DARTA Sacramento-RTD Philsburgh-PAT Buffalo-NFTS Belimore-MMTA	5,987 1,798	5,987 1,772 2,437	5,987 2,188 2,437 2,614	5,987 2,188 2,604 2,117 2,437	9,699 5,987 2,188 2,604 2,117 2,437 2,836 3,409	9,699 5,987 2,259 2,604 2,117 2,437	9,699 5,987 2,212 2,604 2,117 2,437	9,661 5,987 4,125 2,212 2,604 2,117 2,437 2,836 2,229	9,661 5,987 4,125 2,212 2,604 2,117 2,339 2,836 3,131 2,229	9,661 5,987 4,125 2,212 2,604 2,117 2,339 2,836	9,661 5,987 4,125 2,128 1,361 2,604 2,117 2,442 2,836	9,675 5,987 4,125 2,113 1,361 2,604 2,117 2,442 2,836	9,675 5,987 3,650 2,081 1,361 2,604 1,251 2,117 2,442 2,836	9,675 5,987 3,650 2,081 1,361 2,620 1,903 2,117 2,442 2,836 2,459
Los Angeles-LACMTA San Diego Trolley Inc. SI. Louis-BSDA Porliand-TCMTDO Dalas-DARTA Sacramento-RTD Phisburgh-PAT Buffaio-NFTS Beltimore-MMTA San Jose-SCTD	5,987 1,798	5,987 1,772	5,987 2,186 2,437 2,614 3,862	5,987 2,188 2,604 2,117 2,437	9,699 5,987 2,188 2,604 2,117 2,437 2,836 3,409 3,862	9,699 5,987 2,259 2,504 2,117 2,437 2,836	9,699 5,987 2,212 2,604 2,117 2,437 2,836	9,661 5,987 4,125 2,212 2,604 2,117 2,437 2,836	9,661 5,987 4,125 2,212 2,604 2,117 2,339 2,836 3,131	9,661 5,987 4,125 2,212 2,6D4 2,117 2,339 2,836 2,459	9,661 5,987 4,125 2,128 1,361 2,604 2,117 2,442 2,836 2,459	9,675 5,987 4,125 2,113 1,361 2,604 2,117 2,442 2,836 2,459	9,675 5,987 3,650 2,081 1,361 2,604 1,251 2,117 2,442 2,836 2,459	9,675 5,987 3,650 2,081 1,361 2,620 1,903 2,117 2,442 2,836 2,459 2,175
Los Angeles-LACMTA San Diego Trolley Inc. SI. Louis-BSDA Portlend-TCMTDO Dallas-DARTA Sacramento-RTD Phisburgh-PAT Buffalo-NFTS Bellimore-MMTA San Jose-SCTD New Orisens-RTA Clevelend-GCRTA	5,987 1,798 2,437	5,987 1,772 2,437	5,987 2,188 2,437 2,614	5,987 2,188 2,604 2,117 2,437 2,836	9,699 5,987 2,188 2,604 2,117 2,437 2,836 3,409	9,699 5,987 2,259 2,604 2,117 2,437 2,836 3,409	9,699 5,987 2,212 2,604 2,117 2,437 2,836 3,409	9,661 5,987 4,125 2,212 2,604 2,117 2,437 2,836 2,229	9,661 5,987 4,125 2,212 2,604 2,117 2,339 2,836 3,131 2,229	9,661 5,987 4,125 2,212 2,604 2,117 2,339 2,836 2,459 2,229	9,661 5,987 4,125 2,128 1,361 2,604 2,117 2,442 2,836 2,459 2,229 3,603 2,444	9,675 5,987 4,125 2,113 1,361 2,604 2,117 2,442 2,836 2,459 2,229	9,675 5,987 3,650 2,081 1,361 2,604 1,251 2,117 2,442 2,836 2,459 2,229	9,676 5,987 3,650 2,081 1,361 2,620 1,903 2,117 2,442 2,836 2,459 2,175 3,603
Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA Portland-TCMTDO Dallas-DARTA Sacramento-RTD Philsburgh-PAT Builtimore-MMTA San Jose-SCTD New Orteans-RTA	5,987 1,796 2,437 3,862	5,987 1,772 2,437 3,862	5,987 2,186 2,437 2,614 3,862	5,987 2,188 2,604 2,117 2,437 2,836 3,862	9,699 5,987 2,188 2,604 2,117 2,437 2,836 3,409 3,862	9,699 5,987 2,259 2,604 2,117 2,437 2,836 3,409 3,603	9,699 5,987 2,212 2,604 2,117 2,437 2,836 3,409 3,603	9,661 5,987 4,125 2,212 2,604 2,117 2,437 2,836 2,229 3,603	9,661 5,987 4,125 2,212 2,604 2,117 2,339 2,836 3,131 2,229 3,603	9,661 5,987 4,125 2,212 2,604 2,117 2,339 2,836 2,459 2,229 3,603	9,661 5,987 4,125 2,128 1,361 2,604 2,117 2,442 2,836 2,459 2,229 3,603	9,675 5,987 4,125 2,113 1,361 2,604 2,117 2,442 2,836 2,459 2,229 3,603	9,675 5,987 3,650 2,081 1,361 2,604 1,251 2,117 2,442 2,836 2,459 2,229 3,603	9,675 5,987 3,650 2,081 1,361 2,620 1,903 2,117 2,442 2,836 2,459 2,175 3,603 2,177
Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA Portland-TCMTDO Dallas-DARTA Sacramento-RTD Philsburgh-PAT Buffalo-NFTS Beltimore-MMTA San Jose-SCTD New Orleans-RTA Cleveland-GCRTA Denver-RTD	5,987 1,796 2,437 3,862	5,987 1,772 2,437 3,862	5,987 2,186 2,437 2,614 3,862	5,987 2,188 2,604 2,117 2,437 2,836 3,862	9,699 5,987 2,188 2,604 2,117 2,437 2,836 3,409 3,862	9,699 5,987 2,259 2,604 2,117 2,437 2,836 3,409 3,603	9,699 5,987 2,212 2,604 2,117 2,437 2,836 3,409 3,603	9,661 5,987 4,125 2,212 2,604 2,117 2,437 2,836 2,229 3,603	9,661 5,987 4,125 2,212 2,604 2,117 2,339 2,836 3,131 2,229 3,603	9,661 5,987 4,125 2,212 2,604 2,117 2,339 2,836 2,459 2,229 3,603	9,661 5,987 4,125 2,128 1,361 2,604 2,117 2,442 2,836 2,459 2,229 3,603 2,444	9,675 5,987 4,125 2,113 1,361 2,604 2,117 2,442 2,836 2,459 2,229 3,603 2,444	9,675 5,987 3,650 2,081 1,361 2,604 1,251 2,117 2,442 2,836 2,459 2,229 3,603 2,444	9,654 9,675 5,987 3,650 2,081 1,361 2,620 1,903 2,117 2,442 2,836 2,459 2,175 3,603 2,177 1,686 5,148
Los Angeles-LACMTA San Diego Trolley Inc. SI. Louis-BSDA Portlend-TCMTDO Dallas-DARTA Sacramento-RTD Phisburgh-PAT Buffalo-NFTS Bellimore-MMTA San Jose-SCTD New Orisens-RTA Clevelend-GCRTA	5,987 1.798 2.437 3.862 2.444	5,987 1,772 2,437 3,862 2,444	5,987 2,188 2,437 2,614 3,862 2,444	5,987 2,188 2,604 2,117 2,437 2,836 3,862 2,444	9,699 5,987 2,188 2,604 2,117 2,437 2,836 3,409 3,862 2,444	9,699 5,987 2,259 2,504 2,117 2,437 2,836 3,409 3,603 2,444	9,699 5,987 2,212 2,604 2,117 2,437 2,836 3,409 3,603 2,444	9,661 5,987 4,125 2,212 2,604 2,117 2,437 2,836 2,229 3,603 2,444	9,661 5,987 4,125 2,212 2,604 2,117 2,339 2,836 3,131 2,229 3,603 2,444	9,661 5,987 4,125 2,212 2,604 2,117 2,339 2,836 2,459 2,229 3,603 2,444	9,661 5,987 4,125 2,128 1,361 2,504 2,117 2,442 2,836 2,459 2,229 3,603 2,454 1,666	9,675 5,987 4,125 2,113 1,361 2,504 2,117 2,442 2,836 2,2459 2,229 3,603 2,244 1,666	9,675 5,987 3,650 2,081 1,361 2,604 1,251 2,117 2,442 2,836 2,245 9 2,229 3,603 2,244 1,686	9,675 5,987 3,650 2,081 1,361 2,620 1,903 2,117 2,442 2,836 2,459 2,175 3,603 2,177 1,686

Total Number of Employment

HEAVY RAIL	Number of e	mpioyees res	iding in the s	erved area										
agency	1,984	1,985	1,986	1,987	1,988	1,989	1,990	1,991	1,992	1,993	1,994	1,995	1,996	1,997
New York-MTA-NYCT	1,642,774	1,642,774	1,639,312	1,639,312	1,646,562	1,649,810	1,649,810	1,649,810	1,649,810	1,649,810	1,649,810	1,651,292	1,648,975	1,648,975
Washington, D.CWMATA	67,896	70,300	72,532	72,532	72,532	72,532	72,532	81,852	85,521	85,521	89,917	89,917	89,917	90,166
Chicago-RTA-CTA	235,132	235,137	235,137	235,137	235,137	235,137	235,137	235,137	235,137	235,137	215,101	213,679	237,491	237,491
Boston-MBTA	70,075	78,862	78,862	89,447	89,447	89,447	89,447	89,447	89,447	89,447	89,447	89,447	89,447	89,447
Atlanta-MARTA	9,980	13,235	13,235	14,016	15,115	15,115	15,115	15,115	15,115	16,903	16,903	16,903	16,903	17,742
Philadelphia-SEPTA	99,225	99,225	99,225	99,225	99,225	99,225	99,225	99,225	99,225	99,225	99,225	99,225	99,225	99,225
San Francisco-BART	50,704	50,704	50,704	50,704	50,704	50,704	50,704	50,704	50,704	50,704	50,704	50,704	52,690	54,413
New York-PATHC	64,784	64,784	64,784	64,784	64,784	64,784	64,784	64,784	64,784	64,784	64,784	64,784	64,784	64,784
Miami-MDTA	8,952	16,269	16,019	16,019	16,019	16,714	16,714	16,714	16,714	16,714	16.714	16,714	16,714	16,714
Baltimore-MMTA	12,075	12,075	12,075	13,466	13,466	13,466	13,466	13,466	13,466	13,466	13,466	15,947	15,947	15,947
Los Angeles-LACMTA		-	-	-	•	•	•	-	-	8,465	8,465	8,465	24,441	24,441
Philadelphia-NJ-PATC	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200
Cleveland-GCRTA	11,953	11,953	11,953	11,953	11,953	11,953	11,953	11,953	11,953	11,953	11,953	11,953	11,953	11,953
New York-MTA-SIRTOA	21,386	21,386	21,386	21,386	21,386	21,386	21,386	21,386	21,386	21,386	21,386	21,386	21,386	21,386
TOTAL	2.213,911	2,235,679	2,234,199	2,246,956	2,255,305	2,259,248	2,259,248	2,268,568	2,272,237	2,282,490	2,266,850	2,269,391	2,308,848	2,410,884

LIGHT RAIL	Number of en	nployees resi	ding in the se	rved area										
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Boston-MBTA	102,674	102,674	93,871	93,871	93,871	93,871	95,479	95,479	95,479	95,479	95,479	95,479	95,479	95,479
San Francisco-MUNI	95,535	95,535	95,535	95,535	95,535	95,535	95,535	102,505	102,505	102,505	102,505	105,555	105,555	105,555
Philadelphia-SEPTA	100,766	100,766	100,766	100,766	100,766	100,766	100,766	100,766	100,766	100,766	100,766	100,766	100,766	100,766
Los Angeles-LACMTA								23,305	23,305	23,305	23,305	23,305	33,948	33.948
San Diego Trolley Inc.	7,732	8,115	12,407	12,407	12,407	17,757	18,385	18,385	18,385	18,385	19,473	19,670	21,125	21,125
SI. Louis-BSDA											6,205	6,205	6,205	6.205
Portland-TCMTDO				14,038	14,038	14,038	14,038	14,038	14,038	14,038	14,038	14,038	14,038	14,173
Dallas-DARTA													4,229	9,400
Sacramento-RTD				13,080	13,080	13,080	13,080	13,080	13,080	13,080	13,000	13,080	13,080	13,080
Pillsburgh-PAT	29,929	29,929	29,929	29,929	29,929	29,929	29,929	29,929	27,084	27.084	24,347	24,347	24,347	24.347
Buffalo-NFTS			6,091	8,195	8,195	8,195	8,195	8,195	8,195	8,195	8,195	8,195	8,195	8,195
Ballimore-MMTA									10,019	13,940	13,940	13,940	13,940	13,940
San Jose-SCTD					14,214	14,214	14,214	16,940	16,940	16,940	16,940	16,940	16,940	17.029
New Orleans-RTA	15,988	15,988	15,988	15,988	15,988	18,953	18,953	18,953	18,953	18,953	18,953	18,953	18,953	18,953
Cleveland-GCRTA	14,371	14,371	14,371	14,371	14,371	14,371	14,371	14,371	14,371	14,371	14,371	14,371	14,371	14,497
Denver-RTD											3,843	3,843	3,843	3,843
Newark-NJTC	12,097	12,097	12,097	12,097	12,097	12,097	12,097	12,097	12,097	12,097	12,097	12,097	12,097	12,097
Hudson-Bergen LRT														48,514
TOTAL	278,326	278,709	280,289	309,511	323,725	332,040	334,276	367,277	374,451	378,372	386,771	390,018	406,345	561,146

Transit Share on the Journey to Work (Motorized Trips)

HEAVY RAIL	Percentage of	ioumev to wo	rk in those m	notorized trips	served by tra	ansii								
agency	1.984	1,985	1,986	1,967	1,988	1,989	1,990	1.991	1.992	1,993	1.994	1.995	1.996	1.997
New York-MTA-NYCT	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Washington, D.CWMATA	0.44	0.44	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.42	0.42	0.42	0.42
Chicago-RTA-CTA	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.41	0.41	0.41	0.41
Boston-MBTA	0.38	0.38	0.38	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0,39	0.39	0.39	0.39
Aliania-MARTA	0.29	0.26	0.26	0.26	0.25	0.25	0.25	0.25	0.25	0.24	0.24	0.24	0.24	0.23
Philadelphia-SEPTA	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42
San Francisco-BART	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.35	0.34
New York-PATHC	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.60	0.80
Miami-MOTA	0.13	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Ballimore-MMTA	0.36	0.36	0.36	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.35	0.35	0.35
Los Angeles-LACMTA										0.53	0.53	0.53	0.41	0.41
Philadelphia-NJ-PATC	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
Cleveland-GCRTA	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
New York-MTA-SIRTOA	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37
AVERAGE	0.40	0.40	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.40	0.40	0.40	0.39	0.39
LIGHT RAIL	Percentage of													
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Boston-MBTA	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
San Francisco-MUNI	0,47	0.47	0.47	0.47	0.47	0.47	0.47	0.41	0.41	0.41	0.41	0.41	0.41	0.41
Philadelphia-SEPTA	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
Los Angeles-LACMTA								0.20	0.20	0.20	0.20	0.20	0.15	0.15
San Diego Trolley Inc.	0.23	0.22	0.21	0.21	0.21	0.15	0.16	0.16	0.16	0.16	0.15	0.15	0.14	0.14
St. Louis-BSDA											0.12	0.12	0.12	0.12
Portland-TCMTDO				0.16	0.16	0.16	0.16	0.16	0,16	0.16	0.16	0.16	0.16	0.16
Dallas-DARTA													0.13	0.11
Sacramento-RTD				0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Pittsburgh-PAT	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.21	0.21	0.23	0.23	0.23	0.23
Buffalo-NFTS			0.21	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Baltimore-MMTA San Jose-SCTD					0.06	0.06	0.06	0.06	0.22 0.06	0.19	0.19	0.19	0.19	0.19
San Jose-SCTD New Orleans-RTA		0.01	0.04		0.06	0.06	0.06			0.06	0.06	0.06	0.06	0.06
Cleveland-GCRTA	0.21 0.17	0.21	0.21 0.17	0.21 0.17	0.21	0.21	0.21	0.21 0.17	0.21 0.17	0.21	0.21	0.21 0.17	0.21	0.21
Deriver-RTD	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	v.17	0.17	0.17	0.17	0.17	0.17
Newark-NJTC	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.23	0.23	0.23	0.23
Hudson-Bergen LRT	0.28	0.20	0.20	0.20	0.20	0.20	0.20	9.20	0.20	0.20	0.20	0.20	0.20	0.44
AVERAGE	0.29	0.29	0.28	0.25	0.23	0.23	0.23	0.22	0.22	0.21	0.21	0.21	0.20	0.22
	0.20	0.20	0.20	0.20	0.20	0.20	0.20		V.44	V.A.1	v	0.21	0.20	0.44

Rush Hour Proportion (Proportion of initiating trips between 6 and 9 am)

HEAVY RAIL	Proportion of m	olorized trips	initiated het	ween 6 end 9	am over the	24-hour total								
agency	1,984	1.985	1.986	1,987	1,988	1,989	1,990	1.991	1,992	1.993	1.994	1.995	1,996	1.997
New York-MTA-NYCT	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Washington, D.CWMATA		0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Chicago-RTA-CTA	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.68	0.68	0.67	0.67
Boston-MBTA	0.68	0.69	0.69	0.68	0.68	0.68	0,68	0.68	0.68	0.68	0.68	0.68	0.68	0,68
Atlanta-MARTA	0.67	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68
Philadelphia-SEPTA	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
San Francisco-BART	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64
New York-PATHC	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
Mismi-MDTA	0.64	0.67	0.67	0.67	0.67	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68
Ballimore-MMTA	0.65	0.65	0.65	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.65	0.65	0.65
Los Angeles-LACMTA										0.67	0.67	0.67	0.67	0.67
Philadelphia-NJ-PATC	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Cleveland-GCRTA	0.63	0.63	D.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
New York-MTA-SIRTOA	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
AVERAGE	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68
LIGHT RAIL	Proportion of m													
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Boston-MBTA	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
San Francisco-MUNI	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.72	0.72	0.72	0.72	0.71	0.71	0.71
Philadelphia-SEPTA	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Los Angeles-LACMTA								0.73	0.73	0.73	0.73	0.73	0.73	0.73
San Diego Trolley Inc.	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
St. Louis-BSDA											0.71	0.71	0.71	0.71
Portland-TCMTDO				0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
Dallas-DARTA							_						0.72	0.73
Sacramento-RTD				0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71
Phisburgh-PAT	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Buffalo-NFTS			0.68	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Buffelo-NFTS Baltimore-MMTA			0.68				0.66		0.75	0.75	0.75	0.75	0.75	0.66 0.75
Buffelo-NFTS Baltimore-MMTA San Jose-SCTD				0.66	0.72	0.72	0.66 0.70	0.70	0.75 0.70	0.75	0.75	0.75 0.70	0.75 0.70	0.66 0.75 0.70
Buffalo-NFTS Baltimore-MMTA San Jose-SCTD New Orleans-RTA	0.69	0.69	0.69	0.66	0.72 0.69	0.72 0.68	0.66 0.70 0.68	0.70 0.68	0.75 0.70 0.68	0.75 0.70 0.68	0.75 0.70 0.68	0.75 0.70 0.68	0.75 0.70 0.68	0.66 0.75 0.70 0.68
Buffalo-NFTS Baltimore-MMTA San Jose-SCTD New Orleans-RTA Cleveland-GCRTA	0.69 0.74			0.66	0.72	0.72	0.66 0.70	0.70	0.75 0.70	0.75	0.75 0.70 0.68 0.74	0.75 0.70 0.68 0.74	0.75 0.70 0.68 0.74	0.66 0.75 0.70 0.68 0.74
Buffalo-NFTS Baltimore-MMTA Sen Jose-SCTD New Orleans-RTA Cleveland-GCRTA Denver-RTD	0.74	0.69 0.74	0.69 0.74	0.66 0.69 0.74	0.72 0.69 0.74	0.72 0.68 0.74	0.66 0.70 0.68 0.74	0.70 0.68 0.74	0.75 0.70 0.68 0.74	0.75 0.70 0.68 0.74	0.75 0.70 0.68 0.74 0.67	0.75 0.70 0.68 0.74 0.67	0.75 0.70 0.68 0.74 0.67	0.66 0.75 0.70 0.68 0.74 0.67
Buffalo-NFTS Baltimore-MMTA San Jose-SCTD New Orleans-RTA Cleveland-GCRTA Denver-RTD Newark-NJTC		0.69	0.69	0.66	0.72 0.69	0.72 0.68	0.66 0.70 0.68	0.70 0.68	0.75 0.70 0.68	0.75 0.70 0.68	0.75 0.70 0.68 0.74	0.75 0.70 0.68 0.74	0.75 0.70 0.68 0.74	0.66 0.75 0.70 0.68 0.74 0.67 0.78
Buffalo-NFTS Baltimore-MMTA San Jose-SCTD New Orleans-RTA Cleveland-GCRTA Deriver-RTD	0.74	0.69 0.74	0.69 0.74	0.66 0.69 0.74	0.72 0.69 0.74	0.72 0.68 0.74	0.66 0.70 0.68 0.74	0.70 0.68 0.74	0.75 0.70 0.68 0.74	0.75 0.70 0.68 0.74	0.75 0.70 0.68 0.74 0.67	0.75 0.70 0.68 0.74 0.67	0.75 0.70 0.68 0.74 0.67	0.66 0.75 0.70 0.68 0.74 0.67

Autos per Capita

HEAVY RAIL agency New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-MBTA Alianta-MARTA Philadeiphia-SEPTA	Number of auto 1,984		d in the serve	of area										
New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-MBTA Alianta-MARTA		1,985	1,986	1.987	1,988	1,989	1.990	1.991	1,992	1 003	1,994	1 005	1.000	1 00-
Nashinglon, D.CWMATA Chicago-RTA-CTA Boslon-MBTA Nianla-MARTA	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	1,993	0,16	1,995	1,996	1,997 0,16
Chicago-RTA-CTA Boston-MBTA Alianta-MARTA	0.48	0.48	0.49	0.49	0.49	0.49	0.49	0.46	0.46	0.46	0.46	0.46	0.16	0.16
liania-MARTA	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.34	0.35	0.33	0.33
	0.34	0.35	0.35	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
	0.37	0.42	0.42	0.43	0.43	0.43	0.43	0.43	0.43	0.44	0.44	0.44	0.44	0.45
	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.26	0.28	0.28	0.28
San Francisco-BART	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.40	0.41
New York-PATHC Alami-MDTA	0.18 0.44	0.18 0.39	0.18 0.39	0,18 0,39	0.18 0.39	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
allimore-MMTA	0.24	0.24	0.39	0.39	0.39	0.40 0.28	0.40 0.28	0.40 0.28	0.40	0.40	0.40	0.40	0.40	0.40
os Angeles-LACMTA	0.24	0.24	0.24	0.20	0.20	0.20	0.20	0.26	0.28	0.28 0.17	0.28	0.25	0.25	0.25
hiladelphia-NJ-PATC	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.26 0.34	0.26 0.34
Cleveland-GCRTA	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37
New York-MTA-SIRTOA	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48
AVERAGE	0.34	0.34	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.33	0.33	0.33	0.34	0.34
IGHT RAIL	Number of auto	os per resider	t in the serve	d area										
igency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
loston-MBTA	0.36	0.36	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
an Francisco-MUNi	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.45	0.45	0.45
hiladelphia-SEPTA	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0,34
os Angeles-LACMTA San Diego Trolley Inc.	0.30	0.31	0.31	0.31	0.31	0.39		0.31	0.31	0.31	0.31	0.31	0.36	0.36
an Diego Trolley Inc. 1. Louis-BSDA	0.30	0.31	0.31	0.31	0.31	0.39	0.39	0.39	0.39	0.39	0.40 0.47	0.40 0.47	0.41	0,41
ortiand-TCMTDO alles-DARTA				0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.47 0.55 0.37	0.47 0.55 0.48
acramento-RTD	<i>.</i>			0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57
Hisburgh-PAT	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.52	0.52	0.50	0.50	0.50	0.50
uffalo-NFTS			0.37	0,40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
atimore-MMTA an Jose-SCTD					0.61	0.61			0.42	0.43	0.43	0.43	0.43	0.43
lew Orleans-RTA	0.44	0.44	0.44	0.44	0.61	0.61 0.44	0.61 0.44	0.60	0.60	0.60	0.60	0.60	0.60	0.60
leveland-GCRTA	0.53	0.53	0.53	0.53	0.53	0.44	0.53	0.44	0.44	0.44 0.53	0.44	0.44 0.53	0.44	0.44 0.52
enver-RTD					0.00	2.00	0.00	0.00	9.00	0.00	0.53	0.53	0.53	0.52
ewark-NJTC	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
iudson-Bergen LRT VERAGE	0.41	0.41	0.40	0.44	0.45	0.46	0.46	0.45	0.45	0.45	0.44	0.44	0.44	0.32 0.43
	Number of auto					4 000								
gency	1,984	1,985	1,986	1,987	1,988	1,989	1,990	1,991	1,992	1,993	1,994	1,995	1,996	1,997
gency lew York-MTA-NYCT	1,984 0.39	1,985 0.39	1,986 0.39	1,987 0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39
gency lew York-MTA-NYCT /ashinglon, D.CWMATA	1,984 0.39 0.97	1,985 0.39 0.98	1,986 0.39 1.00	1,987 0,39 1.00	0.39 1.00	0.39 1.00	0.39	0.39 0.98	0.39 0.97	0.39 0.97	0.39 0.98	0.39 0.98	0.39 0.98	0.39 0.99
gency lew York-MTA-NYCT Vashington, D.CWMATA hicago-RTA-CTA	1,984 0.39	1,985 0.39	1,986 0.39	1,987 0.39	0.39	0.39 1.00 0.79	0.39 1.00 0.79	0.39 0.98 0.79	0.39 0.97 0.79	0.39 0.97 0.79	0.39 0.98 0.83	0.39 0.98 0.84	0.39 0.98 0.81	0.39 0.99 0.81
gency lew York-MTA-NYCT Vashington, D.CWMATA hicago-RTA-CTA ioston-MBTA	1,984 0.39 0.97 0.79	1,985 0.39 0.98 0.79	1,986 0.39 1.00 0.79	1,987 0.39 1.00 0.79	0.39 1.00 0.79	0.39 1.00	0.39 1.00 0.79 0.82	0.39 0.98 0.79 0.82	0.39 0.97 0.79 0.82	0.39 0.97 0.79 0.82	0.39 0.98 0.83 0.82	0.39 0.98 0.84 0.82	0.39 0.98 0.81 0.82	0.39 0.99 0.81 0.82
gency lew York-MTA-NYCT Vashinglon, D.CWMATA ihicago-RTA-CTA oston-MBTA Ilenla-MARTA	1,984 0.39 0.97 0.79 0.80	1,985 0.39 0.98 0.79 0.84	1,986 0.39 1.00 0.79 0.84	1,987 0.39 1.00 0.79 0.82	0.39 1.00 0.79 0.82	0.39 1.00 0.79 0.82	0.39 1.00 0.79	0.39 0.98 0.79	0.39 0.97 0.79	0.39 0.97 0.79 0.82 1.04	0.39 0.98 0.83 0.82 1.04	0.39 0.98 0.84	0.39 0.98 0.81	0.39 0.99 0.81 0.82 1.07
gency lew York-MTA-NYCT Vashington, D.CWMATA hicago-RTA-CTA oston-MBTA tilanta-MARTA hiladelphia-SEPTA an Francisco-BART	1,984 0.39 0.97 0.79 0.80 0.89 0.71 0.91	1,985 0.39 0.98 0.79 0.84 0.98 0.71 0.91	1,986 0.39 1.00 0.79 0.84 0.98 0.71 0.91	1,987 0.39 1.00 0.79 0.82 0.99 0.71 0.91	0.39 1.00 0.79 0.82 1.01 0.71 0.91	0.39 1.00 0.79 0.82 1.01	0.39 1.00 0.79 0.82 1.01	0.39 0.98 0.79 0.82 1.01	0.39 0.97 0.79 0.82 1.01	0.39 0.97 0.79 0.82	0.39 0.98 0.83 0.82	0.39 0.98 0.84 0.82 1.04	0.39 0.98 0.81 0.82 1.04	0.39 0.99 0.81 0.82
gency ewy York-MTA-NYCT /ashington, D.CWMATA hicago-RTA-CTA oston-MBTA lenta-MARTA hiladephia-SEPTA en Francisco-BART ew York-PATHC	1,984 0.39 0.97 0.79 0.80 0.89 0.71 0.91 0.32	1,985 0.39 0.98 0.79 0.84 0.98 0.71 0.91 0.32	1,986 0.39 1.00 0.79 0.84 0.98 0.71 0.91 0.32	1,987 0.39 1.00 0.79 0.82 0.99 0.71 0.91 0.32	0.39 1.00 0.79 0.82 1.01 0.71 0.91 0.32	0.39 1.00 0.79 0.82 1.01 0.71 0.91 0.32	0.39 1.00 0.79 0.82 1.01 0.71 0.91 0.32	0.39 0.98 0.79 0.82 1.01 0.71 0.91 0.32	0.39 0.79 0.82 1.01 0.71 0.91 0.32	0.39 0.97 0.82 1.04 0.71 0.91 0.32	0.39 0.98 0.83 0.82 1.04 0.71 0.91 0.32	0.39 0.98 0.84 0.82 1.04 0.71	0.39 0.98 0.81 0.82 1.04 0.71	0.39 0.99 0.81 0.82 1.07 0.71
gency ew York-MTA-NYCT sashington, D.CWMATA hicago-RTA-CTA ostor-MBTA lente-MARTA hiladeiphia-SEPTA an Francisco-BART ew York-PATHC liami-MDTA	1,984 0.39 0.97 0.79 0.80 0.89 0.71 0.91 0.32 1.17	1,985 0.39 0.98 0.79 0.84 0.98 0.71 0.91 0.32 1.15	1,986 0.39 1.00 0.79 0.84 0.98 0.71 0.91 0.32 1.15	1,987 0.39 1.00 0.79 0.82 0.99 0.71 0.91 0.32 1.15	0.39 1.00 0.79 0.82 1.01 0.71 0.91 0.32 1.15	0.39 1.00 0.79 0.82 1.01 0.71 0.91 0.32 1.16	0.39 1.00 0.79 0.82 1.01 0.71 0.91 0.32 1.16	0.39 0.98 0.79 0.82 1.01 0.71 0.91 0.32 1.16	0.39 0.97 0.79 0.82 1.01 0.71 0.91 0.32 1.16	0.39 0.97 0.79 0.82 1.04 0.71 0.91 0.32 1.16	0.39 0.98 0.83 0.82 1.04 0.71 0.91 0.32 1.16	0.39 0.98 0.84 0.82 1.04 0.71 0.91 0.32 1.16	0.39 0.98 0.81 0.82 1.04 0.71 0.93 0.32 1.16	0.39 0.99 0.81 0.82 1.07 0.71 0.95 0.32 1.16
gency lew York-MTA-NYCT Jashington, D.CWWATA hicago.RTA-CTA oston-MBTA lianta-MARTA hiladelphia-SCEPTA an Francisco-BART am Francisco-BART lew York-PATHC liamb-MDTA akimore-NMTA	1,984 0.39 0.97 0.79 0.80 0.89 0.71 0.91 0.32	1,985 0.39 0.98 0.79 0.84 0.98 0.71 0.91 0.32	1,986 0.39 1.00 0.79 0.84 0.98 0.71 0.91 0.32	1,987 0.39 1.00 0.79 0.82 0.99 0.71 0.91 0.32	0.39 1.00 0.79 0.82 1.01 0.71 0.91 0.32	0.39 1.00 0.79 0.82 1.01 0.71 0.91 0.32	0.39 1.00 0.79 0.82 1.01 0.71 0.91 0.32	0.39 0.98 0.79 0.82 1.01 0.71 0.91 0.32	0.39 0.79 0.82 1.01 0.71 0.91 0.32	0.39 0.97 0.79 0.82 1.04 0.71 0.91 0.32 1.16 0.69	0.39 0.98 0.83 0.82 1.04 0.71 0.91 0.32 1.16 0.69	0.39 0.98 0.84 0.62 1.04 0.71 0.91 0.32 1.16 0.64	0.39 0.98 0.81 0.82 1.04 0.71 0.93 0.32 1.16 0.64	0.39 0.99 0.81 0.82 1.07 0.71 0.95 0.32 1.16 0.64
gency w York-MTA-NYCT /sshington, D.CWMATA hicago-RTA-CTA soton-MBTA lanta-MARTA hiladisphis-SEPTA an Francisco-BART sw York-PATHC lami-MDTA atimore-MMTA as Angeles-LACMTA	1,984 0.39 0.97 0.79 0.80 0.71 0.91 0.32 1.17 0.61	1,985 0.39 0.98 0.79 0.84 0.98 0.71 0.91 0.32 1.15 0.61	1,986 0.39 1.00 0.79 0.84 0.98 0.71 0.91 0.32 1.15 0.61	1,987 0.39 1.00 0.79 0.82 0.99 0.71 0.91 0.32 1.15 0.69	0.39 1.00 0.79 0.82 1.01 0.71 0.32 1.15 0.69	0.39 1.00 0.79 0.82 1.01 0.71 0.32 1.16 0.69	0.39 1.00 0.79 0.82 1.01 0.71 0.32 1.16 0.69	0.39 0.98 0.79 0.82 1.01 0.71 0.32 1.16 0.69	0.39 0.97 0.79 0.82 1.01 0.71 0.32 1.16 0.69	0.39 0.97 0.79 0.82 1.04 0.71 0.32 1.16 0.69 0.47	0.39 0.98 0.83 0.82 1.04 0.71 0.32 1.16 0.69 0.47	0.39 0.98 0.84 0.82 1.04 0.71 0.91 0.32 1.16 0.64 0.64	0.39 0.98 0.81 0.82 1.04 0.71 0.93 0.32 1.16 0.64 0.69	0.39 0.99 0.81 0.82 1.07 0.71 0.95 0.32 1.16 0.64 0.69
gency lew York-MTA-NYCT Vashington, D.CWMATA Nicago-RTA-CTA oston-MBTA lianta-MARTA Niladalphia-SEPTA an Francisco-BART ww York-PATHC ismi-MDTA akimore-MMTA os Angeles-LACMTA Niladalphia-NJ-PATC	1,984 0.39 0.97 0.80 0.89 0.71 0.91 0.32 1.17 0.61	1,985 0.39 0.98 0.79 0.84 0.98 0.71 0.91 0.32 1.15 0.61	1,986 0.39 1.00 0.79 0.98 0.71 0.91 0.32 1.15 0.61	1,987 0.39 1.00 0.79 0.82 0.99 0.71 0.91 0.32 1.15 0.69 0.67	0.39 1.00 0.79 0.82 1.01 0.71 0.32 1.15 0.69 0.67	0.39 1.00 0.79 0.82 1.01 0.71 0.91 0.32 1.16 0.69 0.67	0.39 1.00 0.79 0.82 1.01 0.71 0.91 0.32 1.16 0.69 0.67	0.39 0.98 0.79 0.82 1.01 0.71 0.32 1.16 0.69 0.67	0.39 0.97 0.79 0.82 1.01 0.71 0.31 0.32 1.16 0.69 0.67	0.39 0.97 0.79 0.82 1.04 0.71 0.32 1.16 0.69 0.47 0.67	0.39 0.98 0.83 0.82 1.04 0.71 0.32 1.16 0.69 0.47 0.67	0.39 0.98 0.84 0.62 1.04 0.71 0.91 0.32 1.16 0.64 0.47 0.67	0.39 0.98 0.81 0.82 1.04 0.71 0.93 0.32 1.16 0.64 0.69 0.67	0.39 0.99 0.81 0.82 1.07 0.71 0.95 0.32 1.16 0.64 0.69 0.67
gency wer York-NATA-NYCT Vashington, D.CWMATA Chicago-RTA-CTA Gaton-MBTA Jaiante-MARTA Miadalphia-SEPTA an Francisco-BART Iway York-PATHC Mam-MDTA Jaikimore-MMTA os Angeles-LACMTA Miadalphia-NJ-PATC	1,984 0.39 0.79 0.80 0.89 0.71 0.91 0.32 1.17 0.51 0.67 0.99	1,985 0.39 0.98 0.79 0.84 0.98 0.71 0.91 0.32 1.15 0.61	1,986 0.39 1.00 0.79 0.84 0.98 0.71 0.32 1.15 0.61 0.67 0.99	1,987 0.39 1.00 0.79 0.82 0.99 0.71 0.32 1.15 0.69 0.67 0.99	0.39 1.00 0.79 0.82 1.01 0.71 0.91 0.32 1.15 0.69 0.67 0.99	0.39 1.00 0.79 0.82 1.01 0.71 0.91 0.32 1.16 0.69 0.67 0.99	0.39 1.00 0.79 0.82 1.01 0.71 0.91 0.32 1.16 0.69 0.67 0.99	0.39 0.98 0.79 0.82 1.01 0.71 0.91 0.32 1.16 0.69 0.67 0.99	0.39 0.97 0.79 0.82 1.01 0.91 0.32 1.16 0.69 0.67 0.99	0.39 0.97 0.82 1.04 0.71 0.91 0.32 1.16 0.69 0.47 0.67 0.99	0.39 0.98 0.83 0.82 1.04 0.71 0.91 0.32 1.16 0.69 0.47 0.67 0.99	0.39 0.98 0.84 0.62 1.04 0.71 0.91 0.32 1.16 0.64 0.67 0.67 0.99	0.39 0.98 0.81 0.82 1.04 0.71 0.93 0.32 1.16 0.64 0.69 0.67 0.99	0.39 0.99 0.81 0.82 1.07 0.71 0.95 0.32 1.16 0.64 0.69 0.67 0.99
gency lew York-MTA-NYCT lew Fork-MTA-NYCT kashington, D.CWMATA Nikasangkon, D.CWMATA Stateman, D.CWMATA Jastangkon, D.CWMATA Jastangkon, S.CSPATA Jastangkon, S.CSPATA Jast	1,984 0.39 0.97 0.80 0.89 0.71 0.91 0.32 1.17 0.61	1,985 0.39 0.98 0.79 0.84 0.98 0.71 0.91 0.32 1.15 0.61 0.67 0.99	1,986 0.39 1.00 0.79 0.98 0.71 0.91 0.32 1.15 0.61	1,987 0.39 1.00 0.79 0.82 0.99 0.71 0.91 0.32 1.15 0.69 0.67	0.39 1.00 0.79 0.82 1.01 0.71 0.32 1.15 0.69 0.67	0.39 1.00 0.79 0.82 1.01 0.71 0.91 0.32 1.16 0.69 0.67	0.39 1.00 0.79 0.82 1.01 0.71 0.91 0.32 1.16 0.69 0.67	0.39 0.98 0.79 0.82 1.01 0.71 0.32 1.16 0.69 0.67	0.39 0.97 0.79 0.82 1.01 0.71 0.31 0.32 1.16 0.69 0.67	0.39 0.97 0.79 0.82 1.04 0.71 0.32 1.16 0.69 0.47 0.67	0.39 0.98 0.83 0.82 1.04 0.71 0.32 1.16 0.69 0.47 0.67	0.39 0.98 0.84 0.62 1.04 0.71 0.91 0.32 1.16 0.64 0.47 0.67	0.39 0.98 0.81 0.82 1.04 0.71 0.93 0.32 1.16 0.64 0.69 0.67	0.39 0.99 0.81 0.82 1.07 0.71 0.95 0.32 1.16 0.64 0.69 0.67
gency wervark-AR-NYCT Veshington, D.CWMATA Thicego-RTA-CTA Siton-MBTA Sister-MARTA Misdelphine-SEPTA am Francisco-BART werv York-PATHC Misdelphine-NHTA as Angeles-LACMTA Misdelphine-NL-PATC Isveland-GCRTA Isvy York-MTA-SIRTOA VERAGE	1,984 0.39 0.97 0.90 0.80 0.89 0.71 0.91 0.32 1.17 0.51 0.51 0.99 1.33 0.82	1.985 0.39 0.98 0.79 0.84 0.96 0.71 0.91 0.32 1.15 0.67 0.99 1.33 0.63	1.966 0.39 1.00 0.79 0.84 0.71 0.91 0.32 1.15 0.61 0.67 0.99 1.33 0.83	1,987 0,39 1,00 0,79 0,82 0,99 0,71 0,99 0,71 0,32 1,15 0,67 0,99 1,33 0,67	0.39 1.00 0.79 0.82 1.01 0.71 0.71 0.32 1.15 0.69 0.67 0.99 1.33 0.84	0.33 1.00 0.79 0.82 1.01 0.71 0.91 0.32 1.16 0.69 0.67 0.99 1.33 0.84	0.33 1.00 0.79 0.82 1.01 0.71 0.31 1.16 0.69 0.69 0.69 1.33 0.84	0.39 0.89 0.79 0.82 1.01 0.91 0.32 1.16 0.69 0.67 0.99 1.33 0.84	0.39 0.97 0.79 0.82 1.01 0.71 0.32 1.16 0.69 0.69 0.87 0.89	0.39 0.97 0.79 0.82 1.04 0.71 0.91 0.91 0.47 0.59 0.47 0.69 0.47 0.59 0.33 0.81	0.39 0.80 0.83 0.82 1.04 0.91 0.91 0.91 0.91 0.69 0.47 0.69 0.47 0.99 1.33 0.82	0.39 0.84 0.84 0.82 1.04 0.71 0.32 1.16 0.64 0.47 0.67 0.67 0.87 0.81	0,39 0,96 0.81 0.82 1.04 0.73 0.32 1.16 0.63 0.64 0.69 0.67 0.99 1.33 0.83	0.39 0.99 0.81 1.07 0.71 0.95 0.32 1.16 0.69 0.67 0.99 1.33 0.82
gency wy York-MTA-NYCT /ashingion, D.CWMATA Nicago-RTA-CTA otom-MBTA lianta-MARTA hiladelphia-SEPTA an Francisco-BART wy York-PATHC liami-MDTA aitimore-MMTA aitimore-MMTA aitimore-MMTA aitimore-MMTA aitimore-MMTA aitimore-MMTA so Angeles-LACMTA hiladelphia-NJ-PATC liavesland-GCRTA wy York-MTA-SIRTOA VERAGE GMT RAIL gency	1.994 0.39 0.97 0.79 0.80 0.89 0.71 0.91 0.32 1.17 0.61 0.61 0.67 1.33 0.82 Number of auto 1994	1.985 0.39 0.98 0.79 0.84 0.98 0.71 0.99 0.32 1.15 0.61 0.67 0.99 1.33 0.63	1.986 0.39 1.00 0.79 0.84 0.38 0.71 0.32 1.15 0.61 0.67 0.99 1.33 0.83 0.83	1.987 0.39 1.00 0.79 0.82 0.99 0.71 0.32 1.15 0.69 0.67 0.99 1.33 0.84	0.39 1.00 0.79 0.82 1.01 0.71 0.91 0.32 1.15 0.69 0.67 0.99 1.33 0.84	0.39 1.00 0.79 0.82 1.01 0.71 0.91 0.91 1.16 0.69 0.67 0.99 1.33 0.84	0.39 1.00 0.79 0.82 1.01 0.71 0.31 0.31 1.16 0.69 0.67 0.99 1.33 0.64	0.39 0.98 0.79 0.82 1.01 0.71 0.31 1.16 0.69 0.67 0.99 1.33 0.84	0.39 0.97 0.82 1.01 0.71 0.91 0.91 0.91 1.16 0.69 0.67 0.99 1.33 0.84	0.39 0.97 0.82 1.04 0.71 0.31 1.16 0.69 0.47 0.67 0.93 0.81	0.39 0.98 0.82 1.04 0.71 0.91 0.31 1.16 0.69 0.47 0.67 0.67 0.82	0.39 0.98 0.84 0.82 1.04 0.71 0.91 0.31 1.16 0.64 0.67 0.67 0.67 0.81	0,39 0,98 0,82 1,04 0,71 0,93 0,32 1,16 0,64 0,64 0,64 0,67 0,99 0,67 0,93 0,83	0.39 0.99 0.81 1.07 0.71 0.95 0.32 1.16 0.64 0.69 0.69 0.69 1.33 0.82
gency wy York-MTA-NYCT Jashington, D.CWMATA Nicsgo-RTA-CTA Ostion-MBTA Israte-MARTA Israte-MARTA an Francisco-BART wy York-PATHC Israt-MDTA astimore-MMTA os Angeles-LACMTA Isladelphia-NL-PATC Isveland-GCRTA wy York-MTA-SIRTOA VERAGE GHT RAIL gency ston-MBTA	1.994 0.39 0.97 0.79 0.80 0.80 0.79 0.80 0.71 0.91 0.32 1.17 0.51 0.57 0.93 1.33 0.82 Number of suito 1994 0.80	1.985 0.39 0.98 0.79 0.64 0.98 0.71 0.91 0.91 0.91 0.51 0.61 0.67 0.67 1.33 0.63	1.966 0.39 1.00 0.74 0.84 0.96 0.71 0.91 0.91 0.57 0.61 0.67 1.33 0.63 0.83	1.987 0.39 1.00 0.79 0.82 0.99 0.71 0.91 0.91 0.91 0.57 0.69 0.67 0.69 1.33 0.64	0.39 1.00 0.79 0.82 1.01 0.71 0.91 0.32 1.15 0.69 1.33 0.84 1988 0.79	0.39 1.00 0.79 0.82 1.01 0.71 0.91 0.69 0.67 0.89 1.33 0.84	0.33 1.00 0.79 0.82 1.01 0.71 0.91 0.63 0.67 0.99 1.33 0.84	0.39 0.79 0.79 0.82 1.01 0.71 0.32 1.16 0.69 0.67 0.99 1.33 0.84	0.39 0.97 0.79 0.82 1.071 0.91 0.32 1.16 0.69 0.67 0.99 1.33 0.84	0.39 0.97 0.79 0.82 1.04 0.71 0.91 0.91 0.47 0.47 0.47 0.47 0.47 0.47 0.59 1.33 0.81	0.39 0.98 0.83 0.82 1.04 0.71 0.91 0.32 1.16 0.67 0.47 0.47 0.47 0.59 1.33 0.62	0.33 0.98 0.84 0.82 1.04 0.71 0.91 0.62 1.16 0.64 0.47 0.67 1.33 0.81	0.39 0.98 0.81 0.82 1.04 0.71 0.32 1.16 0.69 0.69 0.89 1.33 0.83	0.39 0.99 0.81 0.82 1.07 0.71 0.95 0.32 1.16 0.64 0.69 0.67 0.99 1.33 0.82
gency wy York-MTA-NYCT Jashington, D.CWMATA hicago-RTA-CTA diton-MBTA lianta-MARTA hisdelphia-SEPTA an Francisco-BART wy York-PATHC lianta-MMTA aBimore-MMTA aBimore-MMTA aBimore-MMTA aBimore-MMTA aBimore-MMTA abimore-MMTA school Composition wy York-MTA-SIRTOA WERAGE	1.994 0.39 0.97 0.79 0.80 0.89 0.71 0.91 0.32 1.17 0.61 0.61 0.67 1.33 0.82 Number of auto 1994	1.985 0.39 0.98 0.79 0.84 0.98 0.71 0.99 0.32 1.15 0.61 0.67 0.99 1.33 0.63	1.986 0.39 1.00 0.79 0.84 0.38 0.71 0.32 1.15 0.61 0.67 0.93 1.33 0.83 0.83	1.987 0.39 1.00 0.79 0.79 0.99 0.71 0.32 1.35 0.69 0.67 0.99 1.33 0.84	0.39 1.00 0.79 0.82 1.01 0.71 0.32 1.15 0.89 1.33 0.87 0.99 1.33 0.84	0.39 1.00 0.79 0.82 1.01 0.71 0.32 1.16 0.57 0.99 1.33 0.64 1989 0.79	0.33 1.00 0.79 0.82 1.01 0.71 0.32 1.16 0.57 0.99 1.33 0.67 0.94 1.33 0.64	0.39 0.79 0.79 0.82 1.01 0.71 0.32 1.16 0.69 0.67 0.99 1.33 0.64 1991 0.79 1.06	0.39 0.97 0.79 0.82 1.01 0.71 0.32 1.16 0.32 1.16 0.67 0.99 1.33 0.67 0.99 1.33 0.84	0.39 0.79 0.82 1.04 0.71 0.31 0.32 1.16 0.89 0.47 0.59 1.33 0.81	0.39 0.98 0.83 0.82 1.04 0.71 0.91 0.32 1.16 0.69 0.47 0.59 1.33 0.82 1.99 1.33 0.82	0.33 0.98 0.94 0.82 1.04 0.71 0.91 0.32 1.16 0.64 0.47 0.99 1.33 0.81 1995 0.79	0.39 0.98 0.81 0.82 1.04 0.71 0.93 0.52 1.16 0.69 0.69 1.33 0.83 1996 0.79	0.39 0.99 0.81 0.82 1.07 0.71 0.75 0.32 1.16 0.64 0.69 0.67 9 1.33 0.82
sency we York-MTA-NYCT (sahingion, D.CWMATA Neago-RTA-CTATA Aaton-MBTA Isras-MARTA Madaphine-SEPTA an Francisco-BART we York-PATHC israi-MDTA altimore-MWTA so Angeles-LACMTA hildelphine-SHATCA verange GHT RALL gency solon-MBTA an Francisco-MUNI Madephine-SEPTA	1,994 0.39 0.97 0.79 0.80 0.80 0.71 0.91 0.32 1.17 0.51 0.67 0.99 1.33 0.82 Number of auto 1994 0.80 1.06	1.965 0.39 0.98 0.74 0.64 0.99 0.71 0.91 0.91 0.91 0.61 0.61 0.67 0.99 1.33 0.63 0.83 0.83	1.966 0.39 1.00 0.74 0.84 0.96 0.71 0.91 0.91 0.57 0.61 0.67 1.33 0.63 0.83	1.987 0.39 1.00 0.79 0.82 0.99 0.71 0.91 0.91 0.91 0.57 0.69 0.67 0.69 1.33 0.64	0.39 1.00 0.79 0.82 1.01 0.71 0.91 0.32 1.15 0.69 1.33 0.84 1988 0.79	0.39 1.00 0.79 0.82 1.01 0.71 0.91 0.69 0.67 0.89 1.33 0.84	0.33 1.00 0.79 0.82 1.01 0.71 0.91 0.52 1.16 0.63 0.67 0.99 1.33 0.84	0.39 0.98 0.79 0.82 1.01 0.71 0.32 1.16 0.67 0.99 1.33 0.84 1991 0.79 1.06	0.39 0.79 0.82 1.01 0.71 0.32 1.16 0.67 0.99 1.33 0.64 1992 0.79 1.08	0.39 0.97 0.79 0.82 1.04 0.71 0.32 1.16 0.69 0.47 0.69 1.33 0.81 1993 0.79 1.08	0.39 0.98 0.83 0.82 1.04 0.71 0.52 1.16 0.52 1.16 0.47 0.69 0.47 0.69 1.33 0.82	0.33 0.98 0.84 0.82 1.04 0.71 0.91 0.32 1.16 0.67 0.97 1.33 0.81	0.39 0.98 0.81 0.82 1.02 1.16 0.69 0.67 0.99 1.33 0.83 1996 0.79 1.06	0.39 0.89 0.81 0.82 1.07 0.71 0.95 0.32 1.16 0.64 0.69 0.67 0.39 1.33 0.82
gency wy York-MTA-NYCT Jashington, D.CWMATA hicago-RTA-CTA diton-MBTA lianta-MARTA hiladalphia-SEPTA an Francisco-BART wy York-PATHC liami-MDTA altimore-MMTA bis Angelia-LACMTA bis Angelia-LACMTA bis Angelia-LACMTA an Francisco-MUNI hiladalphia-SEPTA bis Angelia-LACMTA an Diago Trolley inc. L. Joura-BSDA	1,994 0.39 0.97 0.79 0.80 0.80 0.71 0.91 0.32 1.17 0.51 0.67 0.99 1.33 0.82 Number of auto 1994 0.80 1.06	1.965 0.39 0.98 0.74 0.64 0.99 0.71 0.91 0.91 0.91 0.61 0.61 0.67 0.99 1.33 0.63 0.83 0.83	1.986 0.39 1.00 0.79 0.84 0.38 0.71 0.32 1.15 0.61 0.67 0.93 1.33 0.83 0.83	1.987 0.39 1.00 0.62 0.99 0.62 0.99 0.71 0.32 1.15 0.69 1.33 0.67 0.99 1.33 0.84 ved area 1987 0.79 1.05 0.88	0.39 1.00 0.82 1.01 0.71 0.31 0.31 0.32 1.15 0.69 0.67 0.99 1.33 0.84	0.39 1.00 0.79 0.62 1.01 0.71 0.32 1.16 0.69 0.67 0.89 0.84 1989 0.79 1.06 0.89	0.39 1.09 0.79 0.82 1.01 0.71 0.32 1.16 0.69 1.33 0.84 1990 0.79 1.06 0.89	0.39 0.79 0.82 1.01 0.71 0.32 1.16 0.59 0.57 0.99 1.33 0.84 1991 0.79 1.08 1.07 1.24	0.39 0.97 0.62 1.01 0.71 0.71 0.31 0.51 0.59 0.67 0.69 1.33 0.84 1992 0.79 1.08 0.88	0.39 0.79 0.62 1.04 0.71 0.31 0.32 1.16 0.67 0.67 0.67 0.67 0.67 0.67 1.33 0.81	0.39 0.98 0.83 0.82 1.04 0.71 0.32 1.16 0.67 0.67 0.67 0.67 0.67 0.67 0.67 0.6	0.39 0.94 0.84 0.84 0.71 0.71 0.32 1.16 0.64 0.67 0.67 0.67 0.87 0.81 1995 0.79 1.06 0.81	0.39 0.98 0.81 0.82 1.04 0.71 0.93 0.32 1.16 0.69 0.69 1.33 0.83 1996 0.79	0.39 0.99 0.81 1.07 0.71 0.75 0.32 1.16 0.64 0.69 0.67 0.99 1.33 0.82
sency wy York-MI-NYCT (sathington, D.CWMATA Isathington, D.CWMATA Dation-MBTA Isras-MARTA January Comparison Isras-Martine Isras-Martine Isras-Martine Isras-Marta Isras-M	1,994 0.39 0.97 0.70 0.80 0.80 0.71 0.91 0.32 1.17 0.61 1.33 0.82 Number of suito 1984 0.80 1.06 0.88	1.965 0.39 0.79 0.64 0.99 0.71 0.91 0.71 0.91 0.71 0.99 1.33 0.67 0.99 1.33 0.83 0.83	1.986 0.39 0.64 0.64 0.94 0.71 0.91 0.92 1.15 0.61 0.99 1.33 0.83 0.83 0.83	1.987 0.39 1.00 0.62 0.82 0.99 0.71 0.91 0.51 0.69 1.33 0.67 0.99 1.33 0.84 ved area 1987 0.79 1.06	0.39 1.00 0.79 0.82 1.01 0.71 0.32 1.15 0.89 1.33 0.84 1986 0.79 1.06 0.89	0.39 1.00 0.79 0.62 1.01 0.71 0.32 1.16 0.59 0.67 0.99 1.33 0.84 1969 0.79 1.06 0.69	0.33 1.00 0.79 0.82 1.01 0.71 0.32 1.16 0.32 1.65 0.67 0.99 1.33 0.84 1990 0.79 1.06 0.89	0.39 0.79 0.82 1.01 0.71 0.32 1.16 0.32 1.16 0.69 0.67 0.99 1.33 0.84 1991 0.79 1.08 0.86	0.39 0.97 0.79 0.82 1.01 0.71 0.32 1.16 0.69 0.67 0.99 1.33 0.84 1992 0.79 1.08 0.84	0.39 0.97 0.79 0.82 1.04 0.71 0.32 1.16 0.89 0.47 0.59 0.47 0.59 1.33 0.81 1993 0.79 1.08 0.79 1.08	0.39 0.98 0.83 0.62 1.04 0.71 0.71 0.32 1.16 0.69 0.47 0.57 0.57 0.57 0.57 0.52 1.33 0.62	0.33 0.94 0.84 0.82 1.04 0.71 0.32 1.16 0.64 0.67 0.93 0.81 1995 0.79 1.06 0.88 1.07	0.39 0.98 0.81 0.82 1.04 0.71 0.73 0.32 1.16 0.64 0.67 0.93 0.67 0.93 0.83 1.996 0.79 1.06 0.88 1.29 1.29 1.29	0.39 0.99 0.82 1.07 0.71 0.52 1.16 0.64 0.64 0.69 1.33 0.82 1.997 0.79 1.06 0.88 1.28 1.28 1.28 1.01
gency wy York-MA-NYCT Jashington, D.CWMATA Nicago-RTA-CTA Suton-MBTA Isara-MARTA Isara-MARTA Isara-MARTA an Francisco-BART wy York-PATHC Isara-MDTA altimore-MMTA os Angelas-LACMTA Nicade phina-LyD-PATC Isaveland-GCRTA awy York-MTA-SIRTOA VERAGE GHT RAIL gency Sofon-MBTA an Francisco-MUNI Nicadephina-SEPTA as Angelas-LACMTA an Diago Trolley Inc. L. Jours-BSDA Ortima-TCMTDO	1,994 0.39 0.97 0.70 0.80 0.80 0.71 0.91 0.32 1.17 0.61 1.33 0.82 Number of suito 1984 0.80 1.06 0.88	1.965 0.39 0.79 0.64 0.99 0.71 0.91 0.71 0.91 0.71 0.99 1.33 0.67 0.99 1.33 0.83 0.83	1.986 0.39 0.64 0.64 0.94 0.71 0.91 0.92 1.15 0.61 0.99 1.33 0.83 0.83 0.83	1.987 0.39 0.62 0.62 0.99 0.71 0.51 0.51 0.53 1.15 0.67 0.67 0.69 1.33 0.64 ved area 1987 1.06 0.88 1.08 1.08	0.39 1.00 0.82 1.01 0.51 0.51 0.51 0.59 1.15 0.69 0.67 0.59 1.33 0.84	0.39 1.00 0.79 0.62 1.01 0.71 0.31 0.51 0.59 1.33 0.67 0.59 0.67 0.59 1.33 0.84	0.39 1.09 0.79 0.82 1.01 0.71 0.32 1.16 0.69 1.33 0.84 1990 0.79 1.06 0.89 1.06 0.89	0.39 0.79 0.82 1.01 0.71 0.32 1.16 0.59 0.57 0.99 1.33 0.84 1991 0.79 1.08 1.07 1.24	0.39 0.97 0.62 1.01 0.71 0.31 0.32 1.33 0.67 0.59 1.33 0.84 1992 0.79 1.08 0.84	0.39 0.97 0.62 1.04 0.71 0.31 0.31 1.16 0.69 0.47 0.67 0.67 0.67 0.89 1.33 0.81 1.993 0.79 1.08 0.88 1.07 1.24	0.39 0.98 0.83 0.62 1.04 0.71 0.51 0.57 0.67 0.67 0.67 0.67 1.08 0.82 1.08 0.82	0.39 0.94 0.84 0.84 0.71 0.71 0.32 1.16 0.64 0.67 0.67 0.67 0.67 0.87 0.81 1.33 0.81	0.39 0.98 1.04 0.71 0.93 0.32 1.16 0.64 0.67 0.67 0.67 0.68 0.67 0.83 1.33 0.83	0.39 0.99 0.81 1.07 0.71 0.55 0.32 1.16 0.64 0.64 0.69 0.67 0.99 1.33 0.82 1.997 1.06 0.88 1.23 1.28 1.23 1.24 1.01 1.13
gency wr York-MT-NYCT /sathington, D.CWMATA /sathington, D.CWMATA /sago-RTA-CTATA /sago-RTA-CTATA /sago-RTA-CTATA /sago-RTA	1,994 0.39 0.97 0.70 0.80 0.80 0.71 0.91 0.32 1.17 0.61 1.33 0.82 Number of suito 1984 0.80 1.06 0.88	1.965 0.39 0.79 0.64 0.99 0.71 0.91 0.71 0.91 0.71 0.99 1.33 0.67 0.99 1.33 0.83 0.83	1.986 0.39 0.64 0.64 0.94 0.71 0.91 0.92 1.15 0.61 0.99 1.33 0.83 0.83 0.83	1.987 0.39 0.79 0.62 0.91 0.91 0.91 0.91 0.91 0.91 0.67 0.93 0.67 0.93 0.67 0.93 0.84 ved area 1997 0.79 1.06 0.88 1.08	0.39 1.00 0.79 0.82 1.01 0.71 0.32 1.15 0.69 0.67 0.59 1.33 0.64 1986 0.79 1.08 1.08 1.08	0.39 1.00 0.79 0.82 1.01 0.71 0.32 1.16 0.69 0.67 0.57 1.33 0.64 1989 0.79 1.05 0.88 1.28 1.14 1.20	0.39 1.00 0.79 0.62 1.01 0.71 0.32 1.16 0.69 0.67 1.33 0.84 1.33 0.84 1.990 0.79 1.05 0.88 1.24 1.14	0.39 0.38 0.79 0.82 1.01 0.71 0.32 1.16 0.69 0.67 0.99 1.33 0.64 1991 0.79 1.24 1.06 0.88 1.07 1.24 1.14	0.39 0.97 0.679 0.621 1.01 0.71 0.32 1.33 0.69 0.67 0.99 1.33 0.64 1992 0.79 1.08 1.08 1.09 1.24 1.14 1.20	0.39 0.97 0.62 1.04 0.71 0.32 1.16 0.69 0.67 0.67 0.67 0.89 1.33 0.81 1993 0.79 1.08 0.88 1.07 1.24 1.14	0.39 0.96 0.83 0.82 1.04 0.71 0.32 1.16 0.69 0.47 0.57 0.57 0.57 0.57 0.57 0.57 0.52 1.33 0.62 1994 0.79 1.03 1.09 0.88 0.88 0.88 1.07 1.27 1.01	0.39 0.94 0.84 0.22 1.04 0.71 0.32 1.16 0.64 0.47 0.67 1.33 0.61 1.995 0.79 1.33 0.81	0.39 0.98 0.81 0.62 1.04 0.71 0.93 0.32 1.04 0.64 0.64 0.64 0.65 1.33 0.83 1996 0.79 1.93 0.83 1996 0.79 1.28 1.28 1.01 1.21	0.39 0.99 0.82 1.07 0.52 1.16 0.54 0.64 0.64 0.69 0.67 0.99 1.33 0.82 1.997 0.82 1.997 1.06 0.88 1.23 1.28 1.28 1.28 1.13 1.34 1.24
sency ws York-MTA-NYCT (sathington, D.CWMATA (neago-RTA-CTA) tashington, D.CWMATA (neago-RTA-CTA) tashington, D.CWMATA (neago-RTA-CTA) haddsphins-SEPTA an Francisco-BART (neago-RTA) sc Angeles-LACMTA haddsphins-LACMTA (no Francisco-MUM) haddsphins-SEPTA no Francisco-MUM) haddsphins-SEPTA no Francisco-MUM) haddsphins-SEPTA no Francisco-MUM) haddsphins-SEPTA to Indeg Triology (nc. Louis-BSDA Oblinad-TCMTDO balas-DARTA scramento-RTD HisburghPAT afride-NTS	1,994 0,39 0,97 0,79 0,80 0,80 0,71 0,51 0,32 1,17 0,51 0,57 0,99 1,33 0,82 Number of auto 1984 0,80 1,06 0,80 1,05 0,80 1,05 0,80	1.965 0.39 0.98 0.79 0.64 0.94 0.94 0.94 0.91 0.57 0.99 0.67 0.99 0.67 0.99 0.67 0.99 0.83 0.83 0.83	1,986 0.39 1,00 0,79 0,84 0,94 0,94 0,94 0,94 0,94 0,94 0,94 0,9	1.987 0.39 0.62 0.62 0.99 0.71 0.51 0.51 0.53 1.15 0.67 0.67 0.69 1.33 0.64 ved area 1987 1.06 0.88 1.08 1.08	0.39 1.00 0.82 1.01 0.51 0.51 0.51 0.59 1.15 0.69 0.67 0.59 1.33 0.84	0.39 1.00 0.79 0.62 1.01 0.71 0.31 0.51 0.59 1.33 0.67 0.59 0.67 0.59 1.33 0.84	0.39 1.09 0.79 0.82 1.01 0.71 0.32 1.16 0.69 1.33 0.84 1990 0.79 1.06 0.89 1.06 0.89	0.39 0.79 0.82 1.01 0.71 0.91 0.91 0.32 1.16 0.69 1.33 0.84 1991 0.79 1.08 0.84	0.39 0.97 0.62 1.01 0.51 0.31 0.32 1.33 0.69 1.33 0.69 1.33 0.84 1992 0.79 1.08 0.84 1.07 1.24 1.14 1.20	0.39 0.97 0.62 1.04 0.71 0.31 0.31 1.16 0.65 0.47 0.67 0.67 0.67 0.89 1.33 0.81 1.08 0.81 1.08 0.81 1.08 1.07 1.24 1.14	0.39 0.98 0.83 0.62 1.04 0.71 0.51 0.57 0.47 0.47 0.47 0.47 0.47 0.47 0.47 0.4	0.39 0.94 0.84 0.82 1.04 0.71 0.32 1.16 0.64 0.67 0.67 0.67 0.63 0.81 1995 0.79 1.06 0.88 107 1.27 1.21 1.24	0.39 0.98 1.04 0.71 0.93 0.32 1.16 0.64 0.67 0.67 0.67 1.33 0.83 1.996 0.79 1.06 0.79 1.06 0.79 1.06 0.83 1.20 1.20 1.21 1.24	0.33 0.81 0.82 1.07 0.71 0.71 0.72 1.16 0.52 0.52 0.52 0.52 0.52 0.52 0.52 0.52
sercy ws York-MA-NYCT ashington, D.CWMATA histon-MBTA histon-MBTA larate-MACTA biston-MBTA larate-MACTA witholetybiston school: school: biston-MBTA school: biston-MBTA biston-MBTA biston-MBTA biston-MBTA biston-MBTA biston-MBTA www.york-MTA-SiRTOA /EFRAGE	1,994 0,39 0,97 0,79 0,80 0,80 0,71 0,51 0,32 1,17 0,51 0,57 0,99 1,33 0,82 Number of auto 1984 0,80 1,06 0,80 1,05 0,80 1,05 0,80	1.965 0.39 0.98 0.79 0.64 0.94 0.91 0.94 0.71 0.94 0.57 0.99 0.67 0.99 0.67 0.99 0.67 0.99 0.83 0.83	1,986 0,39 0,79 0,84 0,94 0,94 0,71 0,91 0,91 0,82 0,83 0,83 0,83 0,83 0,83 0,83 0,83 0,83	1.987 0.39 0.62 0.99 0.62 0.99 0.71 0.51 0.51 0.51 0.67 0.99 1.33 0.64 0.64 ved area 1987 0.64 1.08 1.08 1.08	0.39 1.00 0.79 0.82 1.01 0.71 0.31 0.31 0.31 0.59 0.67 0.69 1.33 0.84 1986 0.79 1.06 0.69 1.06 0.89 1.06 0.89	0.39 1.00 0.79 0.62 1.01 0.51 0.51 0.59 1.16 0.69 0.69 0.69 0.69 1.33 0.84 1.969 0.79 1.05 0.89 0.79 1.05 0.89 1.28 1.14	0.39 1.00 0.79 0.82 1.01 0.71 0.32 1.16 0.69 0.69 0.67 0.99 0.67 0.93 0.84 1990 0.79 1.06 0.89 1.24 1.14 1.20 1.25	0.39 0.79 0.82 1.01 0.71 0.91 0.31 0.51 0.69 1.33 0.69 1.33 0.84 1991 0.79 1.08 0.87 1.08 0.87 1.24 1.24	0.39 0.97 0.679 0.82 1.01 0.71 0.32 1.33 0.69 0.67 0.99 1.33 0.64 1992 0.79 1.08 1.08 1.09 1.24 1.14 1.20	0.39 0.97 0.79 0.82 1.04 0.71 0.32 1.16 0.69 0.47 0.67 0.67 0.67 0.89 0.47 0.57 0.81 0.81 0.81 0.81 1.08 0.88 1.09 0.88 1.09 1.24 1.14 1.20 1.30 0.93	0.39 0.96 0.83 0.82 1.04 0.71 0.32 1.16 0.69 0.47 0.57 0.57 0.57 0.57 0.57 0.57 0.52 1.33 0.62 1994 0.79 1.03 1.09 0.88 0.88 0.88 1.07 1.27 1.01	0.39 0.94 0.84 0.62 1.04 0.71 0.32 1.16 0.64 0.64 0.64 0.64 0.67 1.33 0.81 1995 0.79 1.33 0.81	0.39 0.98 0.81 0.62 1.04 0.71 0.93 0.32 1.33 0.64 0.64 0.64 0.65 1.33 0.83 1996 0.79 1.33 0.83 1996 0.79 1.79 1.28 1.28 1.28 1.24 1.14 1.14 1.32	0.33 0.99 0.81 1.07 0.71 0.75 0.32 0.32 0.45 0.45 0.45 0.45 0.45 0.45 0.45 0.45
sency ws York-MI-NYCT (sathington, D.CWMATA (neago-RTA-CTA) tashington, D.CWMATA (neago-RTA-CTA) tashington, D.CWMATA (neago-RTA-CTA) haddsphis-SEPTA an Francisco-BART (near-MITA) sa Angeles-LACMTA hilladelphis-LACMTA (near-SCATA) wwy York-MTA-SIRTOA /ERAGE GHT RAIL pency ston-MBTA an Francisco-NUM hilladelphis-SEPTA is a Angeles-LACMTA in Diego Trology (nc. 1, Louis-BSDA obliand-TCMTDO blas-DARTA scramento-RTD HisburghPAT Ardia-NTS althore-MMTA althore-MMTA	1,994 0,39 0,97 0,79 0,80 0,80 0,71 0,91 0,32 1,17 0,51 0,67 0,99 1,33 0,82 Number of actio 1994 0,80 1,06 1,01	1.985 0.39 0.38 0.79 0.84 0.94 0.94 0.94 0.91 0.31 0.51 0.67 0.93 0.67 0.93 0.63 0.83 1.05 0.80 1.05 0.88 1.02	1,996 0.39 1,00 0,79 0,84 0,98 0,71 0,31 0,32 1,15 0,67 0,31 0,67 0,31 0,67 0,83 0,83 0,83 0,83 0,83 0,88 1,08	1.987 0.39 0.62 0.99 0.62 0.99 0.71 0.51 0.51 0.51 0.67 0.99 1.33 0.64 0.64 ved area 1987 0.64 1.08 1.08 1.08	0.39 1.00 0.79 0.82 1.01 0.71 0.31 0.31 0.31 0.59 0.67 0.69 1.33 0.84 1986 0.79 1.06 0.69 1.06 0.89 1.06 0.89	0.39 1.00 0.79 0.62 1.01 0.51 0.51 0.59 1.16 0.69 0.69 0.69 0.69 1.33 0.84 1.969 0.79 1.05 0.89 0.79 1.05 0.89 1.28 1.14	0.39 1.00 0.79 0.82 1.01 0.71 0.32 1.16 0.69 0.69 0.67 0.99 0.67 0.93 0.84 1990 0.79 1.06 0.89 1.24 1.14 1.20 1.25	0.39 0.79 0.82 1.01 0.71 0.91 0.31 0.51 0.69 1.33 0.69 1.33 0.84 1991 0.79 1.08 0.87 1.08 0.87 1.24 1.24	0.39 0.97 0.79 0.82 1.01 0.71 0.71 0.32 1.36 0.69 0.67 0.99 1.33 0.84 1992 0.79 1.33 0.84 1992 0.79 1.24 1.08 0.88 1.07 1.24	0.39 0.97 0.62 1.04 0.71 0.31 0.31 1.16 0.65 0.47 0.67 0.67 0.67 0.89 1.33 0.81 1.08 0.81 1.08 0.81 1.08 1.07 1.24 1.14	0.39 0.98 0.83 0.82 1.04 0.71 0.32 1.16 0.69 0.47 0.57 0.57 0.57 0.57 0.57 0.57 0.52 1.33 0.62 1994 0.79 1.08 0.88 0.88 1.08 1.08 1.08 1.08 1.27 1.01 1.14 1.20 1.24	0.39 0.94 0.84 0.82 1.04 0.71 0.32 1.16 0.64 0.67 0.67 0.67 0.63 0.81 1995 0.79 1.06 0.88 107 1.27 1.21 1.24	0.39 0.98 0.81 0.82 1.04 0.71 0.32 1.16 0.64 0.67 0.93 0.67 0.93 0.67 0.93 0.63 0.83 1996 0.79 1.06 0.79 1.06 1.23 1.23 1.23 1.23 1.23 1.23 1.23 1.23	0.33 0.99 0.81 0.02 0.82 0.82 0.82 0.82 0.82 0.85 0.82 0.85 0.82 0.82 0.82 0.82 0.82 0.82 0.82 0.82
sercy we York-MA-NYCT sishington, D.CWMATA htsshefton, D.CWMATA htssoentR-AC- tation-MBTA states-MARTA lartes-MARTA sindelphine-SEPTA an Francisco-BART wy York-PATHC isminote-MMTA iss Angeles-LACMTA lindelphine-Lyb-PATC eveland-GCRTA eveland-GCRTA www.York-MTA-SIRTOA /ERAGE	1,994 0.39 0.97 0.79 0.80 0.80 0.89 0.71 0.91 0.32 1.17 0.51 0.92 1.33 0.82 Number of acto 1994 0.88 1.06 0.88 1.01	1.965 0.39 0.98 0.79 0.64 0.91 0.71 0.91 0.71 0.91 0.61 0.67 0.99 1.33 0.63 0.63 1.06 1.06 1.06 0.88 1.02	1.986 0.39 0.79 0.84 0.84 0.84 0.87 0.71 0.91 0.91 0.91 0.67 0.99 1.35 0.83 0.83 0.83 0.83 0.83 0.83 1.06 0.79 1.06 0.88 1.08	1.987 0.39 0.79 0.82 0.99 0.71 0.91 0.91 0.91 0.91 0.91 0.91 0.67 0.99 1.33 0.84 0.67 0.99 1.35 0.84 0.84 1.05 1.06 0.88 1.06 1.25 0.93 1.02	0.39 1.00 0.79 0.82 1.01 0.71 0.32 1.05 0.69 0.67 0.99 1.06 0.89 1.08 1.14 1.25 0.33 1.83 1.83	0.39 1.00 0.79 0.82 1.01 0.71 0.32 1.32 1.33 0.69 0.67 0.99 1.33 0.84 1999 0.79 1.06 0.89 1.28 1.28 1.14 1.25 0.33 1.83 0.87	0.39 1.00 0.79 0.62 1.01 0.71 0.32 1.16 0.69 0.67 0.99 1.05 0.89 1.93 1.94 1.990 0.79 1.06 0.89	0.39 0.39 0.79 0.62 1.01 0.71 0.32 1.16 0.69 0.67 0.99 0.67 0.93 0.84 1991 0.79 1.08 0.88 1.07 1.24 1.14 1.20 1.25 0.93	0.39 0.97 0.79 0.62 1.01 0.71 0.31 0.51 0.59 1.33 0.69 1.33 0.84 1992 0.79 1.08 0.89 1.08 0.89 1.33 0.84	0.39 0.97 0.79 0.62 1.04 0.71 0.32 1.16 0.69 0.47 0.67 0.67 0.53 0.81 1993 0.79 1.08 1.97 1.24 1.14 1.20 1.30 0.93 1.31	0.39 0.98 0.83 0.62 1.04 0.71 0.32 1.16 0.69 0.47 0.57 0.57 0.57 0.57 0.53 0.82 1994 0.79 1.08 1.07 1.01 1.24 0.93	0.39 0.94 0.84 0.82 1.04 0.71 0.32 1.16 0.64 0.67 0.67 0.67 0.63 0.81 1995 0.79 1.06 0.88 1.07 1.27 1.01 1.14 1.20 1.24 0.93	0.39 0.98 0.81 0.62 1.04 0.71 0.93 0.32 1.33 0.64 0.64 0.64 0.65 1.33 0.83 1996 0.79 1.33 0.83 1996 0.79 1.79 1.28 1.28 1.28 1.24 1.14 1.14 1.32	0.39 0.81 0.62 1.07 0.71 0.55 0.32 0.32 1.16 0.64 0.69 0.67 0.99 1.33 0.82 1.977 0.79 0.79 0.79 0.82 1.06 0.82 1.07 0.82 1.07 1.06 1.07 0.82 1.07 0.81 0.82 0.81 0.82 0.81 0.82 0.82 0.84 0.82 0.84 0.82 0.84 0.82 0.84 0.84 0.82 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84
gency wy York-MTA-NYCT /asthrigton, D.CWMATA hicago-RTA-CTA 2010-MBTA lanta-MARTA lanta-MARTA lantadaphia-SEPTA an Francisco-BART wy York-PATHC laimore-MMTA be Angeles-LACMTA athroare-MMTA athroare-MATA scharter GHT RAIL gency GHT RAIL gency GHT RAIL gency GHT RAIL gency Scharter	1,994 0,39 0,97 0,79 0,80 0,80 0,71 0,91 0,32 1,17 0,51 0,67 0,99 1,33 0,82 Number of actio 1994 0,80 1,06 1,01	1.985 0.39 0.38 0.79 0.84 0.94 0.94 0.94 0.91 0.31 0.51 0.67 0.93 0.67 0.93 0.63 0.83 1.05 0.80 1.05 0.88 1.02	1,996 0.39 1,00 0,79 0,84 0,98 0,71 0,31 0,32 1,15 0,67 0,31 0,67 0,31 0,67 0,83 0,83 0,83 0,83 0,83 0,88 1,08	1.987 0.39 1.00 0.72 0.82 0.99 0.62 0.91 0.51 0.51 0.69 1.33 0.69 1.33 0.84 vad area 1987 0.79 1.06 1.08 1.08 1.08	0.39 1.00 0.79 0.82 1.01 0.71 0.32 1.15 0.69 0.67 0.69 0.67 0.69 1.33 0.84 1.988 0.79 1.06 0.88 1.08 1.14 1.20 1.20 1.20 1.20 1.83	0.39 1.00 0.79 0.82 1.01 0.71 0.32 1.16 0.69 0.69 0.69 0.59 0.79 1.33 0.84 1.989 0.79 1.33 0.84 1.28 1.16 0.88 1.28	0.39 1.00 0.79 0.82 1.01 0.71 0.32 1.16 0.69 0.57 0.57 0.59 1.33 0.84 1.990 0.79 1.33 0.84 1.990 0.79 1.24 1.16 1.26 1.26 1.24 1.14	0.39 0.79 0.79 0.71 0.71 0.71 0.32 1.16 0.69 0.67 0.57 0.57 0.33 0.84 1991 0.79 1.33 0.84 1991 0.79 1.24 1.16 0.80 1.24 1.14	0.39 0.97 0.79 0.82 1.01 0.71 0.71 0.32 1.16 0.69 0.67 0.99 0.99 0.99 0.99 0.99 0.99 0.88 0.88	0.39 0.97 0.79 0.82 1.04 0.71 0.32 1.16 0.69 0.47 0.67 0.67 0.67 0.67 0.80 1.33 0.81 1993 0.79 1.33 0.81	0.39 0.98 0.83 0.82 1.04 0.71 0.32 1.16 0.69 0.47 0.67 0.67 0.67 0.67 0.67 0.80 1.33 0.62 1.994 0.79 1.08 0.80 1.27 1.01 1.14 1.20 1.24 1.20 1.24	0.39 0.94 0.94 0.94 0.71 0.32 1.16 0.64 0.64 0.64 0.64 0.64 0.67 0.57 0.59 1.33 0.81 1995 0.79 1.33 0.81	0.39 0.98 0.81 0.62 1.04 0.71 0.93 0.32 1.33 0.64 0.64 0.64 0.64 0.65 0.83 0.83 1.33 0.83 1.996 0.79 1.33 0.83 1.28 1.01 1.14 1.20 1.24 1.20 1.24 1.20 1.24 1.21 1.20 1.24 1.23 1.20 1.24 1.24 1.24 1.24 1.24 1.24 1.24 1.24	0.39 0.99 0.81 0.82 1.07 0.71 0.62 1.16 0.64 0.69 0.67 0.69 0.67 0.69 0.67 0.59 0.67 0.59 0.67 0.59 0.67 0.59 0.67 0.59 0.67 0.50 0.52 0.52 0.52 0.52 0.55 0.55 0.55
gency wervork-An-NYCT varshington, D.CWMATA hicego-RTA-CTA outson-MBTA liserize-MARTA hisedophiesSEPTA an Francisco-BART werv York-PATHC liserize-MARTA attimote-MMTA os Angeles-LACMTA hisedophies-LUPATC laveland-GCRTA ever York-MTA-SIRTOA VERAGE KGHT RALL gency oston-MBTA an Francisco-MUN hisedophiesSEPTA os Angeles-LACMTA an Diago Trolley Inc. L, Louis-BSDA outand-TCTD hisburgh-PAT ufaio-NTS an Jago SCTD withourgh-PAT ufaio-NTS an Jago SCTD we Orleans-RTA ever Orleans-RTA	1,994 0.39 0.97 0.79 0.80 0.89 0.71 0.91 0.32 1.17 0.51 0.67 0.93 1.33 0.82 Number of acto 1994 0.80 1.06 1.96 1.05 1.01	1.965 0.39 0.98 0.79 0.64 0.91 0.71 0.91 0.32 1.15 0.61 0.67 0.99 1.33 0.83 0.83 1.965 1.96 1.965 1.965 1.965 1.065 1.065 1.02 1.22	1,986 0.39 1,00 0,79 0,84 0,84 0,71 0,91 0,91 0,81 0,81 0,83 0,83 0,83 0,83 0,83 0,83 0,83 0,83	1.987 0.39 0.79 0.82 0.99 0.71 0.91 0.91 0.91 0.91 0.91 0.67 0.93 1.35 0.67 0.93 1.35 0.84 ved area 1987 1.06 0.84 1.08 1.08 1.14 1.25 0.33 1.02 1.22	0.39 1.00 0.79 0.82 1.01 0.71 0.32 1.15 1.15 0.69 0.67 0.99 1.05 0.84 1.33 0.84 1.986 0.79 1.06 0.689 1.08 1.14 1.20 1.25 0.93 1.62 1.62	0.39 1.00 0.79 0.82 1.01 0.71 0.32 1.33 0.69 0.67 0.59 1.33 0.64 1.33 0.64 1.989 0.79 1.06 0.89 1.28 1.14 1.20 1.25 0.93 1.83 0.97 1.22	0.39 1.00 0.79 0.62 1.01 0.71 0.32 1.16 0.63 0.67 0.99 1.33 0.84 1.33 0.84 1.990 0.79 1.06 0.89 1.24 1.14 1.25 0.93 1.83 0.97 1.22	0.39 0.39 0.79 0.62 1.01 0.71 0.71 0.53 0.67 0.59 0.67 0.59 1.33 0.64 1.33 0.64 1.33 0.64 1.25 1.24 1.24 1.25 0.93 1.81 0.97 1.22	0.39 0.97 0.79 0.82 1.01 0.71 0.32 1.33 0.65 0.65 0.65 1.33 0.84 1.992 0.79 1.06 0.88 1.07 1.24 1.14 1.20 1.30 0.93 0.90 1.81 0.97 1.22	0.39 0.97 0.79 0.62 1.04 0.71 0.32 1.33 0.67 0.67 0.67 0.67 0.67 0.89 0.47 1.33 0.81 1.33 0.81 1.993 0.79 1.08 0.88 1.079 1.02 1.24 1.24 1.20 1.30 0.33 1.01 1.84 1.24	0.39 0.98 0.83 0.62 1.04 0.71 0.32 1.32 0.67 0.69 0.47 0.57 0.57 0.57 1.03 0.62 1.33 0.62 1.33 0.62 1.33 0.62 1.33 1.04 1.27 1.01 1.27 1.20 1.24 0.53 1.01 1.81 0.57 1.22 0.57 1.22 0.57	0.39 0.94 0.64 0.62 1.04 0.71 0.32 1.16 0.64 0.67 0.67 0.67 0.67 0.81 1.995 0.79 1.06 0.79 1.068 1.077 1.01 1.14 1.20 1.24 0.33 1.01 1.81 0.01 1.81	0.39 0.98 0.81 0.82 1.04 0.71 0.53 0.32 1.16 0.64 0.67 0.93 0.67 0.93 0.63 0.83 1996 0.79 1.06 0.88 1.23 1.23 1.23 1.23 1.23 1.23 1.23 1.23	0.39 0.99 0.81 0.82 1.07 0.71 1.07 0.95 0.32 0.45 0.65 0.45 0.64 0.69 0.67 0.79 1.06 0.68 1.33 0.82 1997 0.79 1.06 0.88 1.28 1.28 1.28 1.28 1.24 0.13 1.34 0.82 0.81 0.82 0.81 0.82 0.81 0.85 0.82 0.85 0.85 0.85 0.85 0.85 0.85 0.85 0.85
gency lew York-MTA-NYCT Vashington, D.CWMATA Thicago-RTA-CTA Staton-MBTA Jistat-MARTA Mistatophia-SEPTA sam Francisco-BART (saw York-PATHC Alaminot-MMTA Jakimore-MMTA Jakimore-MMTA Jakimore-MMTA Javy York-MTA-SIRTOA VerRAGE	1,994 0.39 0.97 0.79 0.80 0.80 0.89 0.71 0.91 0.32 1.17 0.51 0.92 1.33 0.82 Number of acto 1994 0.88 1.06 0.88 1.01	1.965 0.39 0.98 0.79 0.64 0.91 0.71 0.91 0.71 0.91 0.61 0.67 0.99 1.33 0.63 0.63 1.06 1.06 1.06 0.88 1.02	1.986 0.39 0.79 0.84 0.84 0.84 0.87 0.71 0.91 0.91 0.91 0.87 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83	1.987 0.39 0.79 0.82 0.99 0.71 0.91 0.91 0.91 0.91 0.91 0.91 0.67 0.99 1.33 0.84 0.67 0.99 1.35 0.84 0.84 1.05 1.06 0.88 1.06 1.25 0.93 1.02	0.39 1.00 0.79 0.82 1.01 0.71 0.32 1.05 0.69 0.67 0.99 1.06 0.89 1.08 1.14 1.25 0.33 1.83 1.83	0.39 1.00 0.79 0.82 1.01 0.71 0.32 1.32 1.33 0.69 0.67 0.99 1.33 0.84 1999 0.79 1.06 0.89 1.28 1.28 1.14 1.25 0.33 1.83 0.87	0.39 1.00 0.79 0.62 1.01 0.71 0.32 1.65 0.69 0.67 0.93 0.67 0.93 1.06 0.79 1.06 0.79 1.06 0.89 1.24 1.14 1.25 0.93 1.83 0.87	0.39 0.38 0.79 0.62 1.01 0.71 0.32 1.16 0.69 0.67 0.99 1.00 0.84 1.991 0.79 1.06 0.88 1.07 1.24 1.14 1.25 0.93 1.81 0.97	0.39 0.97 0.79 0.82 1.01 0.71 0.32 1.05 0.65 0.65 0.65 0.65 0.65 0.88 1.07 1.24 1.14 1.20 1.30 0.88 1.24	0.39 0.79 0.79 0.62 1.04 0.71 0.32 1.36 0.69 0.47 0.67 0.67 0.67 0.89 0.47 0.81 1.33 0.81 1.993 0.79 1.06 8.89 1.07 1.24 1.24 1.20 1.30 0.89 1.01 1.81 0.037	0.39 0.98 0.83 0.82 1.04 0.71 0.32 1.16 0.69 0.47 0.67 0.67 0.67 0.67 0.82 1.33 0.82 1.994 0.79 1.33 0.82 1.994 0.79 1.27 1.27 1.20 1.24 1.01 1.14	0.39 0.94 0.94 0.94 0.71 0.32 1.16 0.64 0.67 0.57 0.57 0.57 0.57 0.79 0.79 0.79 0.81 0.81 1.22 1.24 0.83 1.01 1.14	0.39 0.98 1.04 0.71 0.93 0.32 1.32 1.33 0.64 0.67 0.69 0.67 0.69 0.67 0.79 0.79 0.83 1.20 1.23 1.20 1.24 1.23 1.20 1.24 1.20 1.24 1.21	0.39 0.99 0.81 0.07 1.07 0.55 0.32 1.16 0.64 0.69 0.67 0.99 1.33 0.82 1.997 0.79 1.06 0.82 1.28 1.28 1.28 1.28 1.28 1.21 1.13 1.34 1.20 1.24 1.20 1.28 1.93 1.93 1.93 1.91

Proportion of Vacant Housing

	Proportion of v	acoust housin												
HEAVY RAIL agency	1.984	1.985	g in ine serva 1,986	1.987	1,968	1.989	1.990	1,991	1.992	1.993	1,994	1.995	1,996	1.997
New York-MTA-NYCT	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Nashington, D.CWMATA	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Chicago-RTA-CTA	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.11	0.11	0.12	0.12
Boston-MBTA	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Viania-MARTA	0.18 0.13	0.17	0.17 0.13	0.17 0.13	0.17 0.13	0.17	0.17	0.17	0.17	0.16	0.16	0.16	0.16 0.13	0.16 0.13
Philadelphia-SEPTA San Francisco-BART	0.13	0.09	0.09	0.13	0.09	0.09	0.09	0.09	0.13	0.13	0.13	0.09	0.09	0.09
lew York-PATHC	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
lami-MDTA	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
ATMM-aromite	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.14	0.14	0.14
os Angeles-LACMTA										0.14	0.14	0.14	0.12	0.12
Philadelphia-NJ-PATC Cleveland-GCRTA	0.12 0.13	0.12 0.13	0.12 0.13	0.12	0.12 0.13	0.12 0.13	0.12 0.13	0.12 0.13	0.12 0.13	0.12 0.13	0.12 0.13	0.12 0.13	0.12	0.12 0.13
New York-MTA-SIRTOA	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
AVERAGE	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
IGHT RAIL	Proportion of	vecent housin	n in the serve	od Brea										
Igency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Boston-MBTA	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
an Francisco-MUNI	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
hiladelphia-SEPTA	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10 0.08	0.10 0.08	0.10 0.08	0.10 0.08	0.10	0.10 0.07	0.10 0.07
los Angeles-LACMTA San Diego Trolley Inc.	0.08	0.08	0.07	0.07	0.07	0.06	0.07	0.08	0.08	0.08	0.08	0.00	0.07	0.07
A. Louis-BSDA											0.17	0.17	0.17	0.17
ortland-TCMTDO				0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Dallas-DARTA												•	0.16	0.15
Sacramento-RTD	0.07	0.07	0.07	0.07	0.07 0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Pillsburgh-PAT Buffalo-NFTS	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.06	0.06	0.07	0.07 0.13	0.07	0.07 0.13
Baltimore-MMTA			v. 1 4	0,13	0.10	0.10	9.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
San Jose-SCTD					0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
New Orleans-RTA	0.20	0.20	0.20	0.20	0.20	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Cleveland-GCRTA	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	80.0	0.08	0.08	0.08	0.08	0.09
Denver-RTD Newark-NJTC	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.19 0.09	0.19 0.0 9	0.19	0.19 0.09
Newark-NJ1C Hudson-Bergen LRT	0.03	0.03	0.03	0.09	0.09	0.03	0.03	0.03	0.03	0.03	0.03	0.09	0.09	0.09
AVERAGE	0.10	0.10	0.10	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.10	0.10	0.11	0.11
Housing Dens	ity													
Ho using Dens	ity													
HEAVY RAIL	Number of hou					1 684	1 000	1 664	1 663	1 001	1 004	1 995	1 095	1 997
HEAVY RAIL	Number of hou	1,985	1,986	1.987	1,988	1,989	1,990	1,991 20,329	1.992	1,993 20 329	1,9 94 20,329	1,995 20 329	1,996	1,997 20 312
HEAVY RAIL Igency Jew York-MTA-NYCT	Number of hou 1,984 20,407					1,989 20,329 4,166	1,990 20,329 4,166	1,991 20,329 4,302	1,992 20,329 4,341	1,993 20,329 4,341	1,994 20,329 4,248	1,995 20,329 4,240	1,996 20,312 4,248	1,997 20,312 4,194
HEAVY RAIL Igency New York-MTA-NYCT Nashington, D.CWMATA Ziclago-RTA-CTA	Number of hot 1,984 20,407 4,614 7,779	1,985 20,407 4,388 7,708	1,986 20,465 4,166 7,708	1.987 20,465 4,166 7,708	1,988 20,377 4,166 7,708	20,329 4,166 7,708	20,329 4,166 7,708	20,329 4,302 7,708	20,329 4,341 7,708	20,329 4,341 7,708	20,329 4,248 7,633	20,329 4,248 7,610	20,312 4,248 7,457	20,312 4,194 7,457
HEAVY RAIL Igency Isw York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Joston-MBTA	Number of hot 1,984 20,407 4,614 7,779 5,433	1,985 20,407 4,388 7,708 5,586	1,986 20,465 4,166 7,708 5,586	1.987 20,465 4,166 7,708 6,008	1,988 20,377 4,166 7,708 6,008	20,329 4,166 7,708 6,008	20,329 4,166 7,708 6,008	20,329 4,302 7,700 6,008	20,329 4,341 7,708 6,008	20,329 4,341 7,708 6,008	20,329 4,248 7,633 6,008	20,329 4,248 7,610 6,008	20,312 4,248 7,457 6,008	20,312 4.194 7,457 6,008
HEAVY RAIL Igency Iew York-MTA-NYCT Vashington, D.CWMATA Nicago-RTA-CTA Soston-MBTA Miarda-MARTA	Number of ho 1,984 20,407 4,614 7,779 5,433 2,027	1,985 20,407 4,388 7,708 5,586 2,078	1,986 20,465 4,166 7,708 5,586 2,078	1,987 20,465 4,166 7,708 6,008 2,036	1,988 20,377 4,166 7,708 6,008 1,907	20,329 4,166 7,708 6,008 1,907	20,329 4,166 7,708 6,008 1,907	20,329 4,302 7,708 6,008 1,907	20,329 4,341 7,708 6,008 1,907	20,329 4,341 7,708 6,008 1,849	20,329 4,248 7,633 6,008 1,849	20,329 4,248 7,610 6,008 1,849	20,312 4,248 7,457 6,008 1,849	20,312 4,194 7,457 6,008 1,778
HEAVY RAIL Igency Washington, D.CWMATA Nicago-RTA-CTA Soston-MBTA Juania-MARTA Viladajphia-SEPTA	Number of hot 1.984 20,407 4,614 7,779 5,433 2,027 6,645	1,985 20,407 4,388 7,708 5,586 2,070 6,645	1,986 20,465 4,166 7,708 5,586 2,078 6,645	1,987 20,465 4,166 7,708 6,008 2,036 6,645	1,988 20,377 4,166 7,708 6,008 1,907 6,645	20,329 4,166 7,708 6,008 1,907 6,645	20,329 4,166 7,708 6,008 1,907 6,645	20,329 4,302 7,708 6,008 1,907 6,645	20,329 4,341 7,708 6,008 1,907 6,645	20,329 4,341 7,708 6,008 1,849 6,645	20,329 4,248 7,633 6,008 1,849 6,645	20,329 4,248 7,610 6,008 1,849 6,645	20,312 4,248 7,457 6,008 1,849 6,645	20,312 4,194 7,457 6,008 1,778 6,645
HEAVY RAIL Igency Iew York-MTA-NYCT Veshington, D.CWMATA Soston-MBTA Viente-MARTA Philadelphia-SEPTA San Francisco-BART	Number of hot 1,984 20,407 4,614 7,779 5,433 2,027 6,645 5,297	1,985 20,407 4,388 7,708 5,586 2,078 6,645 5,297	1,986 20,465 4,166 7,708 5,586 2,078 6,645 5,297	1,987 20,465 4,166 7,708 6,008 2,036 6,645 5,297	1,988 20,377 4,166 7,708 6,008 1,907	20,329 4,166 7,708 6,008 1,907 6,645 5,297	20,329 4,166 7,708 6,008 1,907 6,645 5,297	20,329 4,302 7,708 6,008 1,907 6,645 5,297	20,329 4,341 7,708 6,008 1,907 6,645 5,297	20,329 4,341 7,708 6,008 1,849 6,645 5,297	20,329 4,248 7,633 6,008 1,849	20,329 4,248 7,610 6,008 1,849 6,645 5,297	20,312 4,248 7,457 6,008 1,849 6,645 5,129	20,312 4,194 7,457 6,008 1,778 6,645 4,853
IEAVY RAIL Igency Hew York-MTA-NYCT Vashington, D. CWMATA Nicego-RTA-CTA Soston-MBTA Viente-MARTA Viente-Market-SEPTA Sen Francisco-BART iew York-PATHC	Number of hot 1.984 20,407 4,614 7,779 5,433 2,027 6,645	1,985 20,407 4,388 7,708 5,586 2,070 6,645	1,986 20,465 4,166 7,708 5,586 2,078 6,645	1,987 20,465 4,166 7,708 6,008 2,036 6,645	1,988 20,377 4,166 7,708 6,008 1,907 6,645 5,297	20,329 4,166 7,708 6,008 1,907 6,645	20,329 4,166 7,708 6,008 1,907 6,645	20,329 4,302 7,708 6,008 1,907 6,645	20,329 4,341 7,708 6,008 1,907 6,645 5,297 17,974 2,711	20,329 4,341 7,708 6,008 1,849 6,645	20,329 4,248 7,633 6,008 1,849 6,645 5,297	20,329 4,248 7,610 6,008 1,849 6,645	20,312 4,248 7,457 6,008 1,849 6,645	20,312 4,194 7,457 6,008 1,778 6,645
KEAVY RAIL gency lew York-MTA-NYCT Vashington, D.C. VMATA Vinlego-RTA-CTA Instale-MARTA Ninisdelpha-SEPTA am Francisco-BART kerw York-PATHC Mami-MOTA allimore-MMTA	Number of hot 1,984 20,407 4,614 7,779 5,433 2,027 6,645 5,297 17,974	1,985 20,407 4,388 7,708 5,586 2,078 6,645 5,297 17,974	1,986 20,465 4,166 7,708 5,586 2,078 6,645 5,297 17,974	1.987 20.465 4.166 7.708 6,008 2,036 6,645 5,297 17.974	1,988 20,377 4,166 7,708 6,008 1,907 6,645 5,297 17,974	20,329 4,166 7,708 6,008 1,907 6,645 5,297 17,974	20,329 4,166 7,708 6,008 1,907 6,645 5,297 17,974	20,329 4,302 7,708 6,008 1,907 6,645 5,297 17,974	20,329 4,341 7,708 6,008 1,907 6,645 5,297 17,974	20,329 4,341 7,708 6,008 1,849 6,645 5,297 17,974 2,711 4,594	20,329 4,248 7,633 6,008 1,849 6,645 5,297 17,974 2,711 4,594	20,329 4,248 7,610 6,008 1,849 6,645 5,297 17,974 2,711 4,878	20,312 4,248 7,457 6,008 1,849 6,645 5,129 17,974 2,711 4,878	20,312 4,194 7,457 6,008 1,778 6,645 4,853 17,974 2,711 4,878
HEAVY RAIL Igency Iew York-MTA-NYCT Vicego-RTA-CTA Viento-MARTA Viento-MARTA Viento-SEPTA Isen Francisco-BART View York-PATHC Amm-MOTA Jailmore-MMTA Jailmore-MATA	Number of hot 1,984 20,407 4,614 7,779 5,433 2,027 6,645 5,297 17,974 2,653 5,720	1,985 20,407 4,388 7,708 5,586 2,070 6,645 5,297 17,974 2,762 5,720	1,986 20,465 4,166 7,708 5,586 2,078 6,645 5,297 17,974 2,762 5,720	1.907 20.465 4.166 7.708 6.008 2.036 6.645 5.297 17.974 2.762 4.594	1,988 20,377 4,166 7,708 6,008 1,907 6,645 5,297 17,974 2,762 4,594	20,329 4,166 7,708 6,008 1,907 6,645 5,297 17,974 2,711 4,594	20,329 4,166 7,708 6,008 1,907 6,645 5,297 17,974 2,711 4,594	20,329 4,302 7,708 6,008 1,907 6,645 5,297 17,974 2,711 4,594	20,329 4,341 7,708 6,000 1,907 6,645 5,297 17,974 2,711 4,594	20,329 4,341 7,708 6,000 1,849 6,645 5,297 17,974 2,711 4,594 6,888	20,329 4,248 7,633 6,008 1,849 6,645 5,297 17,974 2,711 4,594 6,888	20,329 4,248 7,610 6,008 1,849 6,645 5,297 17,974 2,711 4,878 6,888	20,312 4,248 7,457 6,008 1,849 6,645 5,129 17,974 2,711 4,878 10,682	20,312 4,194 7,457 6,008 1,778 6,645 4,853 17,974 2,711 4,878 10,682
HEAVY RAIL Isgency Hew York-MTA-NYCT Netago-RTA-CTA Soston-AMDTA Varies-MARTA Netago-Brancisco-BART Hew York-PATHC Wami-MOTA Ballmore-MMTA Cos Angoles-LACMTA hiladelphia-NJ-PATC	Number of hot 1,984 20,407 4,614 7,779 5,433 2,027 6,645 5,297 17,974 2,653 5,720 6,282	1,985 20,407 4,388 7,708 5,586 2,070 6,645 5,297 17,974 2,762 5,720 6,282	1,986 20,465 4,166 7,708 5,586 2,078 6,645 5,297 17,974 2,762 5,720 6,282	1.987 20.465 4.166 7.708 6.008 2.036 6.645 5.297 17.974 2.762 4.594 6.282	1,988 20,377 4,166 7,708 6,008 1,907 6,645 5,297 17,974 2,762 4,594 6,282	20,329 4,166 7,708 6,008 1,907 6,645 5,297 17,974 2,711 4,594 6,282	20,329 4,166 7,708 6,008 1,907 6,645 5,297 17,974 2,711 4,594 6,282	20,329 4,302 7,700 6,008 1,907 6,645 5,297 17,974 2,711 4,594 6,282	20,329 4,341 7,708 6,008 1,907 6,645 5,297 17,974 2,711 4,594 6,282	20,329 4,341 7,708 6,008 1,849 6,645 5,297 17,974 2,711 4,594 6,888 6,282	20,329 4,248 7,633 6,008 1,849 6,645 5,297 17,974 2,711 4,594 6,888 6,282	20,329 4,246 7,610 6,008 1,849 6,645 5,297 17,974 2,711 4,878 6,888 6,282	20,312 4,248 7,457 6,008 1,849 6,645 5,129 17,974 2,711 4,878 10,682 6,282	20,312 4,194 7,457 6,008 1,778 6,645 4,853 17,974 2,711 4,878 10,682 6,282
HEAVY RAIL sgancy New York-MTA-NYCT Washington, D.CWMATA Soston-MBTA Salarian Septimization Salarian Septimization Salarian Septimization Salarian Septimization Salarian Septimization Salarian Septimization Salarian Septimization Salarian Septimization Sector	Number of hoi 1.984 20,407 4.614 7.779 5.433 2.027 6.645 5.297 17,974 2.653 5.720 6.282 2.904	1,985 20,407 4,388 7,708 5,586 2,070 6,645 5,597 17,974 2,762 5,720 6,282 2,904	1,986 20,465 4,166 7,708 5,586 2,078 6,645 5,597 17,974 2,762 5,720 6,282 2,904	1.987 20.465 4.166 7.708 6.008 2.036 6.645 5.297 17.974 2.762 4.594 6.282 2.904	1,988 20,377 4,166 7,706 6,008 1,907 6,645 5,297 17,974 2,762 4,594 6,282 2,904	20,329 4,166 7,708 6,008 1,907 6,645 5,297 17,974 2,711 4,594 6,282 2,904	20,329 4,166 7,708 6,008 1,907 6,645 5,297 17,974 2,711 4,594 6,282 2,904	20,329 4,302 7,700 6,008 1,907 6,645 5,297 17,974 2,711 4,594 6,282 2,904	20,329 4,341 7,708 6,008 1,907 6,645 5,297 17,974 2,711 4,594 6,282 2,904	20,329 4,341 7,708 6,008 1,849 6,645 5,297 17,974 2,711 4,594 6,888 6,282 2,904	20,329 4,248 7,633 6,008 1,849 6,645 5,297 17,974 2,711 4,594 6,888 6,282 2,904	20,329 4,240 7,610 6,008 1,849 6,645 5,297 17,974 2,711 4,878 6,868 6,282 2,904	20,312 4,248 7,457 6,008 1,849 6,645 5,129 17,974 2,711 4,878 10,682 6,282 2,904	20,312 4,194 7,457 6,008 1,778 6,645 4,853 17,974 2,711 4,878 10,682 6,282 2,904
HEAVY RAIL Igency Hew York-MTA-NYCT Vesthorgion, D.C.VMATA Chicago-RTA-CTA Soston-HMTA Userle-MARTA Soston-PATHC Mami-MOTA Salimora-MMTA .os Angeles-LACMTA hidaelphia-NJPATC Sieveland-GCRTA Sew York-MTA-SRTOA	Number of hot 1,984 20,407 4,614 7,779 5,433 2,027 6,645 5,297 17,974 2,653 5,720 6,282	1,985 20,407 4,388 7,708 5,586 2,070 6,645 5,297 17,974 2,762 5,720 6,282	1,986 20,465 4,166 7,708 5,586 2,078 6,645 5,297 17,974 2,762 5,720 6,282	1.987 20.465 4.166 7.708 6.008 2.036 6.645 5.297 17.974 2.762 4.594 6.282	1,988 20,377 4,166 7,708 6,008 1,907 6,645 5,297 17,974 2,762 4,594 6,282	20,329 4,166 7,708 6,008 1,907 6,645 5,297 17,974 2,711 4,594 6,282	20,329 4,166 7,708 6,008 1,907 6,645 5,297 17,974 2,711 4,594 6,282	20,329 4,302 7,700 6,008 1,907 6,645 5,297 17,974 2,711 4,594 6,282	20,329 4,341 7,708 6,008 1,907 6,645 5,297 17,974 2,711 4,594 6,282	20,329 4,341 7,708 6,008 1,849 6,645 5,297 17,974 2,711 4,594 6,888 6,282	20,329 4,248 7,633 6,008 1,849 6,645 5,297 17,974 2,711 4,594 6,888 6,282	20,329 4,246 7,610 6,008 1,849 6,645 5,297 17,974 2,711 4,878 6,888 6,282	20,312 4,248 7,457 6,008 1,849 6,645 5,129 17,974 2,711 4,878 10,682 6,282	20,312 4,194 7,457 6,008 1,778 6,645 4,853 17,974 2,711 4,878 10,682 6,282
HEAVY RAIL agency New York-MTA-NYCT Nessingfon, D. CWMAT/ Seston-MITA Seston-MITA Seston-MITA Seston-MITA Seston-MITA Seston-SEPTA	Number of ho: 1.984 20,407 4.614 7.779 6.645 5.297 7.974 2.653 5.720 6.282 2.904 2.897 6.999 Number of ho:	1,985 20,407 4,388 7,708 5,586 2,079 6,645 5,297 17,974 2,762 5,720 6,282 2,904 2,997 7,000	1,986 20,465 4,166 5,586 2,078 6,645 5,297 17,974 2,762 5,720 6,282 2,904 2,897 6,987	1.987 20,465 4.166 7.708 6.008 2.036 6.645 5.297 17.974 2.762 4.594 6.282 2.904 2.897 6.924	1,988 20,377 4,166 7,708 6,008 1,907 6,645 5,297 17,974 2,762 4,554 6,282 2,904 2,897 6,906	20.329 4, 166 7,706 6,008 1,907 6,645 5,297 17,974 2,711 4,594 6,282 2,904 2,897 6,898	20.329 4,166 7,708 6,008 1,907 6,645 5,297 17,974 2,711 4,594 6,282 2,904 2,897 6,898	20.329 4,302 7,706 6,008 1,907 6,645 5,297 17,974 2,711 4,594 2,904 2,897 6,909	20.329 4.341 7.708 6.008 1.907 6.645 5.297 17.974 2.711 4.594 2.904 2.897 6.913	20.329 4.341 7.708 6.008 1.849 6.645 5.297 17.974 2.711 4.534 6.888 6.282 2.904 2.897 6.906	20.329 4.248 7.633 6.008 1.849 1.645 5.297 17.974 2.771 4.558 6.688 6.688 6.689 2.994 6.893	20.329 4.246 7.610 6.008 1.849 6.645 5.297 17.974 2.711 4.878 6.888 6.282 2.904 2.997 6.914	20,312 4,248 7,457 6,008 1,849 1,849 1,849 1,849 1,849 1,849 1,849 2,711 4,879 2,771 10,682 6,282 2,904 2,997 7,179	20.312 4.194 7.457 6.008 1.778 6.645 4.853 17.974 2.711 4.878 10.662 2.904 2.897 7.113
HEAVY RAIL Igency Iew York-MTA-NYCT Nicego-RTA-CTA Soston-MBTA Soston-MBTA Soston-MBTA Soston-MBTA Soston-MMTA Soston-MMTA Soston-MMTA Soston-MMTA Soston-MMTA Soston-MMTA Soston-MMTA Soston-MMTA-SIRTOA VerAGE LIGHT RAIL Igency	Number of hot 1,984 20,407 4,614 7,779 5,433 2,027 6,845 2,297 7,974 2,853 5,720 6,282 2,904 2,887 6,999 Number of hot 1984	1,985 20,407 4,388 7,708 5,586 2,079 6,645 5,297 17,974 5,720 6,282 2,394 6,282 2,394 6,282 2,394 7,000	1,986 20,465 4,166 5,586 5,586 5,297 17,978 2,778 2,778 2,772 2,904 6,282 2,904 6,287 6,987 r square mile 1986	1.987 20.465 4.166 7.708 6.008 2.036 6.645 5.297 17.974 2.762 4.594 6.282 2.904 2.897 6.924	1,968 20,377 4,166 7,708 6,008 1,907 6,645 5,297 17,974 2,762 4,594 6,282 2,904 2,897 6,906 4,878 6,906	20.329 4.166 7.708 6.008 1.907 6.645 5.297 17.974 2.711 4.594 6.282 2.904 2.994 6.898	20,329 4,166 7,708 6,008 1,907 6,645 5,297 17,974 2,711 4,594 6,282 2,904 6,282 2,994 6,898	20.329 4.302 7.706 6.008 1.907 6.645 5.297 17.374 2.711 4.594 6.292 2.904 2.897 6.909	20.329 4.341 7.706 6.008 1.907 6.645 5.297 17.974 2.711 4.594 6.282 2.904 2.897 6.313	20.329 4.341 7.706 6.008 1.849 6.645 5.297 17.974 2.711 4.598 6.888 6.888 6.888 6.898 6.906	20.329 4.248 7.633 6.008 1.849 6.645 5.297 17.974 2.771 4.594 6.282 2.904 6.282 2.909 6.893	20.329 4.246 7.610 6.008 1.849 6.645 5.297 17.974 2.711 4.878 6.889 6.282 2.904 2.997 6.914	20,312 4,248 7,457 6,008 1,849 6,645 5,129 17,974 2,711 4,878 2,711 4,878 2,711 10,682 6,282 2,904 2,897 7,179	20.312 4.194 7.457 6.008 1.778 6.645 4.853 17.974 2.711 4.878 2.711 4.878 2.904 2.897 7.113
HEAVY RAIL Iggency Igw York-MTA-NYCT Washington, D. CWMAT/J Nicago RTA-CTA Solton-MITA Solton-MITA Solton-MITA Solton-MITA Solton-MITA Solton-MITA Solton-MITA Solton-MITA Solton-MITA Solton-MITA Solton-MITA Solton-MITA Solton-MITA Solton-MITA Solton-MITA	Number of ho: 1,984 20,407 4,614 7,779 5,465 5,297 7,974 2,653 5,720 6,282 2,904 2,897 6,999 Number of ho: 1984 7,894	1,985 20,407 4,388 7,708 5,586 2,079 6,645 5,297 17,974 2,762 5,720 6,282 2,904 2,897 7,000	1,986 20,452 4,166 7,708 5,596 2,078 6,645 5,297 17,974 2,762 5,720 6,282 2,904 2,964 2,987 6,987 6,987	1.987 20.465 4.166 7.708 6.008 2.036 6.645 5.297 17.974 2.762 4.594 6.282 2.904 2.904 2.904 2.904 0.924	1,988 20,377 4,166 7,708 6,008 1,907 6,645 5,237 17,974 2,762 4,594 6,282 2,904 2,897 6,906 4,996 4,996	20.329 4.156 5.008 1.907 6.645 5.297 17.974 2.711 4.534 6.282 2.904 2.897 6.898 1989 8.154	20.329 4.166 7.708 6.008 1.907 6.645 5.297 17.974 2.711 4.534 6.282 2.904 2.897 6.898	20.329 4.302 7.708 6.008 1.907 6.645 5.297 6.645 5.297 4.574 2.711 4.594 2.904 2.994 2.997 6.909	20.329 4.341 7.708 6.008 1.907 6.645 5.297 4.771 4.594 2.711 4.594 2.904 2.994 2.994 2.997 6.913	20.329 4.341 7.708 6.008 1.849 6.645 5.297 17.974 2.711 4.6.888 6.282 2.904 2.994 2.994 2.994 2.994 2.995 6.906	20.329 4.246 7.633 6.009 1.849 6.645 5.297 17.974 2.711 4.774 2.711 2.711 2.904 2.904 2.997 6.893	20.329 4.246 7.610 6.008 1.849 6.645 5.297 17.974 2.711 4.774 2.711 6.888 6.285 2.304 2.394 2.394 2.394 2.997 6.914	20,312 4,246 7,457 7,457 1,849 6,645 5,129 17,974 17,974 17,974 2,771 10,662 6,282 2,304 2,897 7,179 1996 8,134	20.312 4.194 7.457 6.006 1.778 6.645 4.853 17.974 2.711 4.878 10.682 2.904 2.892 7.113 1997 8.134
HEAVY RAIL Igency Jew York-MTA-NYCT Vikesport D.CWMATA Vikeris-MARTA Joston-MBTA Joston-MBTA Jew York-PATHC Mami-MDTA Jew York-PATHC Mami-MDTA Jew York-MTA-SIRTOA VIERAGE JGHT RAIL Igency Joston-MBTA Jan Francisco-MUNI	Number of hot 1,984 20,407 4,614 7,779 5,433 2,027 6,845 5,297 71,974 2,853 5,720 6,282 2,904 2,897 6,999 Number of hot 1984 7,894 8,151	1,985 20,407 4,388 7,708 5,586 2,079 6,645 5,297 17,974 2,762 5,720 6,282 2,904 2,997 7,000 1985 7,894 8,151	1,986 20,465 4,166 7,708 5,586 6,545 5,297 17,974 5,297 17,974 5,297 17,974 2,904 6,282 2,907 6,287 6,987 7 square mile 1996 8,154	1,987 20,465 4,166 7,706 6,008 2,036 6,645 5,297 17,974 2,762 4,594 6,282 2,904 2,897 6,924 0 fthe serve- 1987 8,154 8,151	1.986 20.377 20.377 7.708 6.008 6.008 1.907 6.645 5.297 17.974 2.762 4.594 2.904 2.994 2.994 2.994 2.997 6.906 d area 1998 8.154 8.154	20.329 4.166 5.008 1.907 6.645 5.297 17.974 2.711 4.594 6.282 2.904 2.904 2.936 6.898 1989 8.154 8.151	20.329 4.166 6.008 1.907 6.645 5.237 17.974 2.711 4.594 6.282 2.904 2.904 2.996 6.898 1990 8.134 8.151	20.329 4.302 7.706 6.006 1.907 6.645 5.297 17.974 2.711 4.594 6.282 2.904 2.904 2.904 5.909	20.329 4.341 7.708 6.008 1.907 6.645 5.297 17.974 2.711 4.594 6.282 2.904 2.894 6.913	20.329 4.341 7.708 6.008 1.849 6.645 5.297 17.974 2.711 4.594 6.888 6.282 2.904 2.904 2.904 2.904 2.904 2.906	20.329 4.246 1.643 6.608 1.649 6.645 5.297 17.974 2.711 4.594 6.688 6.282 2.904 2.904 2.904 2.904 2.904 2.904 8.134 8.134	20.329 4.246 1.640 6.009 1.645 5.297 17.974 2.711 4.878 6.888 6.282 2.904 2.904 2.904 2.904 2.914	20,312 4,246 7,457 6,008 1,849 6,645 5,129 17,974 2,771 4,878 10,682 6,282 2,904 2,9	20.312 4.194 7.457 6.008 1.778 4.653 4.653 4.653 17.974 2.711 4.878 2.904 2.904 2.904 2.907 7.113
HEAVY RAIL bgency view York-MTA-NYCT Viewsbington, D. CWMATA Niegesphase Sotion-MITA Vierie AMARTA Vierie AMARTA Vierie SEPTA Sain Francisco-BART view York-PTA-C Saintore-MATA Saintore-MATA VierAGE IGHT RAIL sgency Sotion-META Saintore-MUNI Niedesphas-SEPTA	Number of ho: 1,984 20,407 4,614 7,779 5,465 5,297 7,974 2,653 5,720 6,282 2,904 2,897 6,999 Number of ho: 1984 7,894	1,985 20,407 4,388 7,708 5,586 2,079 6,645 5,297 17,974 2,762 5,720 6,282 2,904 2,897 7,000	1,986 20,452 4,166 7,708 5,596 2,078 6,645 5,297 17,974 2,762 5,720 6,282 2,904 2,964 2,987 6,987 6,987	1.987 20.465 4.166 7.708 6.008 2.036 6.645 5.297 17.974 2.762 4.594 6.282 2.904 2.904 2.904 2.904 0.924	1,988 20,377 4,166 7,708 6,008 1,907 6,645 5,237 17,974 2,762 4,594 6,282 2,904 2,897 6,906 4,996 4,996	20.329 4.156 5.008 1.907 6.645 5.297 17.974 2.711 4.534 6.282 2.904 2.897 6.898 1989 8.154	20.329 4.166 7.708 6.008 1.907 6.645 5.297 17.974 2.711 4.534 6.282 2.904 2.897 6.898	20.329 4.302 7.708 6.008 1.907 6.645 5.297 6.645 5.297 4.574 2.711 4.594 2.904 2.994 2.997 6.909	20.329 4.341 7.708 6.008 1.907 6.645 5.297 4.771 4.594 2.711 4.594 2.904 2.897 6.913	20.329 4.341 7.708 6.008 1.849 6.645 5.297 17.974 2.711 4.6.888 6.282 2.904 2.994 2.994 2.994 2.994 2.995 6.906	20.329 4.246 7.633 6.009 1.849 6.645 5.297 17.974 2.711 4.774 6.688 6.285 2.904 2.997 6.693	20.329 4.246 7.610 6.008 1.849 6.645 5.297 17.974 2.711 4.774 2.711 6.888 6.285 2.304 2.394 2.394 2.394 2.997 6.914	20,312 4,246 7,457 7,457 1,849 6,645 5,129 17,974 17,974 17,974 2,771 10,662 6,282 2,304 2,897 7,179	20.312 4.194 7.457 6.006 1.778 6.645 4.853 17.974 2.711 4.878 10.682 2.904 2.892 7.113 1997 8.134
HEAVY RAIL Igency Iew York-MTA-NYCT Vietag-RTA-CTA Joston-MBTA Jiedejphia-SEPTA Jiedejphia-SEPTA Jierit-MMTA Jierit-MDTA Jierit-MDTA Jierit-MDTA Jievinand-GCRTA Iew York-MTA-SIRTOA VERAGE JIGHT RAL Jiero-MBTA Jiero-MBT	Number of hot 1,984 20,407 4,614 7,779 5,433 2,027 6,845 5,297 71,974 2,853 5,720 6,282 2,904 2,897 6,999 Number of hot 1984 7,894 8,151	1,985 20,407 4,388 7,708 5,586 2,079 6,645 5,297 17,974 2,762 5,720 6,282 2,904 2,997 7,000 1985 7,894 8,151	1,986 20,465 4,166 7,708 5,586 6,545 5,297 17,974 5,297 17,974 5,297 17,974 2,904 6,282 2,907 6,282 2,997 6,987 7 square mile 1996 8,154	1,987 20,465 4,166 7,706 6,008 2,036 6,645 5,297 17,974 2,762 4,594 6,282 2,904 2,897 6,924 0 fthe serve- 1987 8,154 8,151	1.986 20.377 20.377 7.708 6.008 6.008 1.907 6.645 5.297 17.974 2.762 4.594 2.904 2.994 2.994 2.994 2.997 6.906 d area 1998 8.154 8.154	20.329 4.166 5.008 1.907 6.645 5.237 17.974 2.711 4.594 6.282 2.904 2.904 2.936 6.898 1989 8.154 8.151	20.329 4.166 6.008 1.907 6.645 5.237 17.974 2.711 4.594 6.282 2.904 2.904 2.936 6.898 1990 8.134 8.151	20.329 4.302 7.706 6.008 1.907 6.645 5.297 4.594 2.711 4.594 2.904 2.897 6.309 1991 8.134 8.038	20.329 4.341 7.708 6.008 1.907 6.645 5.297 4.514 4.594 2.904 2.897 6.913 4.594 2.897 6.913	20.329 4.341 7.708 6.008 1.849 6.645 5.297 4.574 4.574 4.574 4.574 4.574 2.904 2.897 6.306 1993 8.134 8.036	20.329 4.246 7.633 6.008 1.849 6.645 5.297 4.574 2.711 4.554 6.688 6.282 2.904 2.897 6.893 1994 8.134 8.134 8.036	20.329 4.246 7.610 6.008 1.849 6.645 5.297 17.974 2.711 4.878 6.888 6.282 2.904 2.897 6.314 9.395 8.134 8.134 8.134	20,312 4,246 7,457 7,457 6,008 1,849 6,645 5,129 17,974 2,711 4,713 10,682 6,282 2,904 2,897 7,179 1996 8,134 8,108 5,540	20.312 4.194 7.457 6.008 1.778 6.645 4.853 17.974 2.711 4.711 4.711 10.662 6.262 2.904 2.897 7.113
HEAVY RAIL Igency Iew York-MTA-NYCT Vashingion, D.CWMAT/ Sotion-MBTA Sotion-MBTA Sotion-MBTA Sotion-MBTA Sotion-MBTA Solimore-MMTA	Number of hot 1,984 20,407 4,614 7,779 5,433 2,027 6,645 5,297 71,974 2,653 5,720 6,262 2,904 2,897 6,999 Number of hot 1984 7,894 8,151 5,940	1,985 20,407 20,4388 7,708 5,586 2,079 6,645 5,297 17,974 2,762 5,720 2,904 2,997 7,000 4,2897 7,000 4,997 7,000	1,986 20,465 7,708 5,586 2,078 6,645 5,297 17,374 2,762 5,720 5,720 5,720 4,2897 6,987 r square mile 1996 8,154 8,154	1.987 20.465 6.008 2.036 6.645 5.297 17.974 2.762 4.534 6.282 2.904 2.897 6.924 0.987 6.924 9.87 8.154 8.151 5.340 2.063	1.986 20.377 20.377 7.706 6.008 1.907 6.645 5.297 17.974 2.762 4.534 6.282 2.904 2.897 6.306 4.895 6.306 4.895 8.155 5.340 2.063	20,229 4,166 7,708 6,006 1,907 6,645 5,297 17,974 2,711 4,594 6,292 2,904 2,897 6,898 1989 8,154 8,151 5,940 2,062	20,329 4,166 7,708 6,008 6,008 5,297 17,974 2,711 4,594 6,282 2,904 2,897 6,898 1990 8,134 8,151 5,940 2,062	20.329 4.302 7.706 6.006 5.297 1.907 6.45 5.297 12.971 2.711 4.594 6.282 2.997 6.909 1991 8.134 8.038 8.038 5.940 3.340	20.329 4.341 7.708 6.007 6.4597 1.907 6.297 17.974 2.711 4.594 6.282 2.897 6.913 1992 8.134 8.038 5.340 5.340 3.340	20.329 4.341 7.708 6.008 5.297 17.974 2.994 6.888 6.282 2.904 2.995 6.906 1993 8.134 8.038 5.540 3.3709 2.062	20.329 4.246 7.633 6.008 6.645 5.297 17.371 4.594 6.645 5.297 17.371 4.594 6.689 6.262 2.904 2.997 6.893 1994 8.134 8.038 8.038 5.340 3.3709 1.967	20.329 4.246 7.610 6.008 6.645 5.297 17.971 2.711 4.878 6.889 6.282 2.904 2.934 2.934 8.935 8.134 8.108 8.104 8.104 8.104	20,312 4,246 7,457 6,008 5,129 17,974 2,711 4,878 10,682 2,904 2,897 7,179 1996 8,134 8,108 8,104 8,104 9,3109 1,349 1,742	20.312 4.194 7.457 6.008 1.778 6.645 4.645 4.645 4.777 4.711 2.711 2.711 2.711 2.712 6.282 2.904 2.904 2.904 2.904 2.904 2.904 8.134 8.108 5.940 3.109 1.909 1.742
HEAVY RAIL Igency Hew York-MTA-NYCT Vestington, D.CWMATJ Station-MBTA Ukaris-MARTA Ukaris-MARTA Station-BATTA Sent-MOTA Sent-Sent-Sent-MOTA Sent-Sent-Sent-Sent-Sent-Sent-Sent-Sent-	Number of hot 1,984 20,407 4,614 7,779 5,433 2,027 6,645 5,297 71,974 2,653 5,720 6,262 2,904 2,897 6,999 Number of hot 1984 7,894 8,151 5,940	1,985 20,407 20,4388 7,708 5,586 2,079 6,645 5,297 17,974 2,762 5,720 2,904 2,997 7,000 4,2897 7,000 4,997 7,000	1,986 20,465 7,708 5,586 2,078 6,645 5,297 17,374 2,762 5,720 5,720 5,720 4,2897 6,987 r square mile 1996 8,154 8,154	1.987 20.465 7.708 6.008 2.036 6.645 5.297 17.974 2.762 4.594 2.904 2.994 2.994 2.994 2.997 6.924	1.986 20.377 20.377 4.66 6.008 6.008 6.045 5.297 17.974 2.762 4.594 2.904 2.997 6.906 4.897 6.906 4.897 6.906	20,229 4,166 6,008 1,907 6,645 5,297 17,974 2,711 4,594 6,282 2,904 2,904 2,904 2,898 1989 8,154 8,151 5,940	20.329 4.166 6.008 1.907 6.645 5.297 17.974 2.711 4.594 6.282 2.904 2.904 2.898 6.898 1990 8.134 8.151 5.940	20.329 4.302 7.706 6.006 1.907 6.445 5.297 17.974 2.711 4.594 6.282 2.904 6.282 2.904 6.909 1991 8.134 8.038 5.340	20.329 4.341 7.708 6.008 1.907 6.645 5.297 17.974 2.711 4.594 6.282 2.904 6.913 1992 8.134 8.038 5.340	20.329 4.341 7.708 6.009 1.849 6.645 5.297 17.974 2.711 4.594 6.888 6.282 2.904 2.904 2.905 6.906 1993 8.134 8.038 5.340	20.329 4.246 1.649 6.645 5.297 17.974 2.711 4.554 6.689 6.282 2.904 6.693 1994 8.134 8.134 8.134 8.340 3.709 1.967	20.329 4.246 1.649 6.645 5.297 17.974 2.711 4.878 6.688 6.282 2.904 2.897 6.314 1995 8.134 8.108 5.340 3.709 1.550	20.312 4.246 1.849 6.645 5.129 17.974 2.711 4.878 10.682 2.904 2.897 7.179 1996 8.134 8.108 5.940 3.109 1.309 1.909	20.312 4.194 5.457 6.069 1.778 6.485 17.778 4.853 17.774 2.774 2.774 2.904 2.887 7.113 1997 8.134 8.106 5.940 3.109 1.909 1.909
HEAVY RAIL Igency Iew York-MTA-NYCT Viewshington, D.CWMATA Viewshington, D.CWMATA Soston-MBTA Saloston-MBTA Saloston-MBTA Salmore-MMTA Jos Angeles-LACMTA Isoviand-GCRTA Level Saloston-MBTA Saloston-MBTA San Francisco-MUNI San Fr	Number of hot 1,984 20,407 4,614 7,779 5,433 2,027 6,645 5,297 71,974 2,653 5,720 6,262 2,904 2,897 6,999 Number of hot 1984 7,894 8,151 5,940	1,985 20,407 20,4388 7,708 5,5866 2,079 6,645 5,297 17,974 2,762 5,720 2,904 2,997 7,000 4,2897 7,000 4,997 7,000	1,986 20,465 7,708 5,586 2,078 6,645 5,297 17,374 2,762 5,720 5,720 5,720 4,2897 6,987 r square mile 1996 8,154 8,154	1.987 20.465 7.706 6.008 2.036 6.645 5.297 17.974 4.534 6.242 2.904 2.87 6.924 0 of the serve- 1987 8.151 5.940 2.063 2.710	1,988 20,377 20,377 4,166 7,706 6,008 1,907 6,645 5,297 17,974 2,762 4,554 6,282 2,904 2,897 6,906 4,878 8,906 4,878 8,151 5,940 2,063 2,710	20,229 4,166 7,708 6,000 6,000 6,000 6,000 6,297 1,907 6,297 2,711 4,594 6,292 2,904 2,897 6,898 8,154 8,151 5,940 2,062 2,710	20.329 4.166 7.708 6.008 6.008 6.007 6.5297 17.971 2.711 4.594 2.211 4.594 2.897 6.898 1990 8.134 8.151 5.940 2.062 2.710	20.329 4.302 7.706 6.007 6.407 6.297 17.974 2.711 4.594 6.282 2.997 6.909 1991 8.134 8.038 5.940 3.709 2.062 2.710	20.329 4.341 7.708 6.007 6.297 17.974 2.711 4.594 2.892 2.897 6.913 1992 8.134 8.038 5.340 3.309 2.062 2.710	20.329 4.341 7.708 6.006 6.009 6.449 6.449 6.297 17.971 2.711 4.594 6.898 6.282 2.997 6.906 2.997 6.906 8.134 8.038 5.940 3.3709 2.062 2.710	20.329 4.246 7.633 6.008 6.645 6.297 17.971 4.594 6.893 2.711 4.594 6.893 2.997 6.893 1994 8.134 8.038 5.340 3.340 9.340 2.340 2.340 2.340 2.997 6.893	20.329 4.246 7.610 6.008 6.645 5.297 17.971 4.878 6.645 5.297 17.971 4.878 6.645 5.297 2.711 4.878 6.645 5.297 5.914 2.997 6.914 2.997 6.914 2.904 2.9	20,312 4,246 7,457 6,006 1,649 6,645 5,129 17,974 4,878 2,711 4,878 2,897 7,179 1995 8,134 8,108 8,134 8,108 5,940 3,109 1,909 1,909 1,909 1,909	20.312 4.194 7.457 6.008 1.778 6.645 4.853 17.974 2.711 4.878 10.662 2.904 2.904 2.904 2.904 2.904 2.904 7.113 19977 8.134 8.108 5.940 3.109 1.099 1.042 2.731 1.810
HEAVY RAIL Igency Iew York-MTA-NYCT Viewsbrigton, D.CWMATA Senfor-MTA S	Number of hot 1,984 20,407 4,614 7,779 5,433 2,027 6,645 5,297 71,974 2,653 5,720 6,262 2,904 2,897 6,999 Number of hot 1984 7,894 8,151 5,940	1,985 20,407 20,4388 7,708 5,5866 2,079 6,645 5,297 17,974 2,762 5,720 2,904 2,997 7,000 4,2897 7,000 4,997 7,000	1,985 20,465 20,465 7,708 6,5586 2,078 6,645 5,297 17,974 2,762 5,720 6,292 2,904 2,897 6,987 r square mile 1996 8,151 5,940 2,063 2,292	1.987 20.465 6.008 2.036 6.645 5.297 17.974 2.762 4.534 6.282 2.904 2.897 6.924 0.987 6.924 0.987 8.154 8.151 5.340 2.063	1,988 20,377 20,377 4,166 7,706 6,008 1,907 6,645 5,297 17,974 6,276 2,762 4,554 6,296 6,906 4,876 6,906 4,876 8,906 4,878 8,956 8,956 2,963 2,710 2,288 2,292	20,229 4,166 7,708 6,006 1,907 6,645 5,297 17,974 2,711 4,594 6,292 2,904 2,897 6,898 1989 8,154 8,151 5,940 2,062	20,229 4,166 7,708 6,008 6,008 6,007 6,645 5,287 17,974 2,711 4,594 6,282 2,904 2,897 6,898 1990 8,134 8,151 5,940 2,062 2,710 2,282	20,329 4,302 7,706 6,007 6,297 1,907 6,297 17,974 2,711 4,594 6,282 2,997 6,909 1991 8,134 8,038 5,940 3,709 2,062 2,710 2,282	20.329 4.341 7.708 6.006 0.007 6.645 5.297 17.971 2.711 4.594 2.892 2.802 2.897 6.913 1992 8.134 8.038 5.940 3.709 2.062 2.710 2.265	20.329 4.341 7.708 6.008 5.297 17.974 2.994 6.888 6.282 2.904 2.995 6.906 1993 8.134 8.038 5.540 3.3709 2.062	20.329 4.246 7.633 6.008 6.649 6.649 6.257 17.971 4.594 6.892 2.904 2.997 6.893 1994 8.134 8.038 5.940 3.709 1.967 1.742 2.710 2.286	20.329 4.246 7.610 6.008 6.449 6.449 6.297 17.971 4.878 6.888 6.282 2.934 2.934 2.934 2.934 2.934 8.688 6.314 8.108 5.340 3.709 1.950 1.750 1.750 1.750 2.288	20,312 4,246 7,457 6,006 1,649 6,645 5,129 17,974 4,878 2,711 4,878 2,897 7,179 1995 8,134 8,108 5,940 2,994 2,897 7,179 1995 8,134 8,108 5,940 3,109 1,374 2,2710 1,374 2,2710 1,374 2,2710	20.312 4.194 7.457 6.006 6.645 2.711 4.853 17.974 2.711 4.878 10.662 2.904 2.887 7.113 1997 8.134 8.108 5.540 3.109 1.909 1.909 1.742 2.731 1.810 2.287
HEAVY RAIL Igency Hew York-MTA-NYCT Vestingion, D.CWMAT/I Sotion-MBTA Sotion-MBTA Sotion-MBTA Sotion-MBTA Sami-MOTA Sami-MOTA Sami-MATA Sami-MOTA Sami-MATA Sami-MATA Sami-MATA Sami-MATA Sami-MATA Sami-MATA Sami-Sami-Sami-Sami-Sami-Sami-Sami-Sami-	Number of hoi 1,984 20,407 4,614 7,779 5,433 2,027 6,455 5,297 17,974 2,653 5,720 6,282 2,904 2,897 6,999 Number of hoi 1,894 8,155 5,940 1,767	1,985 20,407 4,388 7,708 2,079 6,645 5,297 17,974 2,752 5,752 5,752 6,282 2,997 7,000 4,2897 7,894 1985 7,894 8,151 5,540 1,759	1,996 20,465 4,166 7,708 6,247 2,078 6,245 5,297 4,2762 5,720 6,282 2,994 2,994 2,997 6,987 1996 8,154 8,151 5,540 2,063	1.987 20.455 4.166 7.706 2.035 6.645 5.297 17.974 2.752 4.554 6.282 2.904 2.987 6.924 987 8.154 8.151 5.540 2.063 2.710 2.288	1,988 20,377 4,166 7,706 6,645 5,297 17,374 2,762 4,594 6,282 2,904 2,887 6,906 4 area 1998 8,154 8,154 8,154 8,154 8,151 5,540 2,063 2,710 2,288	20,229 4,166 1,907 6,405 5,297 17,974 2,711 4,554 6,282 2,904 2,897 6,898 8,154 8,151 8,154 8,154 8,154 8,154	20,229 4,166 1,907 6,645 5,297 17,974 2,711 4,554 6,282 2,904 2,897 6,898 1990 8,134 8,151 5,940 2,062 2,710 2,288	20,329 4,302 7,706 6,006 1,907 6,445 5,297 17,974 2,974 2,954 6,282 2,954 6,909 1991 8,134 8,0348,034 8,0346 8,0346 8,0346 8,0346 8,0346 8,0366 8,036	20.329 4.341 7.708 6.006 1.907 6.645 5.297 17.974 2.711 4.594 6.282 2.904 2.897 6.913 1992 8.134 8.038 5.340 3.709 2.062 2.710 2.288 2.710	20.329 4.341 7.708 6.006 1.849 6.645 5.297 17.974 2.711 4.594 6.888 6.282 2.994 4.6888 6.282 2.994 2.995 6.906 1993 8.134	20.329 4.246 5.297 1.849 6.645 5.297 17.974 2.711 4.594 6.685 6.262 2.904 6.893 1994 8.134 8.038 8.038 5.940 3.709 1.967 1.742 2.288 2.324	20.329 4.246 7.610 6.068 1.849 6.457 5.297 17.974 2.711 4.878 6.888 6.282 2.904 2.937 6.914 1995 8.134 8.108 5.940 3.709 1.950 1.750 2.2710 2.288 2.327 3.423	20.312 4.246 1.849 6.645 5.129 17.974 2.711 4.878 10.682 6.282 2.904 2.937 7.179 1996 8.134 8.108 5.940 3.109 1.909 1.742 2.710 1.166 2.2710	20.312 4.194 7.457 6.006 1.778 6.645 4.853 17.974 2.711 4.878 10.662 6.262 2.904 2.897 7.113 1997 8.134 8.134 8.134 8.134 8.134 8.199 1.90
HEAVY RAIL Igency Iew York-MTA-NYCT Vashingion, D.CWMATJ Vicesp-RTA-CTA Joston-MBTA Juanis-MARTA Juanis-MARTA Juanis-MARTA Juanis-SEPTA Jam Francisco-BART Juanis-NJ-PATC Isoviand-GCRTA Juanis-NJ-PATC Isoviand-GCRTA Juanis-NJ-PATC Juanis-LACMTA	Number of hoi 1,984 20,407 4,614 7,779 5,433 2,027 6,455 5,297 17,974 2,653 5,720 6,282 2,904 2,897 6,999 Number of hoi 1,894 8,155 5,940 1,767	1,985 20,407 4,388 7,708 2,079 6,645 5,297 17,974 2,752 5,752 5,752 6,282 2,997 7,000 4,2897 7,894 1985 7,894 8,151 5,540 1,759	1,985 20,465 20,465 7,708 6,5586 2,078 6,645 5,297 17,974 2,762 5,720 6,292 2,904 2,897 6,987 r square mile 1966 8,151 5,940 2,063	1.987 20.465 7.706 6.008 2.036 6.645 5.297 17.974 4.554 6.282 2.904 2.874 6.924 0 of the serve 1987 8.151 5.940 2.063 2.710 2.265	1,988 20,377 20,377 1,66 7,706 6,008 1,907 6,645 5,297 17,974 6,282 2,904 2,897 6,906 4,878 6,906 4,878 8,956 2,963 2,710 2,288 2,710 2,282 2,710	20,229 4,166 7,708 6,008 1,907 6,645 5,297 17,974 2,711 4,594 2,271 4,594 2,897 6,898 8,154 8,151 5,940 2,062 2,710 2,262 2,710	20,229 4,166 7,708 6,008 1,907 6,5297 17,974 2,711 4,594 6,282 2,904 2,897 6,898 1990 8,134 8,151 5,940 2,062 2,710 2,292 3,423	20,329 4,302 7,706 6,007 6,649 1,907 6,649 2,711 4,594 2,711 4,594 2,897 6,909 1991 8,134 8,038 5,909 2,062 2,710 2,282 2,710 2,282 2,710	20.329 4.341 7.708 6.008 1.907 6.6397 17.971 2.711 4.594 2.892 2.892 2.892 2.897 6.913 1992 8.134 8.038 5.940 2.062 2.710 2.262 2.710 2.262	20.329 4.341 7.708 6.008 6.009 6.649 6.649 6.297 17.971 2.711 4.598 6.898 6.898 6.898 6.898 2.994 2.994 2.994 2.995 8.334 8.038 5.940 3.709 2.062 2.710 2.262 2.710 2.283	20.329 4.246 7.633 6.008 6.008 6.297 17.974 4.594 6.297 2.711 4.594 6.689 2.904 2.997 6.693 1994 8.134 8.134 8.038 5.940 3.709 1.957 2.710 2.282 2.710	20.329 4.246 7.610 6.008 6.008 6.297 17.974 4.878 6.878 6.878 6.878 6.878 6.878 6.914 1995 8.134 8.108 5.940 3.709 1.3742 2.710 2.289 1.3742 2.710	20,312 4,246 7,457 6,008 1,649 6,645 5,129 17,974 4,878 2,711 4,878 2,711 10,682 6,282 2,997 7,179 1995 8,134 8,108 5,940 3,109 1,3742 1,742 2,710 1,164 2,287 3,423 2,554	20.312 4.194 7.457 6.000 10.000 17.974 4.853 17.971 4.853 17.971 4.853 17.971 4.853 2.711 4.853 2.904 2.897 7.113 1997 8.134 8.108 5.409 3.109 1.909 1.909 1.909 1.909 1.909 1.909 1.909 1.909 1.909 1.909 1.909 1.909 1.909 1.909 2.200 1.909 1.909 1.909 2.301 2.200 1.909 1.909 2.301 2.200 1.909 1.909 2.904 1.909 1.900 1.909 1.909 1.900 1.900 1.900 1.900 1.900 1.900 1.900 1.900 1.900 1.900 1.900 1.900 1.9000 1.9000 1.9000 1.90000 1.90000 1.90000000000
HEAVY RAIL Igency Hew York-MTA-NYCT Vierse-Mark-MTA-NYCT Vierse-Marka Stoton-MBTA Soton-MBTA Soton-MBTA Sam-MortA Head-bybis-RD-PATC Mami-MDTA Sam-Marka	Number of hot 1984 20,407 4,614 7,779 5,433 2,027 6,845 2,297 17,974 2,2653 5,720 6,282 2,904 2,897 6,999 Number of hot 1984 7,894 8,151 5,340 1,767 2,292	1,985 20,407 4,388 7,708 2,079 6,645 5,297 4,2752 5,720 6,282 2,997 7,000 4,287 7,994 8,151 5,540 1,759 2,292	1,996 20,465 4,166 7,708 6,247 2,078 6,245 5,297 4,2762 5,770 6,282 2,994 2,994 2,994 2,994 2,994 2,994 8,154 8,151 5,340 2,063	1.987 20.455 4.166 7.706 2.036 2.036 5.297 17.974 2.752 4.594 6.282 2.904 3.904 2.90	1,988 20,377 4,166 7,706 6,008 1,907 1,907 1,974 2,762 4,594 6,282 2,904 2,987 6,906 4 area 1988 8,154 8,154 8,154 8,154 8,154 8,154 8,154 8,154 8,154 8,154 8,154 8,154 8,2710	20,229 4,166 1,907 6,045 5,297 17,974 2,711 4,554 6,282 2,904 2,994 2,994 2,995 6,896 1989 8,154 8,151 5,540 2,062 2,710 2,288 2,292 3,423	20,229 4,166 7,708 6,006 1,907 6,645 5,297 17,974 2,711 4,554 6,282 2,904 2,897 6,898 1990 8,134 8,151 5,540 2,062 2,710 2,288 2,292 3,423	20,329 4,302 7,706 6,006 1,907 6,459 5,297 17,974 2,594 6,282 2,904 2,954 6,909 1991 8,134 8,038 5,940 3,709 2,062 2,710 2,288 2,292 3,423 1,489	20.329 4.341 7.708 6.006 1.907 6.645 5.297 17.974 2.711 4.594 6.282 2.904 2.897 6.913 1992 8.134 8.038 5.340 3.709 2.062 2.710 2.288 2.130 3.423 3.674	20.329 4.341 7.708 6.006 1.849 6.645 5.297 17.774 2.711 4.554 6.888 6.282 2.994 2.897 6.906 1993 8.134 8.144 8.144 8.144 8.144	20.329 4.246 7.633 6.006 5.297 17.974 2.974 2.997 6.893 6.893 1994 8.134 8.144 8.144 8.144	20.329 4.246 7.610 6.008 5.297 17.974 2.711 4.878 6.888 6.282 2.904 2.994 2.994 2.994 2.994 2.994 8.134 8.108 5.340 3.709 1.950 1.742 2.710 2.288 2.327 3.423 2.540	20,312 4,246 1,849 6,645 5,129 17,974 2,711 4,878 10,682 6,282 2,994 2,994 2,994 2,994 2,997 7,179 1996 8,134 8,108 5,940 3,109 1,974 2,2710 1,164 2,286 2,2710 1,164 2,288 2,2710	20.312 4.194 7.457 6.006 1.778 6.645 4.853 17.974 2.964 2.887 7.113 1997 8.134 8.134 8.134 8.134 8.134 8.148 5.940 3.109 1.9792 2.771 1.810 2.273 1.909 1.742 2.771 1.810
HEAVY RAIL Igency Hew York-MTA-NYCT Vashingion, D.CWMAT/ Nicego-RTA-CTA Sotion-MBTA Sotion-MBTA Sotion-MBTA San Francisco-BART Heidelphia-NATA Sam Francisco-BART Heidelphia-NATA Sam Francisco-MATA Sam Francisco-MUNT Middelphia-SEPTA Sotion-MBTA Sam Francisco-MUNT Middelphia-SEPTA Satorabet-LACMTA Sam Francisco-MUNT Middelphia-SEPTA Satorabet-RTA Satorabet-RTA Satorabet-RTA Satorabet-RTA Satorabet-RTA Satorabet-RTA Satorabet-RTA Satorabet-RTA Satorabet-RTA	Number of hot 1,984 20,407 4,614 7,779 5,465 5,297 7,274 2,653 5,720 6,282 2,904 2,897 6,999 Number of hot 7,894 8,151 5,940 1,767 2,292 4,738	1,985 20,407 7,708 5,586 2,079 6,645 5,586 6,645 5,297 17,974 2,762 5,720 6,282 2,904 6,282 2,904 6,282 2,904 6,282 2,904 5,700 6,282 2,904 1,795 8,151 5,940 1,759 2,292 4,738	1,985 20,465 20,465 5,586 2,078 6,645 5,596 6,267 5,520 5,720 6,297 17,974 2,762 5,720 6,297 6,987 6,987 7,520 6,987 7,520 6,987 7,520 6,987 7,540 2,063 2,292 3,559 4,738	1.987 20.465 7.706 6.009 2.036 6.645 5.297 17.974 6.282 2.904 6.282 2.904 6.924 6.924 0 of the serve- 1987 8.154 8.151 5.940 2.063 2.710 2.288 2.292 3.423	1,986 20,377 4,166 7,706 6,008 1,907 6,645 5,297 17,974 6,262 2,904 2,897 6,906 4,594 6,906 4,596 4,594 2,988 8,151 5,940 2,063 2,710 2,288 2,292 3,423 2,263 4,738	20,329 4,166 7,708 6,008 1,907 6,507 17,974 2,711 4,594 2,597 2,594 2,594 2,594 2,594 2,594 2,594 2,594 2,595 8,154 8,151 5,940 2,062 2,710 2,288 2,292 3,423 2,263	20,329 4,166 7,708 6,008 1,907 6,507 17,971 4,594 2,711 4,594 2,897 6,898 1990 8,134 8,151 5,940 2,062 2,710 2,288 2,292 3,423 2,260	20,329 4,302 4,7708 6,007 6,007 6,5397 17,974 2,711 4,594 2,897 6,509 1991 8,134 8,328 5,909 2,062 2,710 2,262 2,710 2,262 2,710 2,262 2,710	20.329 4.341 7.708 6.007 6.6397 17.974 2.711 4.594 2.892 2.894 2.897 6.513 1992 8.134 8.038 5.940 2.692 2.710 2.662 2.710 2.662 2.710 2.483 3.674 1.489	20.329 4.341 7.708 6.005 6.005 6.297 17.974 4.594 2.711 4.598 6.282 2.990 2.990 2.990 2.990 2.990 2.990 2.990 2.990 2.990 2.990 2.990 2.990 2.062 2.710 2.288 2.130 3.423 2.654 1.489 4.699	20.329 4.246 7.633 6.008 6.008 6.297 17.974 2.711 4.538 6.297 2.711 4.538 6.282 2.904 2.997 6.893 1994 8.134 8.134 8.134 8.338 5.940 3.709 1.967 1.742 2.710 2.282 1.742 2.710	20.329 4.246 7.610 6.008 6.008 6.297 17.974 2.711 4.578 6.888 6.282 2.997 6.914 2.997 6.914 2.997 6.914 2.997 6.914 2.997 6.914 2.997 6.914 2.901 2.904 2.901 2.904 2.901 2.904 2.901 2.904 2.901 2.904 2.904 2.907 6.914 2.90	20,312 4,246 7,457 6,008 1,649 6,649 6,649 6,717 17,974 4,878 2,711 4,878 2,711 4,878 2,904 2,907 7,179 2,904 2,904 2,907 2,904 2,907 2,904 2,907 2,904 2,907 2,904 2,907 2,904 2,907 2,904 2,907 2,904 2,907 2,904 2,907 2,904 2,907 2,904 2,907 2,904 2,907 2,907 2,904 2,907 2,904 2,905 2,90	20.312 4.194 7.457 6.000 10.000 17.974 4.853 17.971 4.853 17.971 4.853 17.971 4.853 2.711 4.853 2.904 2.897 7.113 1997 8.134 8.108 5.409 3.109 1.909 1.909 1.909 1.909 1.909 1.909 1.909 1.909 1.909 1.909 1.909 1.909 1.909 1.909 2.200 1.909 1.909 1.909 2.301 2.200 1.909 1.909 2.301 2.200 1.909 1.909 2.904 1.909 1.900 1.909 1.909 1.900 1.900 1.900 1.900 1.900 1.900 1.900 1.900 1.900 1.900 1.900 1.900 1.9000 1.9000 1.9000 1.90000 1.90000 1.90000000000
HEAVY RAIL Igency Iew York-MTA-NYCT Vierge-Arth-CTA Soton-MBTA Soton-MBTA Soton-MBTA Soton-MBTA Sam Francisco-BART Vierge-MMTA Sam Francisco-BART Soviand-GCRTA Isoviand-GCRTA Isoviand-GCRTA Isoviand-GCRTA Isoviand-GCRTA Sam Francisco-MURI Nieselphia-SEPTA Sam Francisco-MURI Nieselphia-SEPTA Sam Francisco-MURI Nieselphia-SEPTA Sam Francisco-MURI Nieselphia-SEPTA Sam Francisco-MURI Nieselphia-SEPTA Sam Francisco-MURI Sam Francisco-MURI Sam Sam Scamer A Sam Jose-SCTD Iew Jongen-AMTA Sam Jose-SCTD	Number of hos 1,984 20,407 4,614 7,779 5,433 2,027 6,845 2,297 17,974 2,2653 5,720 6,282 2,904 2,897 6,999 Number of hos 1,984 8,151 5,940 1,767 2,292	1,985 20,407 4,388 7,708 2,079 6,545 5,297 4,2752 5,720 6,282 2,394 2,394 5,740 6,282 2,394 2,997 7,000 1,995 7,994 8,151 5,540 1,759	1,996 20,465 4,166 7,708 6,247 2,078 6,245 5,297 4,2762 5,770 6,282 2,994 2,994 2,994 2,994 2,994 2,994 8,154 8,151 5,340 2,063	1.987 20.455 4.166 7.706 2.036 2.036 5.297 17.974 2.752 4.594 6.282 2.904 3.904 2.90	1,988 20,377 4,166 7,706 6,008 1,907 1,907 1,974 2,762 4,594 6,282 2,904 2,987 6,906 4 area 1988 8,154 8,154 8,154 8,154 8,154 8,154 8,154 8,154 8,154 8,154 8,154 8,154 8,2710	20,229 4,166 1,907 6,045 5,297 17,974 2,711 4,554 6,282 2,904 2,994 2,994 2,995 6,896 1989 8,154 8,151 5,540 2,062 2,710 2,288 2,292 3,423	20,229 4,166 7,708 6,006 1,907 6,645 5,297 17,974 2,711 4,554 6,282 2,904 2,897 6,898 1990 8,134 8,151 5,540 2,062 2,710 2,288 2,292 3,423	20,329 4,302 7,706 6,006 1,907 6,459 5,297 17,974 2,594 6,282 2,904 2,954 6,909 1991 8,134 8,038 5,940 3,709 2,062 2,710 2,288 2,292 3,423 1,489	20.329 4.341 7.708 6.006 1.907 6.645 5.297 17.974 2.711 4.594 6.282 2.904 2.897 6.913 1992 8.134 8.038 5.340 3.709 2.062 2.710 2.288 2.130 3.423 3.674	20.329 4.341 7.708 6.006 1.849 6.645 5.297 17.774 2.711 4.554 6.888 6.282 2.994 2.897 6.906 1993 8.134 8.144 8.144 8.144 8.144	20.329 4.246 7.633 6.006 5.297 17.974 2.545 6.689 6.282 2.994 6.893 1994 8.134 8.144 8.144 8.144	20.329 4.246 7.610 6.008 5.297 17.974 2.711 4.878 6.888 6.282 2.904 2.994 2.994 2.994 2.994 2.994 8.134 8.108 5.340 3.709 1.950 1.742 2.710 2.288 2.327 3.423 2.540	20,312 4,246 1,849 6,645 5,129 17,974 2,711 4,878 10,682 6,282 2,994 2,994 2,994 2,994 2,994 2,997 7,179 1996 8,134 8,108 5,940 3,109 1,974 2,2710 1,164 2,286 2,2710 1,268 2,227 3,423 2,268 2,227 3,423 2,268	20.312 4.194 7.457 6.000 1.778 6.645 4.853 17.974 4.878 2.711 4.878 2.711 10.662 2.904 2.887 7.113 10.682 2.904 2.887 7.113 1.9997 8.134 8.108 5.940 3.109 1.079 1.079 1.042 2.271 1.810 1.8104 2.287 3.423 2.2654 4.683
Housing Dens HEAVY RAL spancy New York-MTA-NYCT Washington, D.CWMAT/ Washington, D.CWMAT/ Kashington, D.CWMAT/ Saforamit, D.CWMATA Saforamit, Septime Saforamit, Septime Pailadelphia-SEPTA Saforamit,	Number of hot 1,984 20,407 4,614 7,779 5,465 5,297 7,274 2,653 5,720 6,282 2,904 2,897 6,999 Number of hot 7,894 8,151 5,940 1,767 2,292 4,738	1,985 20,407 7,708 5,586 2,079 6,645 5,586 6,645 5,297 17,974 2,762 5,720 6,282 2,904 6,282 2,904 6,282 2,904 6,282 2,904 5,700 6,282 2,904 1,795 8,151 5,940 1,759 2,292 4,738	1,985 20,465 20,465 5,586 2,078 6,645 5,596 6,267 5,520 5,720 6,297 17,974 2,762 5,720 6,297 6,987 6,987 7,520 6,987 7,520 6,987 7,520 6,987 7,540 2,063 2,292 3,559 4,738	1.987 20.465 7.706 6.009 2.036 6.645 5.297 17.974 6.282 2.904 6.282 2.904 6.924 6.924 0 of the serve- 1987 8.154 8.151 5.940 2.063 2.710 2.288 2.292 3.423	1,986 20,377 4,166 7,706 6,008 1,907 6,645 5,297 17,974 6,262 2,904 2,897 6,906 4,594 6,906 4,596 4,594 2,988 8,151 5,940 2,063 2,710 2,288 2,292 3,423 2,263 4,738	20,329 4,166 7,708 6,008 1,907 6,507 17,974 2,711 4,594 2,597 2,594 2,594 2,594 2,594 2,594 2,594 2,594 2,595 8,154 8,151 5,940 2,062 2,710 2,288 2,292 3,423 2,263	20,329 4,166 7,708 6,008 1,907 6,507 17,971 4,594 2,711 4,594 2,897 6,898 1990 8,134 8,151 5,940 2,062 2,710 2,288 2,292 3,423 2,268	20,329 4,302 4,306 6,006 6,006 6,007 6,5397 17,974 2,711 4,594 2,897 6,509 1991 8,134 8,338 5,909 2,062 2,710 2,262 2,710 2,262 2,710 2,282 3,423 1,489	20.329 4.341 7.708 6.007 6.6397 17.974 2.711 4.594 2.892 2.894 2.897 6.513 1992 8.134 8.038 5.940 2.692 2.710 2.662 2.710 2.662 2.710 2.483 3.674 1.489	20.329 4.341 7.708 6.005 6.005 6.297 17.974 4.594 2.711 4.598 6.282 2.990 2.990 2.990 2.990 2.990 2.990 2.990 2.990 2.990 2.990 2.990 2.990 2.900 2.710 2.288 2.3130 3.423 2.654 1.489 4.689	20.329 4.246 7.633 6.006 5.297 17.974 2.549 6.649 6.297 17.974 2.997 6.893 1994 8.134 8.038 8.338 5.940 3.3749 1.574 2.710 2.286 2.371 3.423 2.654 1.489 1.489 1.489	20.329 4.246 7.610 6.006 5.297 1.249 6.649 6.249 7.711 4.878 6.282 2.904 2.904 2.904 2.904 2.994 8.134 8.108 5.940 3.709 1.950 1.742 2.710 2.288 2.2710 2.288 2.3710 2.288 2.3710 2.288 2.403 1.742 2.710 2.288 2.570	20,312 4,246 7,457 6,006 1,849 6,645 5,129 17,974 2,711 4,878 4,271 10,582 6,282 2,994 2,994 2,994 2,994 2,994 8,134 8,108 5,940 3,109 1,974 2,2710 1,154 8,134 8,134 8,139 1,999 1,940 1,999 1,99 1,9	20.312 4.194 7.457 6.006 6.645 4.853 17.974 2.711 4.878 10.652 2.904 2.887 7.113 1997 8.134 8.108 5.940 3.109 1.909 1.909 1.909 1.742 2.731 1.445 8.134 8.108 5.440 3.109 1.742 2.731 1.445 3.425 2.2661 5.445
HEAVY RAIL agency New York-MTA-NYCT Washington, D.CWMAT/ Kashington, D.CWMAT/ Kashington, D.CWMAT/ Sator-MTA Baston-META Sator-Marka	Number of hot 1,984 20,407 4,614 7,779 5,467 2,297 1,974 2,653 5,720 6,262 2,904 2,897 6,999 Number of hot 1,984 7,894 8,151 5,940 1,767 2,292 4,738 2,570	1,985 20,407 7,708 5,586 2,079 6,645 5,586 2,079 17,974 2,762 5,720 6,282 2,904 6,282 2,904 6,282 2,904 6,282 2,904 6,282 2,904 5,700 1,759	1,985 20,485 20,485 20,485 5,586 2,078 6,245 6,245 6,245 6,297 17,974 2,762 5,720 6,297 6,297 6,297 6,287 6,987 r square mile 8,154 8,151 5,940 2,063 2,292 3,559 4,738 2,570	1.987 20.465 7.706 6.009 2.036 6.645 5.297 17.974 6.282 2.904 6.282 2.904 6.924 6.924 0 fthe serve- 1987 8.154 8.151 5.940 2.063 2.710 2.288 2.292 3.423 4.738 2.570	1,986 20,377 4,166 7,706 6,008 1,907 6,645 5,297 17,974 6,265 6,276 2,762 4,554 6,282 2,904 2,2897 6,906 4,590 6,906 4,590 2,906 2,909 2,906 2,909 2,292 3,423 2,263 4,730 2,2570	20,329 4,166 7,708 6,008 1,907 6,5297 17,974 2,711 4,594 2,597 6,598 8,154 8,151 5,940 2,062 2,710 2,288 2,292 3,423 2,263 4,638 4,658 4,658	20,229 4,166 5,297 1,307 6,645 5,297 17,374 2,711 4,554 6,292 2,904 6,898 8,134 8,154 8,134 8,134 8,134 8,134 8,134 8,134 2,292 2,710 2,288 2,292 3,423 2,283 4,608 2,570	20,329 4,302 4,7706 6,006 1,907 6,5397 17,974 2,711 4,594 2,897 6,509 2,897 6,509 1991 8,134 8,134 8,338 5,940 2,062 2,710 2,262 2,710 2,268 2,292 3,423 1,489 4,608 2,570	20.329 4.341 7.708 6.009 1.907 6.5397 17.974 2.711 4.594 2.892 2.904 2.897 6.513 1992 8.134 8.038 5.940 2.697 6.513 3.079 2.062 2.710 2.268 2.130 3.423 3.674 1.489 4.605	20.329 4.341 7.708 6.005 6.005 6.297 17.974 2.711 4.538 2.297 2.711 4.538 6.888 6.282 2.996 2.996 2.996 2.996 2.996 2.996 2.996 2.996 2.996 2.996 2.996 2.710 2.062 2.710 2.288 2.130 3.423 2.654 1.489 4.689 2.570	20.329 4.248 7.633 6.008 6.008 6.297 17.974 2.711 4.594 6.888 6.282 2.997 6.893 1994 8.135 8.550 1.2557 1.2557 1.2557 1.2557 1.2557 1.2557 1.2557 1.25577 1.25577 1.255777 1.25577777777777777777777777777777777777	20.329 4.246 7.610 6.060 6.064 6.297 17.974 4.578 6.888 6.282 2.997 6.914 2.997 6.914 2.997 6.914 2.997 6.914 2.997 6.914 2.997 6.914 2.997 6.914 2.997 6.914 2.907 1.942 2.327 3.423 2.344 1.489 4.608 2.550	20,312 4,248 7,457 6,008 1,849 6,129 17,974 4,878 2,711 4,878 2,914 10,682 2,904 2,904 2,904 2,904 2,904 2,904 2,904 2,907 7,179 1996 8,134 8,108 5,940 3,109 1,979 1,974 2,2174 4,178 2,217 1,164 4,228 2,21744 2,2174 2,2174 2,2174 2,2174 2,2174 2,217474 2,217474 2,2174	20.312 4.194 7.457 6.009 1.778 6.645 4.863 17.974 4.878 2.711 4.878 2.711 10.662 2.904 2.887 7.113 10.662 2.904 2.887 7.113 10.682 2.904 1.9997 8.134 8.134 8.134 8.134 8.134 8.146 5.340 5.340 5.408 5.340 5.408

Household Size

HEAVY RAIL	Average numb	er of member	rs of a house	1010 35 1718 28										
agency	1,964	1,985	1,986	1,987	1,966	1,989	1,990	1,991	1,992	1,993	1,994	1,995	1,996	1,9
New York-MTA-NYCT	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	
Nashington, D.CWMATA	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	:
Chicago-RTA-CTA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.4	2.4	2.5	
Boston-MBTA	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	
Allania-MARTA	2.4 2.6	2.3 2.6	2.3 2.6	2.3 2.6	2.3 2.6	2.3 2.6	2.3 2.6	2.3 2.6	2.3 2.6	2.4 2.6	2.4	2.4	2.4 2.6	
Philadelphia-SEPTA San Francisco-BART	2.6	2.6	2.6	2.6	2.6	2.5	2.6	2.6	2.5	2.5	2.5	2.6	2.6	
New York-PATHC	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	:
Miami-MDTA	2.6	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	
Baltimore-MMTA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	:
Los Angeles-LACMTA										2.8	2.8	2.8	2.7	:
Philadelphia-NJ-PATC	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	•
Cleveland-GCRTA	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	:
New York-MTA-SIRTOA AVERAGE	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8 2.4	2.8	
WERAGE	2,4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	24	2.4	:
	Average numb	er of membe	rs of a house	hold at the se	rved area									
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	19
Boston-MBTA	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	-
San Francisco-MUNI	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	
Philadelphia-SEPTA	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6 3.4	2.6 3.4	2.6 3.4	2.6 3.4	2.6 3.4	2.6 3.4	
Los Angeles-LACMTA	3.4	3.3	3.5	3.5	3.5	3.3	3.2	3.4 3.2	3.4	3.4 3.2	3,4 3,2	3.4 3.2	3.4 3.1	
San Diego Trolley Inc. SI. Louis-BSDA	3.4	3.3	3.5	3.5	3.0	3.3	3.2	3.2	3.2	3.2	2.1	3.2	2.1	
SI. LOUIS-DSDA Portland-TCMTDO				2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	
Dallas-DARTA				.	•		-					•	3.8	
Sacramenio-RTD				2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	
Pittsburgh-PAT	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	
Buffalo-NFTS			2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	
Baltimore-MMTA									1.9	2.3	2.3	2.3	2.3	:
San Jose-SCTD					3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3
New Orleans-RTA	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2
Cleveland-GCRTA	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2
Denver-RTD											2.1	2.1	2.1	-
Newark-NJTC	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	:
Hudson-Bergen LRT AVERAGE	2.6	2.5	2.5	2.4	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	
Population De	nsity													
Population De	nsity													
- HEAVY RAIL	Number of res		juare mile of 1 1,986	erved area 1,987	1,968	1,989	1,990	1,991	1,992	1,993	1,994	1,995	1,996	1,9
- HEAVY RAIL agency	Number of res	idenis per sq 1,965 47,717			1,988 47,668	1,989 47,550	1,990 47,550	1,991 47,550	1.992 47,550	1,993 47,550	1,994 47,550	1,995 47,550	1.996 47,492	
- HEAVY RAIL agency New York-MTA-NYCT	Number of res 1,984	1,985	1,986	1,987										47,4
HEAVY RAIL agency New York-MTA-NYCT Washington, D.GWMATA Chicago-RTA-CTA	Number of res 1,984 47,717	1,985 47,717	1,986 47,823	1,987 47,823	47,668	47,550 7,625 16,706	47,550	47,550 8,030 16,706	47,550	47,550	47,550 7,993 16,470	47,550 7,993 16,438	47,492 7,993 16,236	47.4 7.5
HEAVY RAIL agency Isw York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-MBTA	Number of res 1,994 47,717 8,313 16,859 11,729	1,985 47,717 7,963 16,706 12,109	1,986 47,823 7,625 16,706 12,109	1,987 47,823 7,625 16,706 12,933	47,668 7,625 16,706 12,933	47,550 7,625 16,706 12,933	47,550 7,625 16,706 12,933	47,550 8,030 16,706 12,933	47,550 8,076 16,706 12,933	47,550 8,076 16,706 12,933	47,550 7,993 16,470 12,933	47,550 7,993 16,438 12,933	47,492 7,993 16,236 12,933	47 7.5 16.1 12.5
HEAVY RAIL agency New York-MTA-NYCT Washington, D.GWMATA Chicago-RTA-CTA Boston-MBTA Milanta-MARTA	Number of res 1,984 47,717 8,313 16,859 11,729 4,029	1,985 47,717 7,963 16,706 12,109 4,016	1,986 47,823 7,625 16,706 12,109 4,016	1,987 47,823 7,625 16,706 12,933 3,955	47,668 7,625 16,706 12,933 3,732	47,550 7,625 16,706 12,933 3,732	47,550 7,625 16,706 12,933 3,732	47,550 8,030 16,706 12,933 3,732	47,550 8,076 16,706 12,933 3,732	47,550 8,076 16,706 12,933 3,682	47,550 7,993 16,470 12,933 3,682	47,550 7,993 16,438 12,933 3,682	47,492 7,993 16,236 12,933 3,682	47,4 7,9 16,1 12,9 3,5
HEAVY RAIL Begoncy New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-MBTA Vilanda-MARTA Philadeiphia-SEPTA	Number of res 1,984 47,717 8,313 16,859 11,729 4,029 14,756	1,985 47,717 7,963 16,706 12,109 4,016 14,756	1,986 47,823 7,625 16,706 12,109 4,016 14,756	1,987 47,823 7,625 16,706 12,933 3,955 14,756	47,668 7,625 16,706 12,933 3,732 14,756	47,550 7,625 16,706 12,933 3,732 14,756	47,550 7,625 16,706 12,933 3,732 14,756	47,550 8,030 16,706 12,933 3,732 14,756	47,550 8,076 16,706 12,933 3,732 14,756	47,550 8,076 16,706 12,933 3,682 14,756	47,550 7,993 16,470 12,933 3,682 14,756	47,550 7,993 16,438 12,933 3,682 14,756	47,492 7,993 16,236 12,933 3,682 14,756	47,4 7,5 16,1 12,5 3,5 14,1
HEAVY RAIL Iggorcy New York-MTA-NYCT New Sork-MTA-NYCT New Sork-MTA-NYCT New Sork-MTA Sorkor-MBTA Niladephia-SEPTA San Francisco-BAT	Number of res 1,984 47,717 8,313 16,859 11,729 4,029 14,756 11,338	1,985 47,717 7,963 16,706 12,109 4,016 14,756 11,338	1,986 47,823 7,625 16,706 12,109 4,016 14,756 11,338	1,987 47,823 7,625 16,706 12,933 3,955 14,756 11,338	47,668 7,625 16,706 12,933 3,732 14,756 11,338	47,550 7,625 16,706 12,933 3,732 14,756 11,338	47,550 7,625 16,706 12,933 3,732 14,756 11,338	47,550 8,030 16,706 12,933 3,732 14,756 11,338	47,550 8,076 16,706 12,933 3,732 14,756 11,338	47,550 8,076 16,706 12,933 3,682 14,756 11,338	47,550 7,993 16,470 12,933 3,682 14,756 11,338	47,550 7,993 16,438 12,933 3,682 14,756 11,338	47,492 7,993 16,236 12,933 3,682 14,756 11,073	47,47,4 7,5 16,5 12,5 12,5 3,5 14,1 10,5
+EAVY RAIL agency New York-MTA-NYCT Nashington, D.CWMATA Siciago-RTA-CTA Bostor-MBTA Warls-MARTA Philadeiphia-SEPTA San Francisco-BART New York-PATHC	Number of res 1,984 47,717 8,313 16,859 11,729 4,029 14,756 11,338 30,027	1,985 47,717 7,963 16,706 12,109 4,016 14,756 11,338 30,027	1,986 47,823 7,625 16,706 12,109 4,016 14,756 11,338 30,027	1,907 47,823 7,625 16,706 12,933 3,955 14,756 11,338 30,027	47,668 7,625 16,706 12,933 3,732 14,756 11,338 30,027	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027	47,550 8,030 16,706 12,933 3,732 14,756 11,338 30,027	47,550 8,076 16,706 12,933 3,732 14,756 11,338 30,027	47,550 8,076 16,706 12,933 3,682 14,756 11,338 30,027	47,550 7,993 16,470 12,933 3,682 14,756 11,338 30,027	47,550 7,993 16,438 12,933 3,682 14,756 11,338 30,027	47,492 7,993 16,236 12,933 3,682 14,756 11,073 30,027	47, 7,5 16,1 12,5 3,5 14,1 10,5 30,1
HEAVY RAIL agency New York-MTA-NYCT Washington, D.CWMATA Cheago-RTA-CTA Boston-META Nilarda-MARTA Nilarda-MARTA Nilarda-MARTA Nilarda-MARTA San Francisco-BART New York-PATHC Mami-MDTA	Number of res 1,984 47,717 8,313 16,859 11,729 4,029 14,756 11,338 30,027 5,249	1,985 47,717 7,963 16,706 12,109 4,016 14,756 11,338 30,027 7,245	1,986 47,823 7,625 16,706 12,109 4,016 14,756 11,338 30,027 7,245	1,987 47,823 7,625 16,706 12,933 3,955 14,756 11,338 30,027 7,245	47,668 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,245	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165	47,550 8,030 16,706 12,933 3,732 14,756 11,338 30,027 7,165	47,550 8,076 16,706 12,933 3,732 14,756 11,338 30,027 7,165	47,550 8,076 16,706 12,933 3,682 14,756 11,338 30,027 7,165	47,550 7,993 16,470 12,933 3,682 14,756 11,338 30,027 7,165	47,550 7,993 16,438 12,933 3,682 14,756 11,338 30,027 7,165	47,492 7,993 16,236 12,933 3,682 14,756 11,073 30,027 7,165	47, 7,5 16,1 12,1 3,1 14,1 10,5 30,1 7,1
HEAVY RAIL agency New York: MTA-NYCT Nashington, D.CWMATA Okcago-RTA-CTA Boston-MBTA San Francisco-DART New York-PATHC Matti-MOTA Bailmore-MMTA	Number of res 1,984 47,717 8,313 16,859 11,729 4,029 14,756 11,338 30,027	1,985 47,717 7,963 16,706 12,109 4,016 14,756 11,338 30,027	1,986 47,823 7,625 16,706 12,109 4,016 14,756 11,338 30,027	1,907 47,823 7,625 16,706 12,933 3,955 14,756 11,338 30,027	47,668 7,625 16,706 12,933 3,732 14,756 11,338 30,027	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027	47,550 8,030 16,706 12,933 3,732 14,756 11,338 30,027	47,550 8,076 16,706 12,933 3,732 14,756 11,338 30,027	47,550 8,076 16,706 12,933 3,682 14,756 11,338 30,027 7,165 9,982	47,550 7,993 16,470 12,933 3,682 14,756 11,338 30,027 7,165 9,982	47,550 7,993 16,438 12,933 3,682 14,756 11,338 30,027 7,165 10,686	47,492 7,993 16,236 12,933 3,682 14,756 11,073 30,027 7,165 10,686	47,4 7,5 16,1 12,5 3,5 14,1 10,5 30,0 7,7 10,6
HEAVY RAIL agency New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Doston-MBTA Aliarta-MARTA Philadeiphia-SEPTA San Francisco-BART San Francisco-BART New York-PATHC Mierm-MDTA Batimore-MMTA Los Angeles-LACMTA	Number of res 1,984 47,717 8,313 16,859 11,729 4,029 14,756 11,338 30,027 5,249 12,387	1,985 47,717 7,963 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,387	1,986 47,823 7,625 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,387	1,987 47,823 7,625 16,706 12,933 3,955 14,756 11,338 30,027 7,245 9,982	47,668 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,245 9,982	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982	47,550 8,030 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982	47,550 8,076 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982	47,550 8,076 16,706 12,933 3,682 14,756 11,338 30,027 7,165 9,982 16,330	47,550 7,993 16,470 12,933 3,682 14,756 11,338 30,027 7,165 9,982 16,330	47,550 7,993 16,438 12,933 3,662 14,756 11,338 30,027 7,165 10,686 16,330	47,492 7,993 16,236 12,933 3,682 14,756 11,073 30,027 7,165 10,686 25,113	47,4 7,5 16,5 12,1 3,1 14,5 10,1 30,1 7,5 10,1 25,5
HEAVY RAIL agency New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-MBTA Aliaria-MARTA Philadeiphia-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Baitmore-MMTA Los Angeles-LACMTA Philadeiphia-NJ-PATC	Number of res 1,984 47,717 8,313 16,859 11,729 4,029 14,756 11,338 30,027 5,249 12,387 10,770	1,965 47,717 7,963 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,367 10,770	1,986 47,823 7,625 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,387 10,770	1,967 47,823 7,625 16,706 12,933 3,955 14,756 11,338 30,027 7,245 9,982 10,770	47,668 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,245 9,982 10,770	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770	47,550 8,030 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770	47,550 8,076 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770	47,550 8,076 16,706 12,933 3,682 14,756 11,338 30,027 7,165 9,982 16,330 10,770	47,550 7,993 16,470 12,933 3,662 14,756 11,338 30,027 7,165 9,962 16,330 10,770	47,550 7,993 16,438 12,933 3,682 14,756 11,338 30,027 7,165 10,686 16,630 10,770	47,492 7,993 16,236 12,933 3,682 14,756 11,073 30,027 7,165 10,686 25,113 10,770	47, 7, 16, 12, 3, 14, 10, 30, 7, 10, 25, 10,
HEAVY RAIL agency New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-MBTA San Francisco-BRAT New York-PATHC Mari-MOTA Baitmorp-MMTA Cas Angeles-LACMTA Philadelphis-NJ-PATC Cleveland-GCRTA	Number of res 1,984 47,717 8,313 16,859 11,729 4,029 14,756 11,338 30,027 5,249 12,387	1,985 47,717 7,963 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,387	1,986 47,823 7,625 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,387	1,987 47,823 7,625 16,706 12,933 3,955 14,756 11,338 30,027 7,245 9,982	47,668 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,245 9,982	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982	47,550 8,030 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982	47,550 8,076 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982	47,550 8,076 16,706 12,933 3,682 14,756 11,338 30,027 7,165 9,982 16,330	47,550 7,993 16,470 12,933 3,682 14,756 11,338 30,027 7,165 9,982 16,330	47,550 7,993 16,438 12,933 3,682 14,756 11,338 30,027 7,165 10,686 16,330	47,492 7,993 16,236 12,933 3,682 14,756 11,073 30,027 7,165 10,686 25,113	47, 7, 16, 12, 3, 14, 10, 30, 7, 10, 25, 10, 6,
HEAVY RALL agency New York-MTA-NYCT Washington, C.:-WMATA Chicago-RTA-CTA Boaton-MBTA Mainte-MARTA Philadephia-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Baltimore-MMATA Baltimore-MMATA Claveland-GCRTA New York-MTA-SIRTOA	Number of res 1,984 47,717 8,313 16,859 11,729 4,029 14,756 11,338 30,027 6,249 12,387 10,770 6,679	1,985 47,717 7,963 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,387 10,770 6,679	1,986 47,823 7,625 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,387 10,770 6,679	1.907 47.823 7.625 16,706 12,933 3.955 14,756 11,338 30,027 7,245 9,982 10,770 6,679	47,668 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,245 9,982 10,770 6,679	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679	47,550 8,030 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679	47,550 8,076 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679	47,550 8,076 16,706 12,933 3,682 14,756 11,338 30,027 7,165 9,982 16,330 10,770 6,679	47,550 7,993 16,470 12,933 3,682 14,756 11,338 30,027 7,165 9,962 16,330 10,770 6,679	47,550 7,993 16,438 12,933 3,682 14,756 11,338 30,027 7,165 10,686 16,330 10,770 6,679	47,492 7,993 16,236 12,933 3,682 14,756 11,073 30,027 7,165 10,686 25,113 10,770 6,679	47,4 7,1 16,1 12,3,4 14,1 10,4 30,1 7,1 10,4 25,1 10,1 25,1 10,1 25,1 10,1 25,1 10,1 25,1 10,1 25,1 10,1 25,1 10,1 25,1 10,1 25,1 10,1 25,1 10,1 25,1 10,1 25,1 10,1 20,1 20,1 20,1 20,1 20,1 20,1 20
HEAVY RAIL agency New York MTA-NYCT Nesschington, D.CWMATA Niaris-MARTA Niaris-MARTA Niaris-MARTA Sonton-MBTA Santinora-MMTA Santinora-MMTA Santinora-MMTA Santinora-MMTA Santinora-MMTA Santinora-MMTA Santinora-MMTA Santinora-MMTA Santinora-MMTA Santinora-MMTA Santinora-MMTA Santinora-MMTA Santinora-MMTA Santinora-MMTA Santinora-MMTA Santinora-MMTA Santinora-MMTA Santinora-MMTA Santinora-MMTA Santinora-Santino Santinora-Santino Santino-Santino S	Number of res 1,984 47,717 8,313 16,859 11,729 4,029 14,756 11,338 30,027 6,249 12,387 10,770 6,679 7,580	1,985 47,717 7,963 16,706 12,109 4,016 14,756 11,338 30,027 7,245 10,770 6,679 7,580 14,545	1,986 47,823 7,625 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,387 10,770 6,679 7,580 14,525	1,987 47,825 7,625 16,706 12,933 3,955 14,756 11,338 30,027 7,245 9,982 10,770 6,679 7,580 14,389	47,668 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,245 9,982 10,770 6,679 7,580	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580	47,550 8,030 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580	47,550 8,076 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580	47,550 8,076 16,706 12,933 3,682 14,756 11,338 30,027 7,165 9,982 16,330 10,770 6,679 14,525	47,550 7,993 16,470 12,933 3,682 14,756 11,338 30,027 7,165 9,962 16,330 10,770 6,679 7,580	47,550 7,993 16,438 12,933 3,682 14,766 11,338 30,027 7,165 10,686 16,330 10,770 6,679 7,580 14,552	47,492 7,993 16,236 12,933 3,682 14,756 11,073 30,027 7,165 10,686 25,113 10,770 6,679 7,580	47.4 7.3 16.3 12.4 3.4 10.4 30.4 7.10.4 25.10.7 6.1 7.5
HEAVY RAIL agency New York MTA-NYCT Nessington, D.CWMATA Niaris-MARTA Viaris-MARTA Viaris-MARTA Solton-META Satimore-MATTA Satimore-MATTA Satimore-MATA Satimo	Number of res 1,984 47,717 8,313 16,859 11,729 4,029 11,729 12,387 10,770 6,579 7,580 14,473 Number of res 1984	1,985 47,717 7,963 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,387 10,770 6,679 7,580 14,545	1,986 47,823 7,625 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,387 10,770 6,679 7,580 14,525	1.987 47.823 7.625 16,706 12.933 3.955 14,756 11.338 30.027 7.245 9.982 10,770 6.679 7.580 14.389	47,668 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,245 9,982 10,770 6,679 7,580 14,357	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,341	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,560 14,341	47,550 8,030 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,992 10,770 6,679 7,580 14,374	47,550 8,076 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,992 10,770 6,679 7,550 14,378	47,550 8,076 16,706 12,933 3,682 14,756 11,338 30,027 7,165 9,982 16,330 10,770 6,679 7,580 14,525	47,550 7,993 16,470 12,933 3,682 14,766 11,338 30,027 7,165 9,992 16,330 10,770 6,679 7,580 14,500	47,550 7,993 16,438 12,933 3,682 14,766 11,338 30,027 7,165 10,6866 16,330 10,770 6,679 7,580 14,552	47,492 7,993 16,236 12,933 3,682 14,766 11,073 30,027 7,165 10,686 25,113 10,770 6,679 7,580 15,187	47, 7, 16, 12, 3, 14, 10, 30, 7, 10, 25, 10, 6, 7, 15,
HEAVY RAL agency New York MTA-NYCT Nestington, D.CWMATA Chicago, RTA-CTA Soston-MBTA Salor, MTA Salor, MT	Number of res 1,994 47,717 6,313 16,859 11,729 4,029 14,756 11,303 7,560 14,473 10,770 6,679 7,560 14,473 Number of res 1984 16,331	1,985 47,717 7,963 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,387 10,770 6,679 14,545	1,986 47,823 7,625 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,387 10,770 6,679 14,525 14,525	1.987 47.823 7.625 16,706 12,933 3.965 14,756 11,338 30,027 7.245 9.982 10,770 6,679 14,389 14,389	47,668 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,245 9,982 10,770 6,679 7,580 14,357 1988 16,756	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,341	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,341	47,550 8,030 16,706 12,333 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,374	47,550 8,076 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,378	47,550 8,076 16,706 12,933 3,662 14,756 11,338 30,027 7,165 9,962 16,330 10,770 6,679 7,560 14,525	47,550 7,993 16,470 12,933 3,682 3,682 3,027 7,165 9,962 16,330 10,770 6,679 7,580 14,500	47,550 7,993 16,438 12,933 3,682 14,756 11,338 30,027 7,165 10,686 16,330 10,770 6,679 7,580 14,552	47,492 7,993 16,236 12,933 3,662 14,756 11,073 30,027 7,165 10,665 25,113 10,770 6,679 7,580 15,187	47, 7, 16, 12, 3, 14, 10, 30, 7, 10, 25, 10, 6, 7, 15,
HEAVY RAL agency New York MTA-NYCT Nessington, D.CWMATA Niaria-MARTA Datashington, D.CWMATA Solton-MBTA Solton-MBTA Satimore-MMTA Satimore-MMTA New York-MTA-SIRTOA New York-MTA-SIRTOA NVERAGE LIGHT RAL agency Boston-MBTA San Francisco-MUN	Number of res 1,984 47,717 8,313 16,859 11,729 4,029 11,729 4,029 11,729 4,029 11,729 4,029 11,729 10,770 6,679 7,560 14,473 Number of res 1984 16,331 17,549	1,985 47,717 7,963 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,387 10,770 6,679 7,245 12,387 10,770 6,679 14,545	1,986 47,823 7,625 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,387 10,770 6,679 7,580 14,525 1986 14,525	1.987 47.823 7.625 16,706 12,933 3.955 14,756 11.338 30,027 7.245 9.982 10,770 6.679 7.580 14,389	47,568 7,525 16,706 12,933 3,732 14,756 11,338 30,027 7,245 9,930 11,338 9,930 10,770 6,679 7,580 14,357	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,341 1989 16,766	47,550 7,625 16,706 12,933 3,732 14,756 11,336 30,027 7,165 9,982 10,770 6,679 7,580 14,341 1990 16,761 17,542	47,550 8,030 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,962 10,770 6,679 7,580 14,374 19,911 16,761 17,515	47,550 8,076 16,706 12,333 3,732 14,756 11,338 30,027 7,165 9,992 10,770 6,679 7,580 14,378	47,550 8,076 16,706 12,933 3,662 14,756 11,338 30,027 7,165 9,962 16,330 10,770 14,525 19,97 14,525 19,97 14,525	47,550 7,993 16,470 12,933 3,682 14,756 11,338 30,027 7,165 9,962 16,330 10,770 16,679 7,580 14,500 14,500	47,550 7,993 16,438 12,933 3,682 14,756 11,338 30,027 7,165 10,686 16,330 10,770 14,552 1995 16,761 17,576	47,492 7,993 16,236 12,333 3,662 14,756 11,073 30,027 7,165 10,666 25,113 10,756 15,187	47, 7. 16, 12, 3, 14, 10, 30, 7. 10, 25, 10, 6, 7, 15, 15,
HEAVY RAL agency New York MTA-NYCT Nestington, D.CWMATA Chicago-RTA-CTA Soston-MBTA Saint-MTA Saint-SEPTA Saint-SEPTA Saintore-MAT	Number of res 1,994 47,717 6,313 16,859 11,729 4,029 14,756 11,303 7,560 14,473 10,770 6,679 7,560 14,473 Number of res 1984 16,331	1,985 47,717 7,963 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,387 10,770 6,679 14,545	1,986 47,823 7,625 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,387 10,770 6,679 14,525 14,525	1.987 47.823 7.625 16,706 12,933 3.965 14,756 11,338 30,027 7.245 9.982 10,770 6,679 14,389 14,389	47,668 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,245 9,982 10,770 6,679 7,580 14,357 1988 16,756	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,341	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,341	47,550 8,030 16,706 12,333 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,550 14,374	47,550 8,076 16,706 12,333 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,378	47,550 8,076 16,706 12,933 3,662 14,756 11,338 30,027 7,165 9,962 16,330 10,770 6,679 7,580 14,525 1993 16,761 17,515	47,550 7,993 16,470 12,933 3,682 14,756 11,338 30,027 7,165 9,962 16,330 10,770 6,679 7,550 14,500	47,550 7,993 16,438 12,933 3,682 14,756 11,338 30,027 7,165 10,686 10,330 10,770 16,330 10,770 14,552 1995 16,761 17,576	47,492 7,993 16,236 12,333 3,662 14,756 11,073 30,027 7,165 10,666 25,113 10,770 6,679 7,580 15,187	47, 7, 16, 12, 3, 14, 10, 30, 7, 10, 6, 7, 15, 16, 7, 15,
HEAVY RAL agency Jew York-MTA-NYCT Washington, D.CWMATA Solaton-MBTA Salarian-BETA San Francisco-BART Yew York-PATHC Mami-MOTA Salimore-MMTA Sal	Number of res 1,984 47,717 8,313 16,859 11,729 4,029 14,756 11,338 30,029 12,387 10,770 6,249 12,387 10,770 6,249 12,387 10,770 6,249 12,387 10,770 6,249 12,387 10,770 14,473 Number of res 1984 16,391 17,3963	1,985 47,717 7,963 16,706 4,016 14,016 14,016 11,338 30,027 7,245 12,307 10,770 6,679 7,580 14,545 16,391 17,542 13,963	1,986 47,823 16,706 12,109 4,016 14,766 11,338 30,027 7,245 12,387 10,770 6,679 7,580 14,525 14,525	1.987 47.823 47.823 16.706 12.933 3.995 14.756 11.338 30.027 7.245 9.982 10.770 6.679 7.580 14.389 10.750 14.389	47,568 7,525 16,706 12,933 3,732 14,756 11,338 30,027 7,245 9,3027 7,245 10,770 6,679 7,580 14,357 14,357	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,992 10,770 6,679 7,560 14,341 1989 16,756 17,542 13,963	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 14,341 1990 14,761 17,542 13,963	47,550 8,030 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,992 10,770 6,679 7,560 14,374 1991 14,374	47,550 8,076 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,992 10,770 6,679 7,560 14,378 1992 16,761 17,815 13,963 11,711	47,550 8,076 16,706 12,933 3,662 14,756 11,338 30,027 7,165 9,982 9,982 9,982 9,982 16,330 14,525 14,525 14,525 1993 16,781 17,515 13,963 11,711	47,550 7,993 16,470 12,933 3,562 14,756 11,338 30,027 7,765 9,962 9,962 14,330 10,770 8,679 7,580 14,500 14,500	47,550 7,993 16,438 12,933 3,682 14,756 11,338 30,027 7,165 10,866 16,330 10,870 10,870 14,552 1995 16,761 17,576 13,963 11,711	47,492 7,993 16,236 12,333 3,682 14,756 11,073 30,027 7,165 10,686 25,113 10,679 15,187 15,187	47,4 7,9,7,9,1 16,5,3,9 112,3,3,9 14,1 10,9 30,1 7,7 10,0 25,5 10,0 25,5 10,0 5,6 7,7 15,0 15,0 16,6 7,7 15,0 16,6 17,7 17,1 16,6 17,1 16,5 17,1 10,0 10,0 10,0 10,0 10,0 10,0 10,0
HEAVY RAIL agency New York-MTA-NYCT Washington, C.:-WMATA ChcagoRTA-CTA Boston-MBTA Boston-MBTA San Francisco-BART New York-PATHC Maint-MDTA Bailmore-MMTA Data Angeles-LACMTA Philedephia-NJ-PATC Claveland-GCRTA New York-MTA-SIRTOA AVERAGE LIGHT RAIL agency Boston-MBTA San Francisco-MURA Philedephia-SEPTA Los Angeles-LACMTA San Diago Troly Inc.	Number of res 1,984 47,717 8,313 16,859 11,729 4,029 11,729 4,029 11,729 4,029 11,729 4,029 11,729 10,770 6,679 7,560 14,473 Number of res 1984 16,331 17,549	1,985 47,717 7,963 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,387 10,770 6,679 7,245 12,387 10,770 6,679 14,545	1,986 47,823 7,625 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,387 10,770 6,679 7,580 14,525 1986 14,525	1.987 47.823 7.625 16,706 12,933 3.955 14,756 11.338 30,027 7.245 9.982 10,770 6.679 7.580 14,389	47,568 7,525 16,706 12,933 3,732 14,756 11,338 30,027 7,245 9,930 11,338 9,930 10,770 6,679 7,580 14,357	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,341 1989 16,766	47,550 7,625 16,706 12,933 3,732 14,756 11,336 30,027 7,165 9,982 10,770 6,679 7,580 14,341 1990 16,761 17,542	47,550 8,030 16,706 12,333 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,550 14,374	47,550 8,076 16,706 12,333 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,378	47,550 8,076 16,706 12,933 3,662 14,756 11,338 30,027 7,165 9,962 16,330 10,770 6,679 7,580 14,525 1993 16,761 17,515	47,550 7,953 16,470 12,933 3,682 14,756 11,338 30,027 7,165 9,982 16,330 10,770 6,679 7,580 14,500 14,500	47,550 7,993 16,438 12,933 3,682 14,756 11,338 30,027 7,165 10,696 16,330 10,770 6,679 7,580 14,552 1995 16,761 17,576 13,963 11,711 5,716	47,492 7,993 16,236 12,933 3,682 14,756 11,073 30,027 7,165 10,686 25,113 10,770 6,679 15,187 15,187	47, 7, 16,5, 12,, 3, 14, 10, 30, 7, 10, 25, 10, 6, 7, 15, 16, 17, 13, 9, 9, 5,
HEAVY RAL agency Jew York-MTA-NYCT Washington, D.CWMATA Chcago-RTA-CTA Solaton-MBTA San Francisco-BART Yend Sphis-SEPTA San Francisco-BART Yend Sphis-NJ-PATC Light RAL agency Boston-MBTA San Francisco-MURA San Francisco-MURA San Francisco-MURA San Francisco-MURA San Francisco-MURA San Francisco-MURA San Francisco-MURA San Francisco-MURA San Diago Troley Inc. San Dajeo Troley Inc. San Dajeo Troley Inc. San Dajeo Troley Inc.	Number of res 1,984 47,717 8,313 16,859 11,729 4,029 14,756 11,338 30,029 12,387 10,770 6,249 12,387 10,770 6,249 12,387 10,770 6,249 12,387 10,770 6,249 12,387 10,770 14,473 Number of res 1984 16,391 17,3963	1,985 47,717 7,963 16,706 4,016 14,016 14,016 11,338 30,027 7,245 12,307 10,770 6,679 7,580 14,545 16,391 17,542 13,963	1,986 47,823 16,706 12,109 4,016 14,766 11,338 30,027 7,245 12,387 10,770 6,679 7,580 14,525 14,525	1.987 47.823 7.625 16.706 12.933 3.995 14.756 11.338 30.027 7.245 9.982 10.770 6.679 7.580 14.389 10.770 6.679 7.580 14.389 19.770 14.389	47,568 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,245 9,992 10,770 6,679 7,580 14,357 1988 16,756 17,542 13,963 6,690	47,550 7,625 16,706 12,333 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,341 1989 16,766 17,542 13,963 6,270	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,341 1990 16,761 17,542 13,953 6,101	47,550 8,030 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,550 14,374 1991 16,761 17,515 13,963 11,771 6,101	47,550 8,076 16,706 12,2333 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,378 10,770 14,378	47,550 8,076 16,706 12,233 3,692 14,756 11,338 30,027 7,165 9,982 16,330 10,770 6,679 7,590 14,525 1993 16,751 17,515 13,963 11,771 6,101	47,550 7,993 16,470 12,933 3,562 14,756 11,338 30,027 7,165 9,962 9,962 9,962 16,330 10,770 6,679 7,550 14,500 14,500	47,550 7,993 16,438 12,933 3,662 14,756 11,338 30,027 7,165 10,686 16,330 10,770 6,679 7,580 14,552 1995 16,751 17,576 13,963 11,711 5,736	47,492 7,993 16,236 12,333 3,682 14,756 11,073 30,027 7,165 10,686 25,113 10,770 6,679 7,580 15,187	47, 7, 16, 3, 14, 10, 30, 7, 10, 25, 10, 6, 7, 15, 16, 17, 13, 9, 5, 3,
HEAVY RAIL agency New York-MTA-NYCT Washington, C.:-WMATA Milaria-MARTA Milaria-MARTA Milaria-MARTA Soliton-PETA Soliton-PETA Salimor-MATA Balimor-MMTA Balimor-MMTA Caviand-GCRTA New York-MTA-SIRTOA AVERAGE LIGHT RAIL agency Bolton-MBTA San Francisco-MUNA Philadeiphia-SEPTA Los Angeles-LACMTA San Francisco-MUNA Philadeiphia-SEPTA Los Angeles-LACMTA San Diago Troly Inc. St. Louis-BSDA Ponland-TCMTDO	Number of res 1,984 47,717 8,313 16,859 11,729 4,029 14,756 11,338 30,029 12,387 10,770 6,249 12,387 10,770 6,249 12,387 10,770 6,249 12,387 10,770 6,249 12,387 10,770 14,473 Number of res 1984 16,391 17,3963	1,985 47,717 7,963 16,706 4,016 14,016 14,016 11,338 30,027 7,245 12,307 10,770 6,679 7,580 14,545 16,391 17,542 13,963	1,986 47,823 16,706 12,109 4,016 14,766 11,338 30,027 7,245 12,387 10,770 6,679 7,580 14,525 14,525	1.987 47.823 47.823 16.706 12.933 3.995 14.756 11.338 30.027 7.245 9.982 10.770 6.679 7.580 14.389 10.750 14.389	47,568 7,525 16,706 12,933 3,732 14,756 11,338 30,027 7,245 9,3027 7,245 10,770 6,679 7,580 14,357 14,357	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,992 10,770 6,679 7,560 14,341 1989 16,756 17,542 13,963	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 14,341 1990 14,341	47,550 8,030 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,992 10,770 6,679 7,560 14,374 1991 14,374	47,550 8,076 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,992 10,770 6,679 7,580 14,378 1992 16,781 17,815 13,963 11,711	47,550 8,076 16,706 12,933 3,662 14,756 11,338 30,027 7,165 9,982 9,982 9,982 9,982 16,330 14,525 14,525 14,525 1993 16,781 17,515 13,963 11,711	47,550 7,953 16,470 12,933 3,682 14,756 11,338 30,027 7,165 9,982 16,330 10,770 6,679 7,580 14,500 14,500	47,550 7,993 16,438 12,933 3,682 14,756 11,338 30,027 7,165 10,696 16,330 10,770 6,679 7,580 14,552 1995 16,761 17,576 13,963 11,711 5,716	47,492 7,993 16,236 12,933 3,682 14,756 11,073 30,027 7,165 10,686 25,113 10,770 6,679 15,187 1,576 15,187	47, 7, 16, 12, 3, 14, 10, 30, 7, 10, 25, 10, 6, 7, 15, 15, 15, 15, 15, 5, 3, 3, 5, 3, 5,
HEAVY RAL agency New York-WTA-NYCT Washington, D.C.:WWATA Chicago-RTA-CTA Boston-MBTA San Francisco-BAT Philadephia-SEPTA San Francisco-BATT New York-PATA Data Martine SepTA San Francisco-MATA Lower San Content Development - NATA Cleveland-GCTA Cleveland-GCTA Cleveland-GCTA San Francisco-MUNA San Francisco-MUNA San Francisco-MUNA San Francisco-MUNA San Francisco-MUNA Philadephia-SEPTA San Diago Trolley Inc. Sa Angela-LACMTA San Diago Trolley Inc.	Number of res 1,984 47,717 8,313 16,859 11,729 4,029 14,756 11,338 30,029 12,387 10,770 6,249 12,387 10,770 6,249 12,387 10,770 6,249 12,387 10,770 6,249 12,387 10,770 14,473 Number of res 1984 16,391 17,3963	1,985 47,717 7,963 16,706 4,016 14,016 14,016 11,338 30,027 7,245 12,307 10,770 6,679 7,580 14,545 16,391 17,542 13,963	1,986 47,823 16,706 12,109 4,016 14,766 11,338 30,027 7,245 12,387 10,770 6,679 7,580 14,525 14,525	1.997 47.823 7.625 16.706 12.933 3.955 14.756 11.338 30.027 7.245 9.982 10.770 6.679 7.580 14.389 10.770 6.679 7.580 14.389	47,658 7,625 16,706 12,333 3,732 14,756 11,338 30,027 7,245 9,982 10,770 6,679 7,580 14,357 1988 16,756 17,542 13,983 6,6590 5,286	47,550 7,625 16,706 12,333 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,341 1989 16,756 17,542 13,963 6,270 5,286	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,341 1990 16,761 17,542 13,953 6,101 5,286	47,550 8,030 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,374 1991 16,761 17,515 13,963 11,711 6,101 5,286	47,550 8,076 16,706 12,233 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,378 1992 16,761 17,315 13,363 11,711 6,101 5,286	47,550 8,076 16,706 12,233 3,662 14,756 11,338 30,027 7,165 9,982 16,330 10,770 6,679 7,580 14,525 1993 16,761 17,515 13,363 11,711 6,101 5,286	47,550 7,993 16,470 12,933 3,682 14,756 11,338 30,027 7,165 4,330 10,770 6,679 7,580 14,500 14,500 14,500	47,550 7,993 16,438 12,933 3,682 14,756 11,338 30,027 7,165 10,686 16,330 10,770 6,679 7,580 14,552 1995 16,761 17,576 13,963 11,711 5,786	47,492 7,993 16,235 12,933 3,682 14,756 11,073 30,027 7,165 10,686 25,113 10,770 6,679 7,580 15,187	47, 7, 16, 12, 3, 14, 10, 25, 10, 6, 7, 15, 16, 17, 13, 9, 5, 3, 5, 4,
HEAVY RAIL agency New York-MTA-NYCT Nesshington, D.CWMATA Wards-MARTA Wards-MARTA Wards-MARTA Wards-MARTA Selford-NETA Selford-NETA Selford-NETA Selford-NETA Selford-NETA Selford-NETA Selford-NETA Selford-NETA Selford-NETA Selford-NETA Second Selford-NETA Second Second Selford-NETA Second Second Selford-NETA Second	Number of res 1,964 47,717 8,313 16,859 11,729 4,029 14,756 11,338 30,027 6,249 12,387 10,770 6,579 7,580 14,473 Number of res 1984 16,391 17,563 5,480	1,985 47,717 7,963 12,109 4,016 14,756 14,756 30,027 7,245 12,377 7,245 12,377 10,770 6,679 7,580 14,545 16,381 17,542 13,363 5,361	1,966 47,823 7,625 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,377 12,377 10,770 6,679 7,580 14,525 16,756 17,542 13,363 6,690	1.987 47.823 7.625 16.706 12.933 3.955 14.756 11.338 30.027 7.245 9.90 10.770 6.679 7.580 14.389 10.770 6.679 7.580 14.389	47,668 7,652 16,706 12,933 3,732 14,756 11,338 30,027 7,245 9,982 10,770 6,679 7,580 14,357 14,357 1988 16,756 17,542 13,963 6,690 5,286 4,481	47,550 7,6550 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,341 1989 16,756 17,542 13,963 6,270 5,286 4,481	47,550 7,625 16,706 12,333 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,341 1,990 16,761 17,542 13,963 6,101 5,286 4,481	47,550 8,030 16,706 12,333 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,374 1991 16,761 17,515 13,963 11,711 6,101 5,286 4,481	47,550 8,076 16,706 12,2333 3,732 14,756 11,338 30,027 7,165 9,992 10,770 6,679 7,580 14,378 10,770 14,378 11,338 11,751 5,286 4,481	47,550 8076 16,706 12,333 3,682 14,756 11,338 30,027 7,165 9,982 16,330 10,770 6,679 14,525 10,770 14,525 1993 16,761 17,515 13,963 11,711 6,101 5,286 4,481	47,550 7,953 16,470 12,333 3,682 14,756 11,338 30,027 7,165 9,982 16,330 10,770 6,679 14,500 14,500 14,500 14,500 14,500 1994 16,761 17,515 13,963 11,711 5,797 3,047 5,794 4,481	47,550 7,993 16,438 12,333 3,692 14,756 11,338 30,027 7,165 10,686 16,330 10,770 6,679 14,552 1995 16,751 17,576 13,963 11,711 5,736 3,047 5,736 4,481	47,492 7,993 16,236 12,933 3,682 14,756 11,073 30,027 7,165 10,686 25,113 10,770 6,679 15,187 15,187 1996 16,751 17,576 13,963 9,959 5,517 3,047 5,569 3,566 4,461	47, 7, 166, 122, 3, 14, 100, 30, 7, 10, 255, 10, 6, 7, 7, 15, 16, 17, 13, 9, 9, 5, 3, 5, 4, 4,
HEAVY RAL agency Jew York-MTA-NYCT Vashington, D.CWWATA Chicago-RTA-CTA Boston-MBTA Jiante-MARTA Distor-MBTA San Francisco-BART Ward-MDTA Batmore-MMTA San Francisco-BART New York-PATA LiGHT RAL Boston-MBTA Sen Francisco-MUNA Sen Francisco-MUNA Sen Francisco-MUNA Sen Francisco-MUNA San Francisco-MUNA San Francisco-MUNA San Ser Alago Trolley Inc. Sa Angelea-LACMTA Sectomeric-RTD Poliadephia-SEPTA Sactamento-RTD Poliadephia-SEPTA Sactamento-RTD Poliadephia-SEPTA Sactamento-RTD Sactamento-RTD Pathsburgh-PAT	Number of res 1,984 47,717 8,313 16,859 11,729 4,029 14,756 11,338 30,029 12,387 10,770 6,249 12,387 10,770 6,249 12,387 10,770 6,249 12,387 10,770 6,249 12,387 10,770 14,473 Number of res 1984 16,391 17,3963	1,985 47,717 7,963 16,706 4,016 14,016 14,016 11,338 30,027 7,245 12,307 10,770 6,679 7,580 14,545 16,391 17,542 13,963	1,986 47,823 7,625 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,337 10,770 6,679 7,580 14,525 10,770 14,525 14,525 16,756 16,756 16,756 16,756 17,542 13,963 6,690	1.997 47.823 7.625 16.706 12.933 3.955 14.756 11.338 30.027 7.245 9.982 10.770 6.679 7.580 14.389 10.770 6.679 7.580 14.389 10.770 6.679 7.580 14.389 10.770 6.679 7.580 14.389 15.754 15.754 15.754 13.963 6.690 5.286	47,658 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,245 9,982 10,770 6,679 7,580 14,357 1988 16,756 17,542 13,363 6,690 5,286 4,481 5,328	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,341 1989 16,756 17,542 13,363 6,270 5,286 4,481 5,328	47,550 7,625 16,706 12,933 3,732 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,341 1990 16,761 17,542 13,363 6,101 5,228	47,550 8,030 16,706 12,933 3,732 11,338 11,338 30,027 7,165 9,992 10,770 6,679 7,580 14,374 1991 16,761 17,515 13,963 11,711 6,101 5,2286 4,461 5,328	47,550 8,076 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,378 1992 16,761 17,515 13,363 11,711 6,101 5,286 4,481	47,550 8,076 16,706 12,233 3,662 14,756 11,338 30,027 7,165 9,982 16,330 10,770 6,679 7,580 14,525 1993 16,761 17,515 13,363 11,711 6,101 5,286 4,481	47,550 7,993 16,470 12,933 3,882 14,756 11,338 30,027 7,165 16,330 10,770 6,679 7,580 14,500 14,500 14,500 14,500 1994 16,761 17,515 13,963 11,711 5,375	47,550 7,993 16,438 12,933 3,682 14,756 11,338 30,027 7,165 10,686 16,330 10,770 6,679 7,580 14,552 1995 16,761 17,576 13,963 11,711 5,736 3,047 5,286	47,492 7,993 16,236 12,933 3,682 14,756 11,073 30,027 7,165 10,686 25,113 10,770 6,679 7,580 15,187 1996 16,761 17,576 13,963 9,959 5,517 3,047 5,266 4,481 5,375	47. 7, 166. 12, 3, 14, 100. 7, 100. 250. 100. 6, 7, 15, 15, 16. 17, 13 9, 5, 3, 5, 4, 4, 4, 5,
HEAVY RAL agency New York MTA-NYCT Nessington, D.CWMATA Philadephia-SEPTA Solton-MBTA Solton-MBTA Saltimor-MMTA Salt	Number of res 1,964 47,717 8,313 16,859 11,729 4,029 14,756 11,338 30,027 6,249 12,387 10,770 6,579 7,580 14,473 Number of res 1984 16,391 17,758 5,480	1,985 47,717 7,963 12,109 4,016 14,756 14,756 30,027 7,245 12,377 7,245 12,377 10,770 6,679 7,580 14,545 16,381 17,542 13,363 5,361	1,966 47,823 7,625 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,377 12,377 10,770 6,679 7,580 14,525 16,756 17,542 13,363 6,690	1.987 47.823 7.625 16.706 12.933 3.955 14.756 11.338 30.027 7.245 9.90 10.770 6.679 7.580 14.389 10.770 6.679 7.580 14.389	47,668 7,652 16,706 12,933 3,732 14,756 11,338 30,027 7,245 9,982 10,770 6,679 7,580 14,357 14,357 1988 16,756 17,542 13,963 6,690 5,286 4,481	47,550 7,6550 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,341 1989 16,756 17,542 13,963 6,270 5,286 4,481	47,550 7,625 16,706 12,333 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,341 1,990 16,761 17,542 13,963 6,101 5,286 4,481	47,550 8,030 16,706 12,333 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,374 1991 16,761 17,515 13,963 11,711 6,101 5,286 4,481	47,550 8,076 16,706 12,333 3,732 14,756 11,338 30,027 7,165 9,992 10,770 6,679 7,580 14,378 11,378 14,378 1992 16,761 17,515 13,963 11,771 6,101 5,286 4,481 4,993	47,550 8076 16,706 12,333 3,682 14,756 11,338 30,027 7,165 9,982 16,330 10,770 6,679 14,525 10,770 14,525 1993 16,761 17,515 13,963 11,711 6,101 5,286 4,481	47,550 7,953 16,470 12,933 3,662 14,756 11,338 30,027 7,165 9,962 16,330 10,770 6,679 14,500 14,500 14,500 14,500 14,500 1994 16,761 17,515 13,963 11,771 3,067 17,515 3,963 11,771 5,286 4,481 5,375 6,933	47,550 7,993 16,438 12,333 3,692 14,756 11,338 30,027 7,165 10,686 16,330 10,770 6,679 14,552 1995 16,751 17,576 13,963 11,711 5,736 3,047 5,736 4,481	47,492 7,993 16,236 12,933 3,682 14,756 11,073 30,027 7,165 10,686 25,113 10,770 6,679 7,580 15,187 1996 16,761 17,576 13,963 9,969 9,969 3,564 3,565 3,5753,575 3,5755 3,5755 3,5755 3,57555 3,57555 3,575555555555	47, 7, 16, 12, 3, 14, 10, 0, 7, 10, 6, 7, 15, 16, 17, 13, 9, 5, 3, 5, 4, 4, 5, 6,
HEAVY RAL agoncy New York-MTA-NYCT Neshington, D.CWMATA Chicago-RTA-CTA Boston-MBTA Sain-Francisco-BRAT New York-PATHCA Warmi-MOTA Baitmore-MMTA Sain-Francisco-BART New York-PATHCA Warmi-MOTA Baitmore-MMTA Sain-Francisco-MATA Sain-Francisco-MATA Sain-Francisco-MATA Sain-Francisco-MAN Philadelphia-SEPTA Los Angelest-ACMTA Sain-Baitory Inc. Si. Loub-BSDA Portland-TCM TDO Delas-DARTA Buffaito-RTD Buffaito-RTD Buffaito-RTD Buffaito-RTS Buffaito-RTS	Number of res 1,964 47,717 8,313 16,859 11,729 4,029 14,756 11,338 30,027 6,249 12,387 10,770 6,579 7,580 14,473 Number of res 1984 16,391 17,758 5,480	1,985 47,717 7,963 12,109 4,016 14,756 14,756 30,027 7,245 12,377 7,245 12,377 10,770 6,679 7,580 14,545 16,381 17,542 13,363 5,361	1,986 47,823 7,625 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,337 10,770 6,679 7,580 14,525 10,770 14,525 14,525 16,756 16,756 16,756 16,756 17,542 13,963 6,690	1.997 47.823 7.625 16.706 12.933 3.955 14.756 11.338 30.027 7.245 9.982 10.770 6.679 7.580 14.389 10.770 6.679 7.580 14.389 10.770 6.679 7.580 14.389 10.770 6.679 7.580 14.389 15.754 15.754 15.754 13.963 6.690 5.286	47,658 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,245 9,982 10,770 6,679 7,580 14,357 1988 16,756 17,542 13,363 6,690 5,286 4,481 5,328	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,341 1989 16,756 17,542 13,363 6,270 5,286 4,481 5,328	47,550 7,625 16,706 12,933 3,732 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,341 1990 16,761 17,542 13,363 6,101 5,228	47,550 8,030 16,706 12,933 3,732 11,338 11,338 30,027 7,165 9,992 10,770 6,679 7,580 14,374 1991 16,761 17,515 13,963 11,711 6,101 5,2286 4,461 5,328	47,550 8,076 16,706 12,933 3,732 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,378 1992 16,761 17,515 13,363 11,711 6,101 5,286 4,481	47,550 8,076 16,706 12,333 3,682 14,756 11,338 30,027 7,165 9,982 16,330 10,770 6,679 14,525 14,525 14,525 1993 16,761 17,515 13,963 11,771 6,101 5,286 4,481 4,993	47,550 7,993 16,470 12,933 3,882 14,756 11,338 30,027 7,165 16,330 10,770 6,679 7,580 14,500 14,500 14,500 14,500 1994 16,761 17,515 13,963 11,711 5,375	47,550 7,993 16,438 12,333 3,682 14,756 11,338 30,027 7,165 10,686 16,330 10,770 6,679 14,552 14,552 1995 16,761 17,576 13,963 11,711 5,736 3,045 11,715 5,286 4,481 5,375 6,333	47,492 7,993 16,236 12,933 3,682 14,756 11,073 30,027 7,165 10,686 25,113 10,770 6,679 7,580 15,187 1996 16,761 17,576 13,963 9,959 5,517 3,047 5,266 4,481 5,375	47,4 7,9 116,5,1 10,0 30,0 25,5 10,0 25,5 10,0 25,5 10,0 10,0 25,5 10,0 10,0 25,5 10,0 10,0 25,5 10,0 10,0 25,5 10,0 10,0 25,5
HEAVY RAIL agency New York-MTA-NYCT Washington, D.CWMATA Cheage-RTA-CTA Soston-MBTA Nianta-MARTA Philadaphia-SEPTA Sam Francizco-BART New York-PATHC Mami-MDTA Baltimore-MMTA Sam Singer Additional Cleveland-GCRTA New York-MTA-SIRTOA AVERAGE LIGHT RAIL agency Boston-MBTA Sam Francisco-MUNN Philadaphia-SEPTA Los Angelez-LACMTA Sam Diago Troley Inc. Sar Data-CMTA Sam Diago Troley Inc. Sacrametric RTD Datas-DARTA Baltimore-MUTA Sam Jose SCTD	Number of res 1,964 47,717 8,313 16,859 11,729 4,029 14,756 11,338 30,027 6,249 12,387 10,770 6,579 7,580 14,473 Number of res 1984 16,391 17,758 5,480	1,985 47,717 7,963 12,109 4,016 14,756 14,756 30,027 7,245 12,377 7,245 12,377 10,770 6,679 7,580 14,545 16,381 17,542 13,363 5,361	1,986 47,823 7,625 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,337 10,770 6,679 7,580 14,525 10,770 14,525 14,525 16,756 16,756 16,756 16,756 17,542 13,963 6,690	1.997 47.823 7.625 16.706 12.933 3.955 14.756 11.338 30.027 7.245 9.982 10.770 6.679 7.580 14.389 10.770 6.679 7.580 14.389 10.770 6.679 7.580 14.389 10.770 6.679 7.580 14.389 15.754 15.754 15.754 13.963 6.690 5.286	47,668 7,656 16,706 12,933 3,732 14,756 11,338 30,027 7,245 9,982 10,770 6,679 7,245 9,982 10,770 6,679 7,245 11,357 14,357 14,357 1988 16,756 17,542 13,956 16,756 17,542 13,956 5,286 4,481 5,228 6,933	47,550 7,625 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,560 14,341 1989 16,756 17,542 13,955 6,270 5,286 4,481 5,328 6,933	47,550 7,625 16,706 12,933 3,732 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,341 1990 16,761 17,542 13,963 6,101 5,286 4,481 5,228 6,933	47,550 8,030 16,706 12,933 3,732 11,338 30,027 7,165 9,992 10,770 6,679 7,580 14,374 1991 16,761 17,515 13,963 11,711 6,101 5,286 4,481 5,228 6,933	47,550 8,076 16,706 12,333 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,569 14,37814,378 14,378 14,378 14,3786	47,550 8,076 16,706 12,393 3,582 14,756 11,338 30,027 7,165 9,982 16,330 10,770 6,679 7,550 14,525 1	47,550 7,993 16,470 12,933 3,682 14,756 11,338 30,027 7,165 16,330 10,770 6,679 7,580 14,500 14,500 14,500 14,500 14,500 14,500 14,500 14,515 13,952 14,515 13,717 1,711 5,286 4,481 5,375 6,333 5,106	47,550 7,993 16,438 12,933 3,682 14,756 11,338 30,027 7,165 16,360 14,570 14,552 1995 16,761 17,576 13,963 11,711 5,756 13,945 11,711 5,375 6,333 5,106	47,492 7,993 16,236 12,933 3,682 14,756 11,073 30,027 7,165 10,586 25,113 10,570 6,679 15,187 19956 16,761 17,576 13,963 9,959 5,517 3,047 5,266 4,461 5,375 6,933 5,106	47,4 7,9 116,5 12,1 3,3,3 10,1 10,1 10,1 10,1 10,1 10,1 1
HEAVY RAL agency New York-MTA-NYCT Washington, D.CWWATA Chicago-RTA-CTA Boston-MBTA Allanis-MARTA San Francisco-BART New York-PATHCA Mianishe-NJ-PATC Clowland-GCRTA New York-PATC Deviation-GCRTA San Francisco-MUTA San Francisco-MUTA San Francisco-MUTA San Francisco-MUTA San Francisco-MUTA San Francisco-MUTA San Francisco-MUTA San Children San John San John San Children San John San John San John Deviation-Company San John Tonga International San John San Children San John S	Number of res 1,984 47,717 8,313 16,859 11,729 4,029 11,729 4,029 11,729 4,0756 11,338 30,027 5,249 12,367 10,770 6,679 7,560 14,473 Number of res 1984 16,331 17,540 5,480 5,328	1,985 47,717 7,963 16,706 14,756 14,756 14,756 14,756 14,756 14,756 14,756 14,756 14,756 14,756 10,770 6,679 7,245 10,770 6,679 7,580 14,545 10,770 6,679 7,580 14,545 10,363 17,545 13,963 5,361 5,328	1,966 47,823 7,625 16,706 12,109 4,016 14,756 11,336 30,027 7,245 12,37 10,770 6,679 7,580 14,525 10,770 6,679 14,525 14,525 1996 16,756 17,546 17,546 13,963 6,690	1,997 47,823 7,625 16,706 14,756 14,756 14,755 14,755 14,755 10,770 6,679 7,245 9,907 10,770 6,679 7,580 14,389 14,48914,489 14,489 14,489 14,48914,489 14,489 14,48914,489 14,489 14,48914,489 14,489 14,48914,489 14,48914,489 14,489 14,48914,489 14,489 14,48914,599 14,599 14,59914,599 14,59914,599 14,59914,599 14	47,668 7,655 16,706 12,933 3,732 14,756 11,338 30,027 7,245 9,982 10,770 6,679 14,357 14,357 14,357 14,357 1988 16,756 17,542 13,963 6,690 5,286 4,481 5,328 6,690	47,550 7,550 16,706 12,933 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,341 1989 16,756 17,542 13,963 6,270 5,286 4,481 5,328 6,393 5,496	47,550 7,625 16,706 12,2333 3,732 14,756 11,338 30,027 7,165 9,992 10,770 6,679 14,341 1990 16,761 17,542 13,963 6,101 5,286 4,481 5,228 6,533 6,496	47,550 8,030 16,706 12,333 3,732 14,756 11,338 30,027 7,165 9,992 10,770 6,679 14,374 1991 16,761 17,515 13,963 11,771 5,286 4,481 5,228 6,933 4,343	47,550 8,076 16,706 12,333 3,732 14,756 11,338 30,027 7,165 9,992 10,770 6,679 14,378 14,378 14,378 14,378 14,378 1992 16,761 17,515 13,963 11,771 17,515 13,963 11,771 17,515 13,963 11,771 17,515 13,963 11,771 17,515 13,963 11,771 17,515 13,963 11,771 17,515 13,963 11,771 17,515 13,963 11,771 17,515 13,963 11,775 11	47,550 8,076 16,706 12,333 3,692 14,756 11,338 30,027 7,165 9,982 16,330 10,770 6,679 14,525 13,982 14,525 14,525 1993 16,761 17,515 13,963 11,771 17,515 13,963 11,771 5,286 4,481 4,999 6,333 5,006 4,343	47,550 7,953 16,470 12,933 3,662 14,756 11,336 11,336 30,027 7,165 9,962 16,330 10,770 6,679 14,5000	47,550 7,993 16,438 12,333 3,862 14,756 11,338 30,027 7,165 10,686 16,330 10,770 6,679 14,552 1995 16,761 17,576 13,963 14,751 17,757 13,963 14,751 17,736 3,047 7,586 4,841 6,333 5,106 4,343 7,793	47,492 7,993 16,236 12,933 3,682 14,756 11,073 30,027 7,165 10,686 25,113 10,770 6,679 15,187 15,187 1996 16,761 17,576 13,963 9,959 9,959 5,517 3,047 5,296 3,662 3,662 4,343	47.4 7.5.5 12.9.1 12.9.3 14.7.1 10.0.2 5.7.7 10.0.2 5.5.1 15.1 11 165.5 15.1 15.1 15.1 15.1
HEAVY RAL agoncy New York-MTA-NYCT Washington, D.CWWATA Chicago-RTA-CTA Boston-MBTA Aliania-MARTA Sain Francisco-BATT Namy York-PATHCA Miani-MATA Sain Francisco-BATT New York-PATHCA Saintore-MMTA Saintore-MATA Saintore-MATA Saintore-MATA Saintore-MATA Sainto-RTD Sainto-RTD Sainto-RTD Sainto-RTD Dates-DARTA Sainto-RTD Dates-CATA Sainto-RTD Dates-CATA Sainto-RTD Dates-CATA Sainto-RTD Dates-CATA Sainto-RTD Dates-CATA Sainto-RTD Dates-CATA Sainto-RTD Dates-CATA Sainto-RTD Dates-CATA Sainto-RTD Dates-CATA Sainto-RTD Dates-CATA Sainto-RTD Dates-CATA Sainto-RTD Dates-CATAA Dates-CATAA Dates-CATAA DATAA DATAA DATAA	Number of res 1,984 47,717 4,029 11,729 4,029 11,729 5,249 12,367 10,770 5,679 7,560 14,473 Number of res 1984 16,391 17,542 13,963 5,480 5,328 8,725 5,453	1,985 47,717 7,963 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,367 14,545 10,770 6,679 7,580 14,545 14,545 14,545 16,391 17,542 13,363 5,361 5,328 8,725 5,453	1,966 47,823 7,625 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,367 10,770 6,679 7,580 14,525 14,525 14,525 14,525 14,525 16,756 17,542 13,963 6,690 5,328 6,691 8,725 5,453	1.997 47.823 7.625 16.706 12.933 3.955 14.756 11.338 30.027 7.245 9.982 10,770 6.679 7.580 14.389 14.389 14.389 14.389 14.389 14.389 15.756 17.542 13.956 17.542 13.956 5.286 6.6333 8.725 5.453	47,668 7,652 16,706 12,933 3,732 14,756 11,338 30,027 7,245 9,982 10,770 6,679 7,245 11,338 11,338 11,357 11,357 11,357 1988 16,756 17,542 13,963 13,963 5,266 4,461 5,328 6,933 6,933 6,953	47,550 7,625 16,706 12,333 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,341 19989 16,756 17,542 13,963 6,270 5,286 4,481 5,328 6,933 6,933 6,990 5,453	47,550 7,625 16,706 12,333 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,560 14,341 10,770 16,761 17,545 13,363 6,101 5,226 4,461 5,328 6,933 6,933 6,933 6,935	47,550 8,030 16,706 12,333 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,374 10,771 16,761 17,515 13,563 13,274 1,271 6,528 6,933 1,711 6,328 6,933 4,343 7,790 5,453	47,550 8,076 16,706 17,2333 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,677 7,560 14,378 10,770 6,679 14,378 11,711 6,101 5,226 4,481 4,999 6,933 11,711 6,101 5,226	47,550 8076 16,706 17,2333 3,682 14,756 11,338 30,027 7,165 9,982 16,330 10,770 6,679 7,580 14,525 1993 16,761 17,515 13,965 13,965 13,965 13,710 6,106 4,441 4,999 6,333 5,106 4,443 7,790 5,453	47,550 7,953 16,470 12,933 3,682 14,756 11,338 30,027 7,165 9,962 16,330 10,770 6,679 7,560 14,500 14,500 14,500 14,500 14,500 14,500 1994 16,761 17,515 13,963 11,711 5,265 13,265 11,715 5,265 4,4451 5,375 6,933 5,106 4,4451 5,375 6,933 5,106 4,4451 5,375 6,933 5,106 4,4451 5,375 6,933 5,106 6,433 7,790 5,453	47,550 7,993 16,438 12,933 3,682 14,756 11,338 30,027 7,165 10,686 16,330 10,770 6,679 17,550 14,552 1995 16,761 17,576 13,963 15,771 15,276 3,047 5,265 3,047 5,265 3,5106 4,4481 5,375 6,933 5,106 4,4481 5,375 6,933 5,106 4,543 4,543	47,492 7,993 16,236 12,933 3,682 14,756 11,073 30,027 7,165 10,686 25,113 10,770 6,679 15,187 10,686 15,187 10,576 15,187 13,965 13,965 13,956 3,5666 4,541 5,375 5,5106 4,343 5,106 4,5453	47.4 7.5.2 16.5.1 12.9.3 14.7.1 10.0.5 25.5.7 10.0.5 25.5.1 15.0 11.1 15.5 15.0 11.1 15.5 15.0 11.1 15.5 15.0 11.1 15.5 15.0 15.0
HEAVY RAIL agency New York-MTA-NYCT Washington, D.CWMATA Cheago-RTA-CTA Sonor-META San Francisco-BRAT New York-PATHC Database Bailmore-MMTA Bailmore-MMTA Bailmore-MMTA Bailmore-MMTA San Francisco-MUNA Philadelphia-NJ-PATC Cleveland-GCRTA New York-MTA-SIRTOA AVERAGE	Number of res 1,984 47,717 8,029 11,729 4,029 11,338 10,679 7,560 14,475 10,770 6,679 7,560 14,473 Number of res 1884 16,391 17,542 13,963 5,480 5,328 8,725	1,985 47,717 7,963 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,367 14,545 10,770 6,679 7,580 14,545 14,545 14,545 14,545 16,391 17,542 13,363 5,361 5,328 8,725	1,966 47,823 7,625 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,367 10,770 6,679 7,580 14,525 14,525 14,525 14,525 16,756 16,756 16,756 16,756 16,756 16,756 16,756 16,756 16,556 16,556 16,569 16,569 16,569 16,569 16,569 16,569 16,569 16,569 16,569 16,569 16,569 16,569 16,569 16,569 16,565 16,566 16,566 16,565 16,566 16,565 16,565 16,565 16,576 16,576 17,555 16,576 17,575 16,576 17,575 16,576 17,575 16,576 17,575 14,575 14,575 14,575 14,575 14,575 16,576 16,575 16,576 16,575 1	1.997 47.823 7.625 16.706 12.933 3.955 14.756 11.338 30.027 7.245 9.982 10,770 6.679 7.580 14.389 14.389 14.389 14.389 14.389 14.389 15.756 2.866 4.461 5.328 6.333 8.725	47,668 7,656 16,706 12,933 3,732 14,756 11,338 30,027 7,245 9,982 10,770 6,679 7,245 10,770 6,679 7,245 11,358 14,357 14,357 1988 16,756 17,542 13,963 5,286 4,481 5,328 6,933 6,495	47,550 7,625 16,706 12,333 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,766 14,341 19989 16,756 17,542 13,963 6,270 5,286 4,481 5,328 6,333 6,333 6,490	47,550 7,625 16,706 12,333 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,341 19900 16,761 17,542 13,953 6,101 5,286 4,461 5,328 6,333 6,495	47,550 8,030 16,706 12,333 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,374 1,37	47,550 8,076 16,706 17,2333 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,589 14,378 11,378 11,378 11,378 11,378 14,378 1992 16,761 17,315 13,515 11,711 6,101 5,286 4,481 4,999 6,333 6,181 4,343 7,790	47,550 8,076 16,706 12,333 3,682 14,756 11,338 30,027 7,165 10,770 6,679 7,165 10,770 14,525 14,525 1993 16,761 17,515 13,963 11,711 6,101 5,286 4,481 4,999 6,933 5,106 4,343 7,790	47,550 7,953 16,470 12,933 3,662 14,756 11,336 11,336 30,027 7,165 9,962 16,330 10,770 6,679 14,5000	47,550 7,993 16,438 12,333 3,862 14,756 11,338 30,027 7,165 10,686 16,330 10,770 6,679 14,552 1995 16,761 17,576 13,963 14,751 17,757 13,963 14,751 17,736 3,047 7,586 4,841 6,333 5,106 4,343 7,793	47,492 7,993 16,236 12,333 3,682 14,766 11,073 30,027 7,165 10,686 25,113 10,770 6,679 15,187 1996 16,761 17,576 13,963 9,959 5,517 3,047 3,047 3,043 3,663 3,664 17,770 17,576 17,780 17,770 17,576 17,770 13,770 17,770 13,963 13,943 14,441 14,343 17,7776 14,441 14,343 17,776 14,441 14,343 17,776 14,441 14,343 17,776 14,441 14,343 17,775 14,441 14,343 17,775 14,445 14,455 14	47.4 7.9 12.9 3.5 5.0 10.7 7.1 10.6 5.1 5.0 10.7 7.5 15.0 10.7 7.5 15.0 11.0 7.5 15.0 11.0 7.5 15.0 11.0 7.5 15.0 11.0 7.5 5.5 5.3 0.0 5.3 5.5 5.3 5.3 5.5 5.3 5.1 4.2 7.7 7.7 1.5 5.5 1.5 9.9 9.5 5.5 3.0 5.5 5.3 5.3 5.3 5.5 5.3 5.3 5.3 5.3 5.3
Population Det HEAVY RAL agency New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-MBTA San Francisco-BART New York-PATHC Miami-MDTA Battimore-MMTA Los Angeles-LACMTA Battimore-MMTA Los Angeles-LACMTA Battimore-MMTA Battimore-MMTA San Francisco-MUNN Philadelphi-BS-EPTA Los Angeles-LACMTA San Francisco-MUNN Philadelphi-BS-EPTA Los Angeles-LACMTA San Diego Toidey Inc. St. Louis-BSDA Porliand-TCMTDO Dalas-DARTA Sarameno-RTD Philoso-PMTA Sarameno-RTD Philoso-PMTA San Jose-SCTD New Orteans-RTA Cleveland-GCRTA Derver-RTD Newserk-NJTC	Number of res 1,984 47,717 4,029 11,729 4,029 11,729 5,249 12,367 10,770 5,679 7,560 14,473 Number of res 1984 16,391 17,542 13,963 5,480 5,328 8,725 5,453	1,985 47,717 7,963 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,367 10,770 6,679 7,580 10,770 6,679 7,580 14,545 14,545 14,545 16,391 17,542 13,363 5,361 5,328 8,725 5,453	1,966 47,823 7,625 16,706 12,109 4,016 14,756 11,338 30,027 7,245 12,367 10,770 6,679 7,580 14,525 14,525 14,525 14,525 14,525 16,756 17,542 13,963 6,690 5,328 6,691 8,725 5,453	1.997 47.823 7.625 16.706 12.933 3.955 14.756 11.338 30.027 7.245 9.982 10,770 6.679 7.580 14.389 14.389 14.389 14.389 14.389 15.756 17.542 13.956 17.542 13.956 5.286 6.633 8.725 5.453	47,668 7,652 16,706 12,933 3,732 14,756 11,338 30,027 7,245 9,982 10,770 6,679 7,245 11,338 11,338 11,357 11,357 11,357 1988 16,756 17,542 13,963 13,963 5,266 4,461 5,328 6,933 6,933 6,953	47,550 7,625 16,706 12,333 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,341 19989 16,756 17,542 13,963 6,270 5,286 4,481 5,328 6,933 6,933 6,990 5,453	47,550 7,625 16,706 12,333 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,560 14,341 10,770 16,761 17,545 13,363 6,101 5,226 4,461 5,328 6,933 6,933 6,933 6,935	47,550 8,030 16,706 12,333 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,374 10,771 16,761 17,515 13,563 13,274 1,271 6,528 6,933 1,711 6,328 6,933 4,343 7,790 5,453	47,550 8,076 16,706 17,2333 3,732 14,756 11,338 30,027 7,165 9,982 10,770 6,679 7,580 14,378 10,770 6,679 14,378 11,711 6,101 5,226 4,481 4,999 6,933 11,711 6,101 5,226	47,550 8076 16,706 12,333 3,682 14,756 11,338 30,027 7,165 9,982 16,330 10,770 6,679 7,580 14,525 1993 16,761 17,515 13,963 11,711 6,106 13,545 11,711 6,106 5,286 4,481 4,999 6,333 5,106 4,343 7,790 5,453	47,550 7,953 16,470 12,933 3,682 14,756 11,338 30,027 7,165 9,962 16,330 10,770 6,679 7,560 14,500 14,500 14,500 14,500 14,500 14,500 1994 16,761 17,515 13,963 11,711 5,265 13,265 11,715 5,265 4,4451 5,375 6,933 5,106 4,4451 5,375 6,933 5,106 4,4451 5,375 6,933 5,106 4,4451 5,375 6,933 5,106 6,433 7,790 5,453	47,550 7,993 16,438 12,933 3,682 14,756 11,338 30,027 7,165 10,686 16,330 10,770 6,679 17,550 14,552 1995 16,761 17,576 13,963 15,771 15,266 3,047 5,265 3,047 5,265 3,5106 4,4481 5,375 6,933 5,106 4,4481 5,375 6,933 5,106 4,543 4,543	47,492 7,993 16,236 12,933 3,682 14,756 11,073 30,027 7,165 10,686 25,113 10,770 6,679 15,187 10,686 15,187 10,576 15,187 13,965 13,965 13,956 3,5666 3,5666 3,5666 3,5666 3,516 3,515 5,375 5,315 5,3	1.9 47.4, 7.9 16.2 13.5.5 14.7, 10.5 30.0.0 7.1 10.5 7.5 15.0 11.7 17.5 15.0 5.3 0.0 5.5 14.7 15.0 15.0 15.0 15.0 15.0 15.0 15.0 15.0

Proportion of Minorities in the Population

HEAVY RAIL	Proportion of A	vincan Americ	ans and Hisp	anic America	n residing in t	the served ar	**							
agency	1,984	1,985	1,986	1,967	1,988	1,989	1,990	1.991	1.992	1,993	1.994	1.995	1,996	1.997
New York-MTA-NYCT	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59
Washington, D.CWMATA	0.44	0.43	0.42	0.42	0.42	0.42	0.42	0.47	0.48	0.48	0.48	0.48	0.48	0.48
Chicago-RTA-CTA	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.49	0.48	0.54	0.54
Boston-MBTA	0.33	0.31	0.31	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Atlanta-MARTA	0.66	0.60	0.60	0.60	0.59	0.59	0.59	0.59	0.59	0.60	0.60	0.60	0.60	0.58
Philadelphia-SEPTA	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
San Francisco-BART	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.37
New York-PATHC	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Miami-MDTA	0.69	0.85	0.85	0,85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Baltimore-MMTA	0.88	0.88	0.88	0.83	0.83	0.83	0.83	0.63	0.83	0.83	0.83	0.84	0.84	0.84
Los Angeles-LACMTA										0.72	0.72	0.72	0.65	0.65
Philadelphia-NJ-PATC	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Cleveland-GCRTA	0.46	0.46	0.46	0,46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
New York-MTA-SIRTOA	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
AVERAGE	0.46	0.47	0.47	0.46	0.46	0.46	0.46	0.47	0.47	0.49	0.48	0.48	0.48	0.48
LIGHT RAIL	Proportion of A													
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Boston-MBTA	0.18	0.18	0.16	0.16	0.16	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
San Francisco-MUN	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.30	0.30	0.30	0.30	0.23	0.23	0.23
Philadelphia-SEPTA	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0,49
Los Angeles-LACMTA								0.82	0.82	0.82	0.82	0.82	0.81	0.81
San Diego Trolley Inc.	0.60	0.60	0.70	0.70	0.70	0.60	0.59	0.59	0.59	0.59	0.58	0.58	0.56	0.56
St. Louis-BSDA											0.55	0.55	0.55	0.55
Portland-TCMTDO				80.0	0.08	0.08	80.0	0.08	0.08	80.0	80.0	0.08	80.0	0.08
Dallas-DARTA Sacramento-RTD				0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.80 0.24	0.68 0.24
Pittsburgh-PAT	0.08	0.08	0.08	0.24	0.08	0.08	0.08	0.08	0.07	0.24	0.09	0.09	0.09	0.09
Buffaio-NFTS	0.08	0.08	0.55	0.47	0.47	0.00	0.00	0.47	0.47	0.07	0.47	0.05	0.05	0.47
Baltimore-MMTA			0.00	0.47	0.47	0.47	0.47	0.47	0.37	0.38	0.38	0.38	0.38	0.38
San Jose-SCTD					0.34	0.34	0.34	0.36	0.36	0.36	0.36	0.36	0.36	0.35
New Orleans-RTA	0.45	0.45	0.45	0.45	0.45	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42
Cleveland-GCRTA	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.54
Denver-RTD	0.00	0.00	0.00	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.65	0.65	0.65	0.65
Newark-NJTC	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Hudson-Bergen LRT	5.74		2.14		2.74		4.14		0.14	4.14	2.14		0.74	0.56
AVERAGE	0.40	0.40	0.43	0.37	0.37	0.35	0.35	0.40	0.40	0.40	0.43	0.42	0.44	0.44

Proportion of the Population below Poverty

HEAVY RAIL	Proportion of p	onviation bei	ow line of no	enty in the se	erved area									
agency	1.984	1,985	1,986	1.987	1,988	1,989	1,990	1,991	1.992	1.993	1,994	1.995	1.996	1.997
New York-MTA-NYCT	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Washington, D.CWMATA	0.12	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.13	0.13	0.13	0.13	0.13	0,13
Chicago-RTA-CTA	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.23	0.22	0.25	0.25
Boston-MBTA	0.17	0.16	0,16	0,16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0,16	0,16
Atlanta-MARTA	0.31	0.28	0.28	0.28	0.27	0.27	0.27	0.27	0.27	0.26	0.26	0.26	0.26	0.25
Philadelphia-SEPTA	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
San Francisco-BART	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.16	0.18	0.18
New York-PATHC	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Miami-MDTA	0.24	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Baltimore-MMTA	0.33	0.33	0.33	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.34	0.34	0.34
Los Angeles-LACMTA										0.34	0.34	0.34	0.30	0.30
Philadelphia-NJ-PATC	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0,17	0.17	0.17	0.17	0.17
Cleveland-GCRTA	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
New York-MTA-SIRTOA	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
AVERAGE	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.22	0.22	0.22	0.22	0.22
LIGHT RAIL	Propertion of p													
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Boston-MBTA	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
San Francisco-MUNI	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.11	0.12	0.12	0.12
Philadelphia-SEPTA	0.19	0,19	0.19	0,19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
Los Angeles-LACMTA								0.33	0.33	0.33	0.33	0.33	0.30	0.30
San Diego Trolley Inc.	0.22	0.22	0.28	0.28	0.28	0.24	0.24	0.24	0.24	0.24	0.23	0.23	0.23	0.23
SI. Louis-BSDA Portland-TCMTDO				0.17	0.17	0.17	0.17	0.17	0.17	0,17	0.23 0.17	0.23	0.23	0.23
Dallas-DARTA				0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17 0.24	0.17 0.22
Sacramanio-RTD				0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.24	0.22
Pittsburgh-PAT	0.10	0.10	0,10	0,10	0.10	0.10	0.10	0.10	0.09	0.09	0.11	0.11	0.11	0.11
Buffaio-NFTS	0.10	0.10	0.27	0.25	0.25	0.25	0.25	0.25	0.25	0.05	0.25	0.25	0.25	0.25
Ballimore-MMTA			0.21		••	0.20	0.20	0.20	0.22	0.21	0.21	0.21	0.21	0.21
San Jose-SCTD					0.12	0.12	0.12	0.11	0.11	0.11	0.11	0.11	0.11	0.11
New Orleans-RTA	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Cleveland-GCRTA	0.18	0.18	0.18	0.18	0.18	0.18	0,18	0.18	0,18	0.18	0.18	0.18	0.18	0.19
Denver-RTD											0.44	0.44	0.44	0,44
Newark-NJTC	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Hudson-Bergen LRT														0,16
AVERAGE	0.18	0.18	0.20	0.19	0.19	0.18	0.18	0.19	0.19	0.19	0.21	0.21	0.21	0.21

Average Per Capita Income

HEAVY RAIL	Annual dollars													
agency	1,984	1,985	1,986	1,987	1,988	1,989	1,990	1,991	1,992	1,993	1,994	1,995	1,996	1,997
New York-MTA-NYCT	16,518	16,518	16,528	16,528	16,507	16,500	16,500	16,500	16,500	16,500	16,500	16,500	16,512	16.512
Washington, D.CWMATA	24,407	24,218	24,292	24,292	24,292	24,292	24,292	22,864	22,749	22,749	22,367	22,367	22.367	22,365
Chicago-RTA-CTA	14,481	14,481	14,481	14,481	14,481	14,481	14,481	14,481	14,481	14,481	15,686	15,794	14,673	14.673
Boston-MBTA	16,770	16,976	16,976	17,615	17,615	17,615	17,615	17,615	17,615	17,615	17,615	17,615	17.615	17.615
Atlanta-MARTA	11,824	13,838	13,838	13,627	13,473	13,473	13,473	13,473	13,473	13,290	13,290	13,290	13,290	14.061
Philadelphia-SEPTA	11,922	11,922	11,922	11,922	11,922	11,922	11,922	11,922	11.922	11,922	11,922	11,922	11,922	11,922
San Francisco-BART	13,590	13,590	13,590	13,590	13,590	13,590	13,590	13,590	13,590	13,590	13,590	13,590	13.627	13,706
New York-PATHC	32,639	32,639	32,639	32,639	32,639	32,639	32.639	32.639	32.639	32,639	32,639	32,639	32.639	32.639
Miami-MDTA	12,694	9,309	9,309	9,309	9,309	9,279	9,279	9,279	9,279	9.279	9,279	9,279	9,279	9.279
Baltimore-MMTA	10,206	10,206	10.206	10,869	10,869	10,869	10,869	10,869	10,869	10,869	10.869	10.279	10.279	10.279
Los Angeles-LACMTA										9,636	9,636	9,636	9,304	9,304
Philadelphia-NJ-PATC	22.077	22.077	22.077	22.077	22.077	22.077	22.077	22.077	22.077	22.077	22.077	22.077	22.077	22.077
Cleveland-GCRTA	8.932	8,932	8,932	8,932	8,932	8,932	8,932	8,932	8,932	8,932	8,932	8,932	8,932	8,932
New York-MTA-SIRTOA	17.515	17.515	17.515	17.515	17.515	17.515	17.515	17,515	17,515	17.515	17.515	17.515	17.515	17.515
AVERAGE	16.429	16,325	16.331	16,415	16,402	16.399	16,399	16,289	16,280	15,792	15.851	15.817	17,515	17,515
LIGHT RAIL	Annual dollars	per resident	of served are											
LIGHT RAIL agency	Annual dollars 1984	per resident 1985	of served are 1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
					1988 20.742	1989 20.742						1995 20 617	1996 20 617	
agency	1984	1965	1986	1987 20,742	20,742	20,742	20,617	20,617	20,617	20,617	20,617	20,617	20,617	20,617
agency Boston-MBTA	1984 20,366 19,302	1985 20,366 19,302	1986 20,742 19,302	1987 20,742 19,302	20,742 19,302	20,742 19,302	20,617 19,302	20,617 19,124	20,617 19,124	20,617 19,124	20,617 19,124	20,617 18,982	20,617 18,982	20,617 18,982
agency Boston-MBTA San Francisco-MUNI Philadelphia-SEPTA	1984 20,366	1985 20,366	1986 20,742	1987 20,742	20,742	20,742	20,617	20,617 19,124 12,292	20,617 19,124 12,292	20,617 19,124 12,292	20,617 19,124 12,292	20,617 18,982 12,292	20,617 18,982 12,292	20,617 18,982 12,292
agency Boslon-MBTA San Francisco-MUNI Philadelphia-SEPTA Los Angeles-LACMTA	1984 20,366 19,302 12,292	1985 20,366 19,302 12,292	1986 20,742 19,302 12,292	1987 20,742 19,302 12,292	20,742 19,302 12,292	20,742 19,302 12,292	20,617 19,302 12,292	20,617 19,124 12,292 7,581	20,617 19,124 12,292 7,581	20,617 19,124 12,292 7,581	20,617 19,124 12,292 7,581	20,617 18,982 12,292 7,581	20,617 18,982 12,292 8,301	20,617 18,982 12,292 8,301
sgency Boston-MBTA San Francisco-MUNI Philadelphia-SEPTA Los Angeles-LACMTA San Diego Trolley inc.	1984 20,366 19,302	1985 20,366 19,302	1986 20,742 19,302	1987 20,742 19,302	20,742 19,302	20,742 19,302	20,617 19,302	20,617 19,124 12,292	20,617 19,124 12,292	20,617 19,124 12,292	20,617 19,124 12,292 7,581 10,374	20,617 18,982 12,292 7,581 10,367	20,617 18,982 12,292 8,301 12,141	20,617 18,982 12,292 8,301 12,141
agency Boston-MBTA San Francisco-MUNI Philadeiphia-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA	1984 20,366 19,302 12,292	1985 20,366 19,302 12,292	1986 20,742 19,302 12,292	1987 20,742 19,302 12,292 8,532	20,742 19,302 12,292 8,532	20,742 19,302 12,292 9,891	20,617 19,302 12,292 10,187	20,617 19,124 12,292 7,581 10,187	20,617 19,124 12,292 7,581 10,187	20,617 19,124 12,292 7,581 10,187	20,617 19,124 12,292 7,581 10,374 14,679	20,617 18,982 12,292 7,581 10,367 14,679	20,617 18,982 12,292 8,301 12,141 14,679	20,617 18,982 12,292 8,301 12,141 14,679
agency Boston-MBTA San Francisco-MUNI Philadelphia-SEPTA Los Angeles-LACMTA San Diego Trolley inc. SI. Louis-BSDA Portland-TCMTDO	1984 20,366 19,302 12,292	1985 20,366 19,302 12,292	1986 20,742 19,302 12,292	1987 20,742 19,302 12,292	20,742 19,302 12,292	20,742 19,302 12,292	20,617 19,302 12,292	20,617 19,124 12,292 7,581	20,617 19,124 12,292 7,581	20,617 19,124 12,292 7,581	20,617 19,124 12,292 7,581 10,374	20,617 18,982 12,292 7,581 10,367	20,617 18,982 12,292 8,301 12,141 14,679 13,420	20,617 18,982 12,292 8,301 12,141 14,679 13,475
agency Boston-MBTA San Francisco-MUNI Philadelphia-SEPTA Los Angeles-LACMTA San Diego Trolley inc. St. Louis-BSDA Portland-TCMTDO Dallas-DARTA	1984 20,366 19,302 12,292	1985 20,366 19,302 12,292	1986 20,742 19,302 12,292	1987 20.742 19.302 12.292 8,532 13.420	20,742 19,302 12,292 8,532 13,420	20,742 19,302 12,292 9,891 13,420	20,617 19,302 12,292 10,187 13,420	20,617 19,124 12,292 7,581 10,187 13,420	20,617 19,124 12,292 7,581 10,187 13,420	20,617 19,124 12,292 7,581 10,187 13,420	20,617 19,124 12,292 7,581 10,374 14,679 13,420	20,617 18,982 12,292 7,581 10,367 14,679 13,420	20,617 18,982 12,292 8,301 12,141 14,679 13,420 7,944	20,617 18,982 12,292 8,301 12,141 14,679 13,475 11,589
agency Boston-MBTA San Franctsco-MUNI Philadelphia-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA Portland-TCMTDO Delles-DARTA Sacramento-RTD	1984 20,366 19,302 12,292 10,144	1985 20,366 19,302 12,292 10,134	1986 20,742 19,302 12,292 8,532	1987 20,742 19,302 12,292 8,532 13,420 13,392	20,742 19,302 12,292 8,532 13,420 13,392	20,742 19,302 12,292 9,891 13,420 13,392	20,617 19,302 12,292 10,187 13,420 13,392	20,617 19,124 12,292 7,581 10,187 13,420 13,392	20,617 19,124 12,292 7,581 10,187 13,420 13,392	20,617 19,124 12,292 7,581 10,187 13,420 13,392	20,617 19,124 12,292 7,581 10,374 14,679 13,420 13,392	20,617 18,982 12,292 7,581 10,367 14,679 13,420 13,392	20,617 18,982 12,292 8,301 12,141 14,679 13,420 7,944 13,392	20.617 18.982 12.292 8.301 12.141 14.679 13.475 11.589 13.392
agency Boston-MBTA San Francisco-MUNI Philadalphia-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA Portland-TCMTDO Dailas-DARTA Sacramento-RTD Philsburgh-PAT	1984 20,366 19,302 12,292	1985 20,366 19,302 12,292	1986 20,742 19,302 12,292 8,532 14,407	1987 20,742 19,302 12,292 8,532 13,420 13,392 14,407	20,742 19,302 12,292 8,532 13,420 13,392 14,407	20,742 19,302 12,292 9,891 13,420 13,392 14,407	20,617 19,302 12,292 10,187 13,420 13,392 14,407	20,617 19,124 12,292 7,581 10,187 13,420 13,392 14,407	20,617 19,124 12,292 7,581 10,187 13,420 13,392 15,018	20,617 19,124 12,292 7,581 10,187 13,420 13,392 15,018	20,617 19,124 12,292 7,581 10,374 14,679 13,420 13,392 14,872	20,617 18,982 12,292 7,581 10,367 14,679 13,420 13,392 14,872	20,617 18,982 12,292 8,301 12,141 14,679 13,420 7,944 13,392 14,872	20.617 18.982 12.292 8.301 12.141 14.679 13.475 11.589 13.392 14.872
agency Boston-MBTA San Francisco-MUNI San Francisco-MUNI Delago Trolley Inc. Si. Louis-BSDA Portland-TCMTDO Dalles-DARTA Sacramento-RTD Philsburgh-PAT Buffalo-NFTS	1984 20,366 19,302 12,292 10,144	1985 20,366 19,302 12,292 10,134	1986 20,742 19,302 12,292 8,532	1987 20,742 19,302 12,292 8,532 13,420 13,392	20,742 19,302 12,292 8,532 13,420 13,392	20,742 19,302 12,292 9,891 13,420 13,392	20,617 19,302 12,292 10,187 13,420 13,392	20,617 19,124 12,292 7,581 10,187 13,420 13,392	20,617 19,124 12,292 7,581 10,187 13,420 13,392 15,018 12,313	20,617 19,124 12,292 7,581 10,187 13,420 13,392 15,018 12,313	20,617 19,124 12,292 7,581 10,374 14,679 13,420 13,392 14,872 12,313	20,617 18,982 12,292 7,581 10,367 14,679 13,420 13,392 14,872 12,313	20,617 18,982 12,292 8,301 12,141 14,679 13,420 7,944 13,392 14,872 12,313	20.617 18.982 12.292 8.301 12.141 14.679 13.475 11.589 13.392 14.872 12.313
agency Bostor-MBTA San Francisco-MUNI Philadelphia-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA Portland-TCMTDO Delliss-DDARTA Sacramento-RTD Pittsburgh-PAT Buffalo-NFTS Builmore-MMTA	1984 20,366 19,302 12,292 10,144	1985 20,366 19,302 12,292 10,134	1986 20,742 19,302 12,292 8,532 14,407	1987 20,742 19,302 12,292 8,532 13,420 13,392 14,407	20,742 19,302 12,292 8,532 13,420 13,392 14,407 12,313	20,742 19,302 12,292 9,891 13,420 13,392 14,407 12,313	20,617 19,302 12,292 10,187 13,420 13,392 14,407 12,313	20,617 19,124 12,292 7,561 10,187 13,420 13,392 14,407 12,313	20,617 19,124 12,292 7,581 10,187 13,420 13,392 15,018 12,313 18,195	20,617 19,124 12,292 7,581 10,187 13,420 13,392 15,018 12,313 16,289	20,617 19,124 12,292 7,581 10,374 14,679 13,420 13,392 14,872 12,313 16,289	20,617 18,982 12,292 7,581 10,367 14,679 13,420 13,392 14,872 12,313 16,289	20,617 18,982 12,292 8,301 12,141 14,679 13,420 7,944 13,392 14,872 12,313 16,289	20.617 18.982 12.292 8.301 12.141 14.679 13.475 11.589 13.392 14.872 12.313 16.289
agency Boston-MBTA San Francisco-MUNI Boston-MBTA San Diago Trollay inc. St. Louis-BSDA Pontiand-TCMTDO Dellas-DARTA Sacramento-RTD Philsburgh-PAT Buffaio-NFTS Bailmore-MMTA San Jose-SCTD	1984 20,366 19,302 12,292 10,144 14,407	1985 20,366 19,302 12,292 10,134	1986 20,742 19,302 12,292 8,532 14,407 12,463	1987 20,742 19,302 12,292 8,532 13,420 13,392 14,407 12,313	20,742 19,302 12,292 8,532 13,420 13,392 14,407 12,313 15,399	20,742 19,302 12,292 9,891 13,420 13,392 14,407 12,313 15,399	20,617 19,302 12,292 10,187 13,420 13,392 14,407 12,313 15,399	20,617 19,124 12,292 7,581 10,187 13,420 13,392 14,407 12,313 15,724	20,617 19,124 12,292 7,581 10,187 13,420 13,392 15,018 12,313 18,195 15,724	20,617 19,124 12,292 7,581 10,187 13,420 13,392 15,018 12,313 16,289 15,724	20,617 19,124 12,292 7,581 10,374 14,679 13,420 13,392 14,872 12,313 16,289 15,724	20,617 18,982 12,292 7,581 10,367 14,679 13,420 13,392 14,872 12,313 16,289 15,724	20,617 18,982 12,292 8,301 12,141 14,679 13,420 7,944 13,392 14,872 12,313 16,289 15,724	20.617 18,982 12,292 8,301 12.141 14,679 13,475 11,589 13,392 14,872 12,313 16,289 15,736
agency Boston-MBTA San Francisco-MUNI Philadalphia-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA Portland-TCMTDO Dellas-DARTA Sacramento-RTD Philsburgh-PAT Buffalo-NFTS Bellimore-MMTA San Jose-SCTD New Orteans-RTA	1984 20,366 19,302 12,292 10,144 14,407 18,682	1985 20,366 19,302 12,292 10,134 14,407 18,682	1986 20,742 19,302 12,292 8,532 14,407 12,463 18,682	1987 20,742 19,302 12,292 8,532 13,420 13,392 14,407 12,313 18,682	20,742 19,302 12,292 8,532 13,420 13,392 14,407 12,313 15,399 18,662	20,742 19,302 12,292 9,891 13,420 13,392 14,407 12,313 15,399 18,807	20,617 19,302 12,292 10,187 13,420 13,392 14,407 12,313 15,399 18,807	20,617 19,124 12,292 7,561 10,167 13,420 13,392 14,407 12,313 15,724 18,807	20,617 19,124 12,292 7,581 10,187 13,420 13,392 15,018 12,313 18,195 15,724 18,807	20,617 19,124 12,292 7,581 10,187 13,420 13,392 15,018 12,313 16,289 15,724 18,807	20,617 19,124 12,292 7,581 10,374 14,679 13,420 13,392 14,872 12,313 16,289 15,724 18,807	20,617 18,982 12,292 7,581 10,367 14,679 13,420 13,392 14,872 12,313 16,289 15,724 18,807	20,617 18,982 12,292 8,301 12,141 14,679 13,420 7,944 13,392 14,872 12,313 16,289 15,724 18,807	20.617 18,982 12,292 8,301 12,141 14,679 13,475 11,589 13,392 14,872 12,313 16,289 15,736 18,807
agency Boston-MBTA San Francisco-MUNI Philadalphia-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. Si Louis-BSDA Portland-TCMTDO Dellas-DARTA Sacramento-RTD Pittsburgh-PAT Buffalo-NFTS Bailmore-MMTA San Joss-SCTD New Orteans-RTA Cleveland-GCRTA	1984 20,366 19,302 12,292 10,144 14,407	1985 20,366 19,302 12,292 10,134	1986 20,742 19,302 12,292 8,532 14,407 12,463	1987 20,742 19,302 12,292 8,532 13,420 13,392 14,407 12,313	20,742 19,302 12,292 8,532 13,420 13,392 14,407 12,313 15,399	20,742 19,302 12,292 9,891 13,420 13,392 14,407 12,313 15,399	20,617 19,302 12,292 10,187 13,420 13,392 14,407 12,313 15,399	20,617 19,124 12,292 7,581 10,187 13,420 13,392 14,407 12,313 15,724	20,617 19,124 12,292 7,581 10,187 13,420 13,392 15,018 12,313 18,195 15,724	20,617 19,124 12,292 7,581 10,187 13,420 13,392 15,018 12,313 16,289 15,724	20,617 19,124 12,292 7,581 10,374 14,679 13,420 13,392 14,872 12,313 16,289 15,724 18,807 23,371	20,617 18,982 12,292 7,581 10,367 14,679 13,420 13,392 14,872 12,313 16,289 15,724 18,807 23,371	20,617 18,982 12,292 8,301 12,141 14,679 13,420 7,944 13,392 14,872 12,313 16,289 15,724	20.617 18,982 12,292 8,301 12.141 14,679 13,475 11,589 13,392 14,872 12,313 16,289 15,736
agency Boston-MBTA San Francisco-MUINI Philadelphia-SEPTA Los Angeles-LACMTA San Diego Trolley inc. St. Louis-BSDA Portland-TCMTDO Dallas-DARTA Sacramento-RTD Philsburgh-PAT Bellimore-MMTA San Jose-SCTD New Orteans-RTA Cleveland-GCRTA Derver-RTD	1994 20,366 19,302 12,292 10,144 14,407 18,682 23,371	1985 20,366 19,302 12,292 10,134 14,407 18,682 23,371	1986 20,742 19,302 12,292 8,532 14,407 12,463 18,682 23,371	1987 20,742 19,302 12,292 8,532 13,420 13,392 14,407 12,313 18,682 23,371	20,742 19,302 12,292 8,532 13,420 13,392 14,407 12,313 15,399 18,662 23,371	20,742 19,302 12,292 9,891 13,420 13,392 14,407 12,313 15,399 18,607 23,371	20,617 19,302 12,292 10,187 13,420 13,392 14,407 12,313 15,399 18,807 23,371	20,617 19,124 12,292 7,561 10,187 13,420 13,392 14,407 12,313 15,724 18,807 23,371	20,617 19,124 12,292 7,581 10,187 13,420 13,392 15,018 12,313 18,195 15,724 18,807 23,371	20,617 19,124 12,292 7,581 10,187 13,420 13,392 15,018 12,313 16,289 15,724 18,807 23,371	20,617 19,124 12,292 7,581 10,374 14,679 13,420 13,392 14,872 12,313 16,289 15,724 18,807 23,371 9,700	20,617 18,982 12,292 7,581 10,367 14,679 13,420 13,392 14,872 12,313 16,289 15,724 18,807	20,617 18,982 12,292 8,301 12,141 14,679 13,420 7,944 13,392 14,872 12,313 16,289 15,724 18,807	20.617 18,982 12,292 8,301 12,141 14,679 13,475 11,589 13,392 14,872 12,313 16,289 15,736 18,807
agency Boston-MBTA San Francisco-MUNI Philadalphia-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA Portland-TCMTDO Delias-DARTA Sacramento-RTD Philsburgh-PAT Buffalou-NFTS Bailimore-MMTA San Joss-SCTD New Crisens-RTA Cleveland-GCRTA Denver.RTD Newark-NJTC	1984 20,366 19,302 12,292 10,144 14,407 18,682	1985 20,366 19,302 12,292 10,134 14,407 18,682	1986 20,742 19,302 12,292 8,532 14,407 12,463 18,682	1987 20,742 19,302 12,292 8,532 13,420 13,392 14,407 12,313 18,682	20,742 19,302 12,292 8,532 13,420 13,392 14,407 12,313 15,399 18,662	20,742 19,302 12,292 9,891 13,420 13,392 14,407 12,313 15,399 18,807	20,617 19,302 12,292 10,187 13,420 13,392 14,407 12,313 15,399 18,807	20,617 19,124 12,292 7,561 10,167 13,420 13,392 14,407 12,313 15,724 18,807	20,617 19,124 12,292 7,581 10,187 13,420 13,392 15,018 12,313 18,195 15,724 18,807	20,617 19,124 12,292 7,581 10,187 13,420 13,392 15,018 12,313 16,289 15,724 18,807	20,617 19,124 12,292 7,581 10,374 14,679 13,420 13,392 14,872 12,313 16,289 15,724 18,807 23,371	20,617 18,982 12,292 7,581 10,367 14,679 13,420 13,392 14,872 12,313 16,289 15,724 18,807 23,371	20,617 18,982 12,292 8,301 12,141 14,679 13,420 7,944 13,392 14,872 12,313 16,289 15,724 18,807 23,371	18,982 12,292 8,301 12,141 14,679 13,475 11,589 13,392 14,872 12,313 16,289 15,736 18,807 22,898
agency Boston-MBTA San Francisco-MUINI Philadelphia-SEPTA Los Angeles-LACMTA San Diego Trolley inc. St. Louis-BSDA Portland-TCMTDO Dallas-DARTA Sacramento-RTD Philsburgh-PAT Bellimore-MMTA San Jose-SCTD New Orteans-RTA Cleveland-GCRTA Derver-RTD	1994 20,366 19,302 12,292 10,144 14,407 18,682 23,371	1985 20,366 19,302 12,292 10,134 14,407 18,682 23,371	1986 20,742 19,302 12,292 8,532 14,407 12,463 18,682 23,371	1987 20,742 19,302 12,292 8,532 13,420 13,392 14,407 12,313 18,682 23,371	20,742 19,302 12,292 8,532 13,420 13,392 14,407 12,313 15,399 18,662 23,371	20,742 19,302 12,292 9,891 13,420 13,392 14,407 12,313 15,399 18,607 23,371	20,617 19,302 12,292 10,187 13,420 13,392 14,407 12,313 15,399 18,807 23,371	20,617 19,124 12,292 7,561 10,187 13,420 13,392 14,407 12,313 15,724 18,807 23,371	20,617 19,124 12,292 7,581 10,187 13,420 13,392 15,018 12,313 18,195 15,724 18,807 23,371	20,617 19,124 12,292 7,581 10,187 13,420 13,392 15,018 12,313 16,289 15,724 18,807 23,371	20,617 19,124 12,292 7,581 10,374 14,679 13,420 13,392 14,872 12,313 16,289 15,724 18,807 23,371 9,700	20,617 18,982 12,292 7,581 10,367 14,679 13,420 13,392 14,872 12,313 16,269 15,724 18,807 23,371 9,700	20,617 18,982 12,292 8,301 12,141 14,679 13,420 7,944 13,392 14,872 12,313 16,289 15,724 18,807 23,371 9,700	20.617 18.982 12.292 8.301 12.141 14.679 13.475 11.589 13.392 14.872 12.313 16.289 15.736 18.807 22.898 9.700

Average Household Median Income

HEAVY RAIL	Annual dollars	s of income p	er household	of served are										
neme	1.984	1,985	1.986	1,987	1.988	1.989	1,990	1.991	1.992	1.993	1.994	1,995	1,996	1.997
New York CTA	29,163	29,163	29,158	29,158	29,158	29,144	29,144	29,144	29.144	29.144	29,144	29.144	29,153	29,153
Washington, D.CWMATA	38,245	38,268	38,803	38,803	38,803	38,803	38,803	37,382	37.195	37,195	36,995	36,995	36.995	37.036
Chicago-CTA	26,089	26,089	26.089	26.089	26,089	26.089	26.089	26.089	26.089	26,089	27,885	28,069	26,538	26.538
Boston-MBTA	29.562	30,184	30,184	30.562	30,562	30,562	30,562	30,562	30,562	30,562	30,562	30,562	30,562	30,562
Allanta-MARTA	18,780	21.845	21.845	21.737	21,822	21.822	21,822	21,822	21.822	22.162	22,162	22,162	22.162	23,396
Philadelphia-SEPTA	22,635	22,635	22,635	22,635	22,635	22.635	22,635	22.635	22.635	22.635	22,635	22.635	22,635	22,635
San Francisco-BART	24,404	24,404	24,404	24,404	24,404	24,404	24,404	24,404	24.404	24.404	24,404	24,404	24,756	25,072
New York-PATH	40,828	40,828	40,828	40,828	40,828	40,828	40.828	40,828	40,828	40,828	40.828	40,828	40.828	40,828
Miami-Dade Cnty TA	23,196	18,654	18,654	18,654	18,654	18,794	18,794	18,794	18,794	18,794	18,794	18,794	18,794	18,794
Beltimore-MTA	18,113	18,113	18,113	19,809	19,809	19,809	19,809	19,809	19,809	19,809	19.809	18,303	18.303	18,303
LA-LACMTA/SCRTD										13,369	13,369	13,369	16.892	16,892
Linderwold-PATCO	29,354	29,354	29,354	29,354	29,354	29,354	29,354	29,354	29,354	29.354	29.354	29,354	29.354	29,354
Cieveland RTA	17,538	17,538	17,538	17,538	17,538	17,538	17,538	17,538	17,538	17,538	17.538	17.538	17.538	17.538
Staten Island Rapid Trans	41,592	41,592	41,592	41,592	41,592	41,592	41,592	41,592	41,592	41,592	41.592	41.592	41,592	41,592
TOTAL	27,654	27,590	27,631	27,782	27,788	27,798	27,798	27,689	27,674	26,677	26,791	26,696	26.864	26.978
LIGHT RAIL	Annual dollars													
name	1984	1985	1986	1987	1986	1989	1990	1991	1992	1993	1994	1995	1996	1997
Boston-MBTA	32,482	32,482	32,360	32,360	32,360	32,360	32,301	32,301	32,301	32,301	32,301	32,301	32,301	32,301
San Francisco-MUNI	35,243	35,243	35.243	35,243	35,243	35,243	35,243	35,586	35,586	35,586	35,586	35,107	35,107	35,107
Philadelphia-SEPTA														25,639
LA-SCRTD								19,894	19,894	19,894	19,894	19,894	22.831	22,831
San Diego Trolley	18,141	18,195	17.877	17,877	17,877	21,769	21,371	21,371	21,371	21.371	22,001	21,957	22,460	22,460
St. Louis-BI-State											21,980	21,980	21,980	21,980
Portland Try-County MTD Dallas-DART				20,878	20,878	20,878	20,878	20,878	20,878	20,878	20,878	20,878	20,878	20,856
Sacramento RTD													20.158	23,979
Pittsburgh-PAT	28,783	28,783	28,783	22,722 28,763	22,722 28,783	22,722	22,722	22,722	22.722	22.722	22,722	22,722	22,722	22,722
Buffaio-Niagara Frontier	20,703	20,703	17,737	19,338		28,783	28,783	28,783	29,910	29,910	29,191	29,191	29,191	29,191
Ballimore-Maryland DOT			11.131	19,336	19,338	19,338	19,338	19,338	19,338	19,338	19,338	19,338	19,338	19,338
Santa Clara County TD					40,553	40,553	40.553		23,794	25,490	25,490	25,490	25,490	25,490
					40,000	40,000		40,175	40,175	40,175	40,175	40,175	40,175	40,217
New Orleans Public Suc	24 545	24 646	24 646	24 646	74 846									
New Orleans Public Svc Claveland RTA	24,545 38 112	24,545	24,545	24,545	24,545	24,184	24,184	24,184	24,184	24,184	24,184	24.184	24,184	24,184
Cleveland RTA	24,545 38,112	24,545 38,112	24,545 38,112	24,545 38,112	24,545 38,112	24,184 38,112	24,184 38,112	24,184 38,112	24,184 38,112	24,184 38,112	38,112	38,112	38,112	37,350
Cleveland RTA Denver-RTD	38,112	38,112	38,112	38,112	38,112	38,112	38,112	38,112	38,112	38,112	38,112 12,765	38,112 12,765	38,112 12,765	37,350 12,765
Cleveland RTA Denver-RTD Newark-NJT Corp.											38,112	38,112	38,112	37,350 12,765 20,567
Cleveland RTA Denver-RTD	38,112	38,112	38,112	38,112	38,112	38,112	38,112	38,112	38,112	38,112	38,112 12,765	38,112 12,765	38,112 12,765	37,350 12,765

Population

HEAVY RAIL	Population r	esiding in the	served area											
name	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
New York CTA	3,718,553	3,718,553	3,711,029	3,711,029	3,726,225	3,737,456	3,737,456	3,737,456	3.737.456	3,737,456	3.737.456	3,737,456	3,732,428	3,732,428
Washington, D.CWMATA	112,889	117,133	120,701	120,701	120,701	120,701	120,701	140,208	147.719	147 719	155,226	155.226	155,226	155.623
Chicago-CTA	514,860	514,872	514,872	514,872	514,872	514,872	514,872	514,872	514,872	514.872	438,272	432,801	512,234	512.234
Boston-MBTA	135,942	150,513	150,513	168,775	168,775	168,775	168,775	168,775	168,775	168,775	168,775	168,775	168,775	168,775
Atlanta MARTA	22,967	28,517	28,517	30,297	32,469	32,469	32,469	32.469	32.469	36,195	36,195	36,195	36,195	37.686
Philadelphia-SEPTA	247,894	247,894	247,894	247,894	247,894	247,894	247,894	247,894	247.894	247,894	247.894	247.894	247.894	247,894
San Francisco-BART	105,557	105,557	105,557	105,557	105,557	105,557	105,557	105,557	105.557	105.557	105,557	105,557	109,293	112.617
New York-PATH	99,990	99,990	99,990	99,990	99,990	99,990	99,990	99,990	99,990	99,990	99,990	99,990	99,990	99,990
Miami-Dade Cnty TA	17,060	40,137	40,137	40,137	40,137	41,699	41,699	41,699	41,699	41,699	41,699	41.699	41,699	41,699
Baltimore-MTA	30,347	30,347	30,347	32,941	32,941	32,941	32,941	32,941	32,941	32,941	32,941	41,142	41,142	41,142
LA-LACMTA/SCRTD										21,066	21,066	21,066	52,235	52,235
Lindenwold-PATCO	33,927	33,927	33.927	33,927	33,927	33,927	33,927	33,927	33,927	33,927	33,927	33,927	33,927	33,927
Cieveland RTA	33,797	33,797	33,797	33,797	33,797	33,797	33,797	33,797	33,797	33,797	33,797	33,797	33,797	33,797
Staten Island Rapid Trans	44,799	44,799	44,799	44,799	44,799	44,799	44,799	44,799	44,799	44,799	44,799	44,799	44,799	44,799
TOTAL	4,870,688	4,918,142	4,914,186	4,936,822	4,954,190	4,966,983	4,966,983	4,986,490	4,994,001	5,018,793	4,949,700	4,952,430	5,061,740	5,314,846

LIGHT RAIL	Population re	siding in the	served area											
name	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Boston-MBTA	178,330	178,330	162,535	162,535	162,535	162,535	165,771	165,771	165,771	165,771	165,771	165.771	165.771	165.771
San Francisco-MUNI	172,785	172,785	172,785	172,785	172,785	172,785	172,785	185,835	185,835	185,835	185,835	191,753	191,753	191,753
Philadelphia-SEPTA	234,999	234,999	234,999	234,999	234,999	234,999	234,999	234,999	234,999	234,999	234,999	234,999	234,999	234,999
LA-SCRTD								66,167	66.167	66,167	66,167	66.167	92.621	92,621
San Diego Trolley	23,562	24,554	37,934	37,934	37,934	49,283	50,696	50,696	50,696	50,696	53.041	53,406	56.002	56,002
St. Louis-Bi-State											13.895	13.895	13,895	13.895
Portland Try-County MTD				28,491	28,491	28,491	28.491	28,491	28,491	28,491	28,491	28,491	28,491	28,722
Dallas-DART												20,000	12.391	21,293
Sacramento RTD				27,695	27,695	27,695	27,695	27.695	27.695	27,695	27.695	27,695	27.695	27,695
Pittsburgh-PAT	65,425	65,425	65,425	65,425	65,425	65,425	65,425	65,425	57.889	57,889	53.592	53.592	53,592	53,592
Buffalo-Niagara Frontier			15,590	20,037	20.037	20.037	20,037	20,037	20.037	20.037	20.037	20.037	20.037	20.037
Baltimore-Maryland DOT									19,779	28,949	28,949	28,949	28,949	28,949
Santa Clara County TD					27,088	27.088	27.088	33.006	33,006	33,006	33,006	33,006	33.006	33,160
New Orleans Public Svc	36,122	36,122	36,122	36,122	36,122	40,977	40,977	40,977	40,977	40,977	40.977	40,977	40,977	40,977
Cleveland RTA	32,066	32,066	32.066	32,066	32.066	32.066	32,066	32,066	32.066	32.066	32.066	32,066	32.066	33,168
Denver-RTD								,			10,300	10.300	10.300	10,300
Newark-NJT Corp.	32,918	32,918	32,918	32,918	32,918	32,918	32,910	32,918	32,918	32,918	32,918	32,918	32,918	32,918
Hudson-Bergen LRT									,_,_			02,010	04,210	96.258
TOTAL	541,208	542,200	555,375	616,008	643,096	659,300	663,949	749,084	761,327	770,497	792,740	799,023	840,464	1.182,110

Labor used on Maintenance

HEAVY RAIL	Annuel Labor	Hours (000's)												
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
New York-MTA-NYCT	22,820	30,598	31,606	32,362	27.274	28.584	27,835	26,126	25,605	25.367	26.166	24,911	23,998	22.791
Washington, D.CWMATA	3,140	3,390	3.585	3.851	3,922	4.055	4,068	4,300	4.426	4,358	4.537	4,701	4,644	4,601
Chicago-RTA-CTA	2,846	3,144	3,202	3,143	3.438	3,342	3,240	3,119	3.088	2.910	2,955	2,488	2.491	2,843
Boston-MBTA		2,654	2.488	2,560	2.440	2,425	2.355	2.469	2.462	2,685	1.868	1,653	1,766	1.584
Atlanta-MARTA	278	847	867	978	678	772	942	913	646	854	661	729	810	857
Philadelphia-SEPTA	1.315	1.300	2,009	1.839	1,986	2.052	1,969	2,391	1,602	1.272	1.606	1.682	1,765	1,728
San Francisco-BART	1.658	1.784	1.834	1.810	1.822	1.834	2,135	2,262	2.142	2,197	2.035	1,980	2,190	2.476
New York-PATHC	1,114	1.316	1.316	1.217	1.217	1,200	1,381	1.381	2,142	1,355	1,280	1,300	1,177	1,136
Miami-MOTA	184	490	515	519	492	521	551	550	544	557	568	549	501	538
Baltimore-MMTA	208	371	388	429	469	510	546	555	548	500	465	450	445	448
Los Angeles-LACMTA								000		180	170	201	252	269
Philadelphia-NJ-PATC	348	370	360	354	354	344	346	298	295	273	273	253	252	263
Cleveland-GCRTA	320	280	295	342	336	362	361	322	318	299	298	326	336	188
New York-MTA-SIRTOA	222	244	274	272	292	308	312	306	192	213	234	206	227	210
TOTAL	19,774	28,889	29,902	30,593	26.407	28.089	28,446	27.626	26.027	27.238	27.509	26,593	26.144	26.039
LIGHT RAIL	Annual Labor I													
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Boston-MBTA		357	387	356	327	352	318	256	251	318	975	851	819	851
San Francisco-MUNI	884	919	768	726	797	801	801	636	617	580	708	614	569	638
Philadelphia-SEPTA	748	747	1,688	1,591	1,233	1,263	1,212	1,312	844	642	629	630	649	616
Los Angeles-LACMTA								179	179	251	223	246	574	650
San Diego Trolley Inc.	57	76	92	113	121	140	236	223	220	230	245	251	288	324
St. Louis-BSDA											61	105	124	118
Portland-TCMTDO Dallas-DARTA				98	102	116	131	125	138	136	174	260	313	346
													124	221
Sacramento-RTD				60	79	76	85	87	96	126	91	121	116	124
Pillsburgh-PAT	389	364	344	529	562	458	690	463	480	680	537	450	449	422
Buffalo-NFTS			192	199	213	213	213	184	197	203	209	200	199	177
Baltimore-MMTA									40	121	157	175	188	198
San Jose-SCTD New Orleans-RTA					145	145	150	203	179	157	189	206	212	226
New One ans-RTA Claveland-GCRTA	121	131	158	160	158	162	175	222	62	47	193	41	74	100
	207	246	147	201	194	201	207	198	171	160	162	178	202	135
Denver-RTD											52	66	71	73
Newark-NJTC TOTAL	34	53	49	59	60	59	57	57	68	57	70	55	75	69
TOTAL	1,102	1,197	1,912	2,061	1,975	1,867	1,751	2,095	1,606	1,656	2,164	2,140	2,495	2,606

Half Rush Hour Proportion (Proportion of initiating trips between 8 and 8:30 am)

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HEAVY RAIL	Proportion of a	olorized trint	hebueen 8 s	nd 8-30 am r	wer the 24-b	our total of the	served area							
agency	1,984	1,985	1,986	1,967	1,968	1,989	1,990	1,991	1,992	1,993	1,994	1,995	1,996	1,997
New York-MTA-NYCT	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Washington, D.CWMATA		0.19	0.19	0,19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
Chicago-RTA-CTA	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Boston-MBTA Atlanta-MARTA	0.18 0.15	0.18 0.16	0.18	0.18 0.15	0.18 0.15	0.18	0.18 0.15	0.18 0.15	0.18 0.15	0.18 0.15	0.18 0.15	0.18 0.15	0.18 0.15	0.18 0.15
Philadelphia-SEPTA	0.16	0.16	0.16	0,16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0,16
San Francisco-BART	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.14	0.14
New York-PATHC	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Miami-MDTA	0.16	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Baltimore-MMTA Los Angeles-LACMTA	0.13	0.13	0.13	0.14	0.14	0.14	0.14	0.14	0.14	0.14 0.08	0.14	0.13 0.08	0.13	0,13 0,13
Philadelphia-NJ-PATC	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
Cleveland-GCRTA	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
New York-MTA-SIRTOA	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
AVERAGE	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
LIGHT RAIL	D	- de sime d'Asia a												
agency	Proportion of a 1984	1985	1986	1967	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Boston-MBTA	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
San Francisco-MUNI	0.17	0.17	0.17	0,17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.16	0.16	0.16
Philadelphia-SEPTA								0.09	0.09		0.09	0.09		0.15
Los Angeles-LACMTA Sen Diego Trolley Inc.	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.09 0.08	0.09	0.09	0.09	0.09 0.09
SI. Louis-BSDA			••••								0.13	0.13	0.13	0.13
Portland-TCMTDO				0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Dalles-DARTA Secremenio-RTD				0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.09	0.12
Pitisburgh-PAT	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Buffaio-NFTS			0.16	0,16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Baltimore-MMTA									0.18	0.16	0.16	0.16	0.16	0.16
San Jose-SCTD New Orleans-RTA	0.17	0.17	0.17	0.17	0.10 0.17	0.10 0.17	0.10 0.17	0.10 0.17	0.10 0.17	0.10 0.17	0.10 0.17	0.10 0.17	0.10 0.17	0.10 0.17
Cleveland-GCRTA	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Denver-RTD											0.10	0.10	0.10	0.10
Newark-NJTC	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Hudson-Bergen LRT AVERAGE	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.20 0.14
Jobs Density o	f Metrop	olitan A	Area											
HEAVY RAIL	Number of Job	s per Square	Mile											
HEAVY RAIL agency	Number of Job 1,984	s per Square 1,985	M#s 1,986	1,967	1,988	1,989	1,990	1,991	1,992	1,993	1.994	1,995	1,996	1.997
HEAVY RAIL agency New York-MTA-NYCT	Number of Job 1,984 4,013	s per Square 1,985 4,105	Mile 1,986 4,178	4,184	4,235	4,262	4,210	4,068	4,023	4,023	4,058	4,065	4,067	4,027
HEAVY RAIL agancy New York-MTA-NYCT Washington, D.CWMATA	Number of Job 1,984 4,013	s per Square 1,985	M#s 1,986			1,989 4,262 467 860								
HEAVY RAIL agency New York MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-WBTA	Number of Job 1,984 4,013 372 759 555	s per Square 1,985 4,105 394 773 574	Mile 1,986 4,178 415 793 590	4,184 436 817 594	4,235 452 840 611	4,262 467 860 609	4,210 472 871 592	4,068 462 867 565	4,023 460 863 570	4,023 468 882 581	4,058 476 906 595	4,065 482 929 608	4,067 503 938 597	4,027 506 950 593
HEAVY RAIL sgency New York-MTA-NYCT Washington, D. CWMATA Chicago-RTA-CTA Boston-MBTA Allenfa-MRTA	Number of Job 1,984 4,013 372 759 555 244	s per Square 1,985 4,105 394 773 574 262	Mile 1,966 4,178 415 793 590 278	4,184 436 817 594 288	4,235 452 840 611 299	4,262 467 860 609 306	4,210 472 871 592 311	4,068 462 867 565 310	4,023 460 863 570 318	4,023 468 882 581 335	4,058 476 906 595 354	4,065 482 929 608 370	4,067 503 938 597 371	4,027 506 950 593 379
HEAVY RAIL sgancy New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-MBTA Allerta-MRRTA Philadeiphe-SEPTA	Number of Job 1,984 4,013 372 759 555 244 623	s per Square 1,985 4,105 394 773 574 262 641	Mile 1,986 4,178 415 793 590 278 656	4,184 436 817 594 288 676	4,235 452 840 611 299 691	4,262 467 860 609 306 701	4,210 472 871 592 311 701	4,068 462 867 565 310 685	4,023 460 863 570 318 681	4,023 468 882 581 335 686	4,058 476 906 595 354 696	4.065 482 929 608 370 700	4,067 503 938 597 371 714	4,027 506 950 593 379 714
HEAVY RAIL sgency New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-MBTA Alianta-MARTA Philadelphia-SEPTA San Francisco-BART	Number of Job 1,984 4,013 372 759 555 244 623 841	s per Square 1,985 4,105 394 773 574 262 641 864	Mile 1,986 4,178 415 793 590 278 656 884	4,184 436 817 594 288 676 908	4,235 452 840 611 299 691 940	4,262 467 860 609 306 701 964	4,210 472 871 592 311 701 982	4,068 462 867 565 310 685 978	4,023 460 863 570 318 681 962	4,023 468 882 581 335 686 960	4,058 476 906 595 354	4,065 482 929 608 370	4,067 503 938 597 371 714 1,017	4,027 506 950 593 379 714 1,023
HEAVY RAIL sgancy New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-MBTA Allerta-MRRTA Philadeiphe-SEPTA	Number of Job 1,984 4,013 372 759 555 244 623	s per Square 1,985 4,105 394 773 574 262 641	Mile 1,986 4,178 415 793 590 278 656	4,184 436 817 594 288 676	4,235 452 840 611 299 691	4,262 467 860 609 306 701	4,210 472 871 592 311 701	4,068 462 867 565 310 685	4,023 460 863 570 318 681	4,023 468 882 581 335 686	4,058 476 906 595 354 696 969	4,065 482 929 608 370 700 988	4,067 503 938 597 371 714	4,027 506 950 593 379 714
HEAVY RAIL agency New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-MBTA Alienta-MRATA Philadeiphia-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Belimora-MMTA	Number of Job 1,964 4,013 372 759 555 244 623 841 4,013	s per Square 1,985 4,105 394 773 574 262 641 864 4,105	Mile 1.986 4.178 415 793 590 278 656 884 4.178	4,184 436 817 594 288 676 908 4,184	4,235 452 840 611 299 691 940 4,235	4,262 467 860 609 306 701 964 4,262	4,210 472 871 592 311 701 982 4,210	4,068 462 867 565 310 685 978 4,068	4,023 460 863 570 318 681 962 4,023	4,023 468 882 581 335 686 960 4,023 562 524	4,058 476 906 595 354 696 969 4,058 572 533	4,065 482 929 608 370 700 988 4,065 580 541	4,067 503 938 597 371 714 1,017 4,067 585 554	4,027 506 950 593 379 714 1,023 4,027 591 554
HEAVY RAIL agency New York-MTA-NYCT Washington, D.C. WMATA Chicago-RTA-CTA Boston-MBTA Alienta-MARTA Philadeiphie-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Baltimore-MMTA Los Angeles-LACMTA	Number of Job 1,984 4,013 372 759 555 244 623 841 4,013 498 463	s per Square 1,985 4,105 394 773 574 262 641 864 4,105 509 480	MHe 1,986 4,178 590 278 656 884 4,178 517 4,93	4,184 436 817 594 288 676 908 4,184 516 515	4,235 452 840 611 299 691 940 4,235 536 528	4,262 467 860 609 306 701 964 4,262 549 541	4,210 472 871 592 311 701 982 4,210 553 545	4,068 462 867 565 310 685 978 4,068 546 528	4,023 460 863 570 318 681 962 4,023 543 521	4,023 468 882 581 335 686 960 4,023 562 524 1,216	4,058 476 906 595 354 696 969 4,058 572 533 1,224	4,065 482 929 608 370 700 988 4,065 580 541 1,240	4,067 503 938 597 371 714 1,017 4,067 585 554 1,282	4,027 506 950 593 379 714 1,023 4,027 591 554 1,273
HEAVY RAIL agency New York-MTA-NYCT Washington D.CWMATA Chicago-RTA-CTA Boston-MBTA Alienta-MRATA Philadelphia-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Los Angeles-LACMTA Philadelphia-NJ-PATC	Number of Job 1,984 4,013 372 759 555 244 623 841 4,013 498 463 623	s per Square 1,985 4,105 394 773 574 262 641 864 4,105 509 480 641	Mile 1,986 4,178 415 793 590 279 656 884 4,178 517 493 656	4,184 436 817 594 288 676 908 4,184 516 515 676	4,235 452 840 611 299 691 940 4,235 536 528 691	4,262 467 860 306 701 964 4,262 549 541 701	4,210 472 871 592 311 701 982 4,210 553 545 701	4,068 462 867 565 310 685 978 4,068 546 528 685	4,023 460 863 570 318 681 962 4,023 543 521 681	4,023 468 882 581 335 686 960 4,023 562 524 1,216 686	4,058 476 906 595 354 696 969 4,058 572 533 1,224 696	4,065 482 929 608 370 700 988 4.065 580 541 1.240 700	4,067 503 938 597 371 714 1,017 4,067 585 554 1,282 714	4,027 506 950 593 379 714 1,023 4,027 591 554 1,273 714
HEAVY RAIL agency New York-MTA-NYCT Washington, D.C. WMATA Chicago-RTA-CTA Boston-MBTA Alienta-MARTA Philadeiphie-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Baltimore-MMTA Los Angeles-LACMTA	Number of Job 1,984 4,013 372 759 555 244 623 841 4,013 498 463	s per Square 1,985 4,105 394 773 574 262 641 864 4,105 509 480	MHe 1,986 4,178 590 278 656 884 4,178 517 4,93	4,184 436 817 594 288 676 908 4,184 516 515	4,235 452 840 611 299 691 940 4,235 536 528	4,262 467 860 609 306 701 964 4,262 549 541	4,210 472 871 592 311 701 982 4,210 553 545	4,068 462 867 565 310 685 978 4,068 546 528	4,023 460 863 570 318 681 962 4,023 543 521	4,023 468 882 581 335 686 960 4,023 562 524 1,216	4,058 476 906 595 354 696 969 4,058 572 533 1,224	4,065 482 929 608 370 700 988 4,065 580 541 1,240	4,067 503 938 597 371 714 1,017 4,067 585 554 1,282	4,027 506 950 593 379 714 1,023 4,027 591 554 1,273
HEAVY RAIL agency New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Bostor-MBTA Alianta-MARTA Philadelphia-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Ballimora-MMTA Los Angeise-LACMTA Philadelphia-NL-PATC Claveland-GCRTA New York-MTA-SIRTOA	Number of Job 1,984 4,013 372 759 555 264 623 841 498 463 623 499 4,013	s per Square 1,985 4,105 394 773 574 262 641 864 4,105 5480 641 426 4,105	Mile 1,986 4,178 4,178 793 590 278 656 433 4,178	4,184 436 817 594 288 676 908 4,184 516 515 676 441	4,235 452 840 611 299 691 940 4,235 536 528 691 450	4,262 467 860 609 306 701 964 4,262 549 541 701 461	4,210 472 871 592 311 701 982 4,210 553 545 701 465	4,068 462 867 565 310 685 978 4,068 546 528 685 460	4,023 460 863 570 318 681 962 4,023 543 521 681 457	4,023 468 882 581 335 686 960 4,023 562 524 1,216 686 463	4,058 476 906 595 354 696 969 4,058 572 533 1,224 696 476	4,065 482 929 608 370 700 988 4,065 580 541 1,240 700 487	4,067 503 938 597 371 1,017 4,067 585 554 1,282 714 488	4,027 506 950 593 379 714 1,023 4,027 591 554 1,273 714 492
HEAVY RAIL sgarcy New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-WBTA Allenta-MRATA Philadelpha-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Balimora-MATA Dashora-MATA Claveland-GCRTA New York-MTA-SIRTOA	Number of Job 1,964 4,013 372 759 555 244 633 841 4,013 633 633 641 4,013 103 103 103 103 103 103 103 103 103	s per Square 1,985 4,105 394 773 577 262 641 426 4,105 641 426 4,105 509 480 641 426 4,105 509 480 509 509 509 509 509 509 509 50	Mile 1,986 4,178 793 793 505 884 4,178 656 433 4,178 Mile	4,184 436 817 594 288 676 908 4,184 516 515 676 441 4,184	4,235 452 840 611 299 940 4,235 536 528 691 4,235 4,235	4,262 467 860 609 306 4,262 549 541 701 4,262 549 541 461 4,262	4,210 472 871 592 311 982 4,210 553 5545 701 465 4,210	4,068 462 867 565 310 685 978 4,068 546 528 685 460 4,068	4,023 460 863 570 318 681 962 4,023 543 521 681 457 4,023	4.023 468 882 581 335 686 960 4.023 524 1.216 686 463 4.023	4,058 476 906 595 354 696 969 4,058 572 533 1,224 696 476	4,065 482 929 608 370 700 988 4,065 580 541 1,240 700 487	4,067 503 938 597 371 1,017 4,067 585 554 1,282 714 488	4,027 506 950 593 379 714 1,023 4,027 591 554 1,273 714 492
HEAVY RAIL agency New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Bostor-MBTA Alianta-MARTA Philadelphia-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Ballimora-MMTA Los Angeise-LACMTA Philadelphia-NL-PATC Claveland-GCRTA New York-MTA-SIRTOA	Number of Job 1,984 4,013 372 759 555 264 623 841 498 463 623 499 4,013	s per Square 1,985 4,105 394 773 574 262 641 864 4,105 5480 641 426 4,105	Mile 1,986 4,178 4,178 793 590 278 656 884 4,178 656 433 4,178	4,184 436 817 594 288 676 908 4,184 516 515 676 441	4,235 452 840 611 299 691 940 4,235 536 528 691 450	4,262 467 860 609 306 701 964 4,262 549 541 701 461	4,210 472 871 592 311 701 982 4,210 553 545 701 465	4,068 462 867 565 310 685 978 4,068 546 528 685 460	4,023 460 863 570 318 681 962 4,023 543 521 681 457	4,023 468 882 581 335 686 960 4,023 562 524 1,216 686 463	4.058 476 906 595 354 696 969 4.058 572 533 1.224 696 4.058	4,065 482 929 608 370 700 988 4,065 580 541 700 4,065	4,067 503 938 597 371 1,017 4,067 505 554 1,282 714 488 4,067	4,027 506 950 593 379 714 1.023 4.027 554 1.273 714 492 4.027
HEAVY RAIL agency New York-MTA-NYCT Washington, D. C. VWAT Chicago-RTA-CTA Boston-WBTA Alianta-MARTA Philadephis-SEPTA San Francisco-BART New York-PATHC Miami-MUTA Dealimora-MMTA Dealimora-MMTA Dealimora-MATA New York-MTA-SIRTOA	Number of Job 1,984 4,013 372 759 555 244 623 841 4,013 438 453 623 419 4,013 3 419 4,013 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	s per Square 1,985 4,105 394 773 574 864 4,105 509 480 641 426 4,105 517 509 574	Mile 1,986 4,178 4,178 793 590 278 684 4,178 590 1185 590 1185 590	4,184 436 817 594 288 676 908 4,184 515 515 576 441 4,184 1987 1173	4,235 452 840 611 299 691 940 4,235 536 528 691 450 4,235 450 4,235	4.262 467 860 609 306 4.262 549 541 701 461 4.262 1989 1227	4.210 4.72 871 592 311 701 982 4.210 553 545 701 465 4.210 1990 592 1245	4,068 462 967 565 310 685 978 4,068 546 528 685 460 4,068 4,068	4,023 460 863 570 318 681 962 4,023 543 521 681 457 4,023 521 681 457 4,023	4.023 468 882 581 335 686 960 4.023 562 4.023 562 4.023 524 4.023 584 4.023 581 1993 581	4.058 476 906 595 354 696 969 4.058 573 1.224 696 4.058 476 4.058	4.065 482 929 608 370 700 988 4.065 580 541 1.240 700 487 4.065 1995 608	4,067 503 938 597 371 714 1,017 4,067 585 554 4,067 1,282 714 4,88 4,067	4,027 506 950 593 379 714 1,027 594 4,027 594 4,027 1992 4,027
HEAVY RAIL sgency New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-MBTA Allerta-MRTA Philadepin-SEPTA San Francisco-BART New York-PATHC Miamh-MDTA Bailmora-MMTA Los Angeles-LACMTA Philadepin-NL-PATC Cleveland-GCRTA New York-MTA-SIRTOA	Number of Job 1,964 4,013 372 759 555 244 633 841 4,013 633 633 641 4,013 103 103 103 103 103 103 103 103 103	s per Square 1,985 4,105 394 773 574 262 641 426 4,105 641 426 4,105 509 480 641 426 509 480 641 426 505 505 505 505 505 505 505 50	Mile 1.996 4.178 415 793 509 278 656 884 4.178 557 433 4.178 Mile 1986 590	4,184 436 817 594 288 676 908 676 908 4,184 515 515 676 441 4,184	4,235 452 840 611 299 691 940 4,235 536 528 691 450 4,235 4,235	4,262 467 860 609 306 4,262 549 541 701 4,262 749 541 461 4,262	4.210 472 871 592 311 701 982 4.210 553 545 701 465 4.210 1990 592	4,068 462 867 565 310 685 978 4,068 546 546 685 460 4,068 1991 565 1234 685	4,023 460 863 570 318 681 962 4,023 543 543 543 543 543 543 543 543 543 54	4.023 468 802 581 335 686 960 4.023 562 524 1.216 686 463 4.023 1993 581 11993 581	4.058 476 906 595 354 696 969 696 572 533 1.224 696 476 4.058 1994 595 1205 5996	4,065 482 929 608 370 700 988 4,065 581 1,240 700 841 1,240 700 705 487 4,065	4,067 503 938 597 371 4,067 585 554 1,282 714 4,067 888 4,067 1996 597 1246 597	4.027 506 950 379 714 1.023 4.027 591 554 1.273 714 4.927 4.027
HEAVY RAIL sgency New York-MTA-NYCT Washington, D.C. WMATA Chicago-RTA-CTA Boston-MBTA Allerta-MARTA Philadephis-SEPTA San Francisco-BART New York-PATHC Miami-MUTA Dataset, J.C. Mark- Miami-MUTA Baltimore-MMTA Baltimore-MMTA Dataset, J.C. Mark- Philadephis-NJ-PATC Cleveland-SCRTA New York-MTA-SIRTOA LIGHT RAIL sgency Boston-MBTA San Francisco-MUNI Philadephia-SEPTA Los Angeles-LACMTA	Number of Job 1,984 4,013 372 759 555 244 623 498 463 623 419 4,013 8 401 3 419 4,013 8 401 3 419 4,013	s per Square 1,985 4,105 394 773 574 864 4,105 509 480 641 426 4,105 s per Square 1985 574 641	Mile 1,986 4,178 4,178 793 590 278 684 4,178 590 1185 590 1185 590	4,184 436 817 594 288 676 908 4,184 515 515 576 441 4,184 1987 1173 676	4,235 452 840 611 299 940 4,235 536 528 691 450 4,235 4,235 4,235	4.262 467 860 609 306 4.262 549 541 701 461 4.262 1989 1989	4.210 4.72 871 592 311 701 982 4.210 553 545 701 465 4.210 1990 592 1245 701	4.068 462 867 310 685 978 4.068 546 528 685 460 4.068 1991 565 1234 685	4.023 460 863 570 316 881 962 4.023 541 681 457 4.023 521 681 457 4.023 570 1203 681 1203 681 1203	4.023 468 882 581 335 686 960 4.023 562 524 1.216 463 4.023 581 1993 581 1199 806 1216	4.058 476 906 995 354 696 969 4.058 572 533 1.224 696 4.76 4.058	4.065 482 929 608 370 700 988 4.065 580 541 1.240 700 487 4.065 508 1223 700 1240	4.067 503 938 597 371 1.017 4.067 585 554 4.067 714 488 4.067 1996 597 1246 714 1282	4,027 506 950 953 379 714 1.023 4.027 554 1.273 714 492 4.027 1997 598 1254 719 1259
HEAVY RAIL sgency New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-MBTA Allerta-MRTA Philadepin-SEPTA San Francisco-BART New York-PATHC Miamh-MDTA Bailmora-MMTA Los Angeles-LACMTA Philadepin-NL-PATC Cleveland-GCRTA New York-MTA-SIRTOA	Number of Job 1,984 4,013 372 759 555 244 623 841 4,013 438 453 623 419 4,013 3 419 4,013	s per Square 1,985 4,105 394 773 574 262 641 426 4,105 641 426 4,105 509 480 641 426 4,105 574	Mile 1,986 4,178 4,178 793 590 278 684 4,178 590 1185 590 1185 590	4,184 436 817 594 288 676 908 4,184 515 515 576 441 4,184 1987 1173	4,235 452 840 611 299 691 940 4,235 536 528 691 450 4,235 450 4,235	4.262 467 860 609 306 4.262 549 541 701 461 4.262 1989 1227	4.210 4.72 871 592 311 701 982 4.210 553 545 701 465 4.210 1990 592 1245	4,068 462 867 565 310 685 978 4,068 546 546 685 460 4,068 1991 565 1234 685	4,023 460 863 570 318 681 962 4,023 543 543 543 543 543 543 543 543 543 54	4.023 468 802 581 335 686 960 4.023 562 524 1.216 686 463 4.023 1993 581 11993 581	4.058 476 906 595 354 696 969 696 572 533 1.224 696 476 4.058 1994 595 1205 5996	4,065 482 929 608 370 700 988 4,065 581 1,240 700 841 1,240 700 705 487 4,065	4,067 503 938 597 371 4,067 585 554 1,282 714 4,067 888 4,067 1996 597 1246 597	4.027 506 950 379 714 1.023 4.027 591 554 1.273 714 4.927 4.027
HEAVY RAIL sgercy New York-MTA-NYCT Washington, D.C. VWAATA Chicago-RTA-CTA Boston-MBTA Alianta-MARTA Philadelphia-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Ballimora-MMTA Los Angeise-LACMTA New York-MTA-SIRTOA LIGHT RAIL sgency Boston-MBTA San Francisco-MUNI Philadelphia-SEPTA Los Angeise-LACMTA San Olego Trolley Inc. Si. Louis-BSDA Portland-ToTMDO	Number of Job 1,984 4,013 372 759 555 244 623 498 463 623 419 4,013 8 401 3 419 4,013 8 401 3 419 4,013	s per Square 1,985 4,105 394 773 574 864 4,105 509 480 641 426 4,105 s per Square 1985 574 641	Mile 1,986 4,178 4,178 793 590 278 684 4,178 590 1185 590 1185 590	4,184 436 817 594 288 676 908 4,184 515 515 576 441 4,184 1987 1173 676	4,235 452 840 611 299 940 4,235 536 528 691 450 4,235 4,235 4,235	4.262 467 860 609 306 4.262 549 541 701 461 4.262 1989 1989	4.210 4.72 871 592 311 701 982 4.210 553 545 701 465 4.210 1990 592 1245 701	4.068 462 867 310 685 978 4.068 546 528 685 460 4.068 1991 565 1234 685	4.023 460 863 570 316 881 962 4.023 541 681 457 4.023 521 681 457 4.023 570 1203 681 1203 681 1203	4.023 468 882 581 335 686 960 4.023 562 524 1.216 463 4.023 581 1993 581 1199 806 1216	4.058 476 906 595 354 696 969 4.058 572 533 1.224 476 4.058 1994 595 1205 896 1225 896 1224 341	4.065 402 929 608 370 988 4.065 580 700 487 700 487 700 487 700 487 700 485 580 1240 345	4.067 503 938 597 371 1.017 1.017 1.017 1.017 1.017 1.017 1.017 1.067 585 554 1.282 714 4.067 1996 597 1246 714 1282 367 240 240	4.027 506 950 593 379 714 1.023 4.027 591 1.273 714 4.92 4.027 1997 598 1254 719 1299 374 242
HEAVY RAIL sgarcy New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-MBTA Allerta-MARTA PhiladebiheSEPTA San Francisco-BART New York-MTA Bailmore-MMTA Los Angeles-LACMTA Philadebihe-NJ-PATC Clavelend-GRTA New York-MTA-SIRTOA	Number of Job 1,984 4,013 372 759 555 244 623 498 463 623 419 4,013 8 401 3 419 4,013 8 401 3 419 4,013	s per Square 1,985 4,105 394 773 574 864 4,105 509 480 641 426 4,105 s per Square 1985 574 641	Mile 1,986 4,178 4,178 793 590 278 684 4,178 590 1185 590 1185 590	4.184 436 908 908 4.184 515 515 576 441 4.184 1987 1173 676 307	4 235 452 840 611 299 691 4,235 536 528 691 450 4,235 4,235 1998 611 1203 691 324	4.262 467 509 306 701 954 4.262 549 541 461 4.262 1989 1227 701 337 178	4.210 472 592 311 701 982 4.210 553 545 701 465 4.210 592 1245 701 344 184	4.068 462 867 565 310 685 978 978 978 978 546 528 685 460 4.068 4.068 1991 565 1234 685 1234 685 1234 846 346	4.023 460 570 318 681 962 4.023 543 521 681 457 4.023 1992 570 1203 681 1203 681 457 4.023	4.023 468 802 581 335 686 960 960 960 562 524 1.216 686 463 4.023 501 1199 501 1199 501 1216 337	4.058 476 906 595 354 696 969 969 872 533 1.224 696 476 4.058 1995 1205 896 1205	4.065 482 929 608 370 700 988 4.065 541 1.240 700 487 4.065 508 1223 700 1240 345 239 214	4.067 503 936 597 371 1.017 4.067 586 554 1.282 714 488 4.067 1996 597 1246 714 714 282 367 240 217 247	4.027 506 950 533 1.023 4.027 591 1.273 7.14 492 4.027 598 1254 7.19 7.19 7.19 7.293 3.74 2.422 2.2333
HEAVY RAIL agency New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-WBTA Alianta-MARTA Philadelphia-SEPTA San Francisco-BART New York-PATHC Miami-MDTA Baltimore-MMTA Los Angeles-LACMTA Philadelphia-NJ-PATC Cleveland-GCRTA New York-MTA-SIRTOA	Number of Job 1,984 4,013 372 759 555 244 623 498 463 623 419 4,013 8 401 3 419 4,013 8 401 3 419 4,013	s per Square 1,985 4,105 394 773 574 864 4,105 509 480 641 426 4,105 s per Square 1985 574 641	Mile 1,986 4,178 4,178 590 278 656 884 4,178 590 433 4,178 Mile 1986 590 1155 656	4.184 436 817 594 876 908 4.184 515 515 676 4.184 4.184 1987 1173 676 307 161	4 235 452 540 611 299 691 940 4.235 528 691 4.50 4.235 4.235 4.235 1988 611 1203 691 324 169	4.262 467 509 306 701 964 4.262 549 541 701 4.262 1989 1227 701 337 178	4.210 472 871 592 311 701 982 4.210 545 701 4.210 4.210 4.210 1990 592 1245 701 344 184	4,068 462 867 565 310 685 978 4,068 546 528 685 460 4,068 4,068 1991 565 1234 685 1234 565 1234 565	4.023 460 863 570 318 681 962 4.023 543 521 681 4.023 1992 570 1203 681 1240 340 189 187	4.023 468 802 591 335 686 960 4.023 562 524 1.216 686 4.023 4.023 1993 581 1199 686 1216 337 196	4.058 476 906 595 354 696 969 969 969 969 969 4.058 572 533 1.224 696 4.76 8 4.058 1994 595 1205 1205 1205 1205 1205 1205 1205 120	4.065 482 929 608 370 988 4.065 580 580 580 4.065 580 4.065 1223 700 1240 345 239 214 194	4.067 503 938 597 371 1.017 1.017 1.017 1.017 1.017 1.017 1.017 1.067 585 554 1.282 714 4.067 1996 597 1246 714 1282 367 240 240	4.027 506 950 593 379 714 1.023 4.027 591 1.273 714 4.92 4.027 1997 598 1254 719 1299 374 242
HEAVY RAIL sgarcy New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-MBTA Allerta-MARTA PhiladebiheSEPTA San Francisco-BART New York-MTA Bailmore-MMTA Los Angeles-LACMTA Philadebihe-NJ-PATC Clavelend-GRTA New York-MTA-SIRTOA	Number of Job 1,984 4,013 372 759 555 244 623 498 463 623 419 4,013 8 401 3 419 4,013 8 401 3 419 4,013	s per Square 1,985 4,105 394 773 574 864 4,105 509 480 641 426 4,105 s per Square 1985 574 641	Mile 1,986 4,178 4,178 793 590 278 684 4,178 590 1185 590 1185 590	4.184 436 908 908 4.184 515 515 576 441 4.184 1987 1173 676 307	4 235 452 840 611 299 691 4,235 536 528 691 450 4,235 4,235 1998 611 1203 691 324	4.262 467 509 306 701 954 4.262 549 541 461 4.262 1989 1227 701 337 178	4.210 472 592 311 701 982 4.210 553 545 701 465 4.210 592 1245 701 344 184	4.068 462 867 565 310 685 978 4.068 546 528 685 4.069 4.069 1991 565 1254 1254 1255 1255 1255 1254 187 189	4.023 460 570 318 681 962 4.023 543 521 681 457 4.023 1992 570 1203 681 1203 681 457 4.023	4.023 468 802 581 335 686 960 960 960 562 524 1.216 686 463 4.023 501 1199 501 1199 501 1216 337	4.058 476 906 595 354 696 969 969 872 533 1.224 696 476 4.058 1995 1205 896 1205	4.065 482 929 608 370 700 988 4.065 541 1.240 700 487 4.065 508 1223 700 1240 345 239 214	4.067 503 938 597 1.017 1.0070	4.027 506 950 950 379 714 1.023 4.027 591 1.273 714 4.027 4.027 4.027 1997 598 1254 719 1299 374 242 222 333 211
HEAVY RAIL sgarcy New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-MBTA Allerta-MARTA Philadelphis-SEPTA San Francisco-BART New York-MTA Balimor-MMTA Los Angelset-ACMTA Philadelphis-NL-PATC Clavaland-SCRTA New York-MTA-SIRTOA Light RAIL sgency Boston-MBTA San Diego Trailey Inc. San	Number of Job 1,984 4,013 372 759 555 244 623 498 463 623 419 4,013 8 401 3 419 4,013 8 401 3 419 4,013	s per Square 1,985 4,105 394 773 574 864 4,105 509 480 641 426 4,105 s per Square 1985 574 641	Mile 1,986 4,178 4,178 93 593 596 884 4,178 596 433 4,178 Mile 1986 590 1155 656	4.184 436 594 288 676 908 908 4.184 515 576 441 4.184 1987 1173 676 307 161	4 235 452 840 611 299 691 4.235 536 528 691 4.50 4.235 5.246 5.247 5.247 5.247 5.247 5.247 5.247 5.247 5.247 5.247 5.247 5.247 5.247 5.247 5.247 5.247 5.247 5.257 5.247 5.257 5.257 5.257 5.257 5.257 5.257 5.257 5.257 5.2577 5.257777777777	4.262 467 509 509 544 4.252 549 541 461 4.262 1989 1227 701 337 178 126 403	4.210 472 592 311 701 982 4.210 553 545 701 465 4.210 592 1245 701 344 184 184	4.068 462 867 565 310 685 978 978 546 528 685 460 4.068 4.068 4.068 1991 565 51234 885 51234 885 1234 885 1234 885 1234 885 1236 346	4.023 460 863 570 962 4.023 543 521 681 457 4.023 770 1203 681 1240 340 189 187 270 402 221	4.023 468 802 581 335 582 960 4.023 562 524 1.216 686 463 4.023 581 1199 581 1199 581 1199 581 1199 581 1216 337 196 184 273 402 524	4.058 476 906 595 354 696 969 969 872 533 1.224 696 476 4.058 1994 595 1205 896 1205 896 1224 341 2265 1295 896 1224 341 2265 1895 896 9276 1994 533	4.065 482 929 608 370 700 988 580 580 700 487 4.065 580 700 487 4.065 1995 508 1223 700 1240 345 2239 214 1945	4.067 503 938 597 371 1.017 4.067 585 554 1.282 714 488 4.067 1996 597 1246 714 1282 367 71246 714 240 217 240 217 205 245 245 421 554	4.027 506 950 950 1.023 4.027 591 1.273 7.14 4.027 598 1.264 7.19 7.598 1264 7.19 3.74 242 222 3.32 1289 3.74 242 255 559
HEAVY RAIL agency New York-MTA-NYCT Washington D.C.WMATA Chicago-RTA-CTA Boston-MBTA Alianta-MARTA Philadephis-SEPTA San Francisco-BART New York-PATHC Miami-MOTA Balimora-MMTA Disadephis-NJ-PATC Cleveland-GCRTA New York-MTA-SIRTOA LIGHT RAIL agency Boston-MBTA San Francisco-MUNI Philadephis-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. Si, Louis-BSDA Portand-TCMTDO Datas-DARTA Sacramerica-RTD Philadephis-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. Si, Louis-BSDA Portand-TCMTDO Datas-DARTA Baltimore-MMTA Butfilower-NMTA Baltimore-NMTA Baltimore-NMTA	Number of Job 1,984 4,013 372 759 555 244 623 498 463 623 419 4,013 8 401 3 419 4,013 8 401 3 419 4,013	s per Square 1,985 4,105 394 773 574 864 4,105 509 480 641 426 4,105 s per Square 1985 574 641	Mile 1,986 4,178 4,178 93 593 596 884 4,178 596 433 4,178 Mile 1986 590 1155 656	4.184 436 594 288 676 908 908 4.184 515 576 441 4.184 1987 1173 676 307 161	4 235 452 840 611 299 691 4.235 536 528 691 450 4.235 4.235 4.235 1998 611 1203 651 324 169 166 257	4.262 467 509 306 701 964 4.262 549 541 461 4.262 1989 1227 701 337 178 178 178 263	4.210 472 592 311 701 982 4.210 553 545 701 465 4.210 592 1245 701 344 184 184 269	4.068 462 867 565 310 685 978 978 978 546 528 685 460 4.068 4.068 4.068 1991 565 51234 885 51234 885 51234 885 1286 346	4.023 460 863 570 318 681 962 4.023 543 521 681 4.023 1992 570 1203 681 1240 340 189 187 270	4.023 468 802 501 335 686 960 4.023 524 1.216 686 463 4.023 524 4.023 581 1993 581 1819 1819 1819 1819 1819 1819 1819	4.058 476 906 595 354 696 969 969 4.058 572 533 1.224 4.058 4.058 4.058 4.058 1994 595 1205 696 1205 696 1205 696 1205 696 1205 696 1205 696 1205 696 595 1205 696 596 1205 696 1205 696 1205 696 595 596 597 597 597 597 597 597 597 597 597 597	4.065 405 929 608 370 700 988 4.065 580 541 1.240 4.065 580 4.065 1995 608 1223 700 1223 700 1244 194 271 827	4.067 503 938 597 1.017 1.017 1.017 1.067 585 554 1.282 714 4.067 1.282 597 1246 714 1286 714 1286 714 1286 241 2206 281 533	4.027 506 950 950 3379 714 1.023 4.027 591 1.273 714 4.027 4.027 4.027 1997 598 1264 719 1269 719 1264 719 1264 719 1264 719 222 333 211 285 659 842
HEAVY RAIL sgarcy New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Boston-MBTA Allerita-MARTA Philadelphis-SEPTA San Francisco-BART New York-MTA Balimor-MMTA Dalimor-MMTA Balimor-MMTA San Diego Trollery Inc. Si, Louis-BSDA Portland-TCMTDO Dalitas-DARTA Sacamenti-RTD Philadelphis-NETS Balimor-NMTA Sacamenti-RTD Philadelphis-PAT Bulfalo-NETS Balimor-MMTA	Number of Job 1,964 4,013 372 799 555 244 623 841 4,013 498 463 623 419 4,013 Number of Job 1964 623 264	s per Square 1,985 4,105 394 773 577 262 641 426 4,105 509 480 641 426 4,105 574 641 279	Mile 1,986 4,178 4,178 793 590 278 656 884 4,178 556 4,333 4,178 Mile 1986 590 1155 656 245 377	4.184 436 908 908 4.184 515 515 515 515 515 515 515 515 515 51	4 235 452 840 611 299 940 4.235 536 691 450 4.235 1988 611 1203 611 1203 611 324 168 257 393 787	4.262 467 609 954 4.262 549 541 461 4.262 1989 1227 701 337 178 128 128 128 128 128 128 128 128 128 12	4.210 472 592 311 701 982 4.210 553 545 701 465 4.210 592 1245 701 344 184 184	4.068 462 867 565 310 685 978 978 546 528 685 460 4.068 4.068 4.068 1991 565 51234 885 51234 885 1234 885 1234 885 1234 885 1236 346	4.023 460 863 570 962 4.023 543 521 681 457 4.023 770 1203 681 1240 340 189 187 270 402 221	4.023 468 802 581 335 582 960 4.023 562 524 1.216 686 463 4.023 581 1199 581 1199 581 1199 581 1199 581 1216 337 196 184 273 402 524	4.058 476 906 595 354 696 969 969 953 4.058 572 533 1.224 696 476 4.058 1994 595 5205 896 1205 896 1224 341 2265 1295 895 896 9276 1295 1295 895 895 895 895 895 895 895 895 895 8	4.065 482 929 608 370 700 988 580 580 700 487 4.065 580 700 487 4.065 1995 508 1223 700 1240 345 239 214 1945	4.067 503 938 597 371 1.017 4.067 585 554 1.282 714 488 4.067 1996 597 1246 714 1282 367 71246 714 240 217 240 217 205 245 245 421 554	4.027 506 950 950 1.023 4.027 591 1.273 7.14 4.027 598 1.264 7.19 7.598 1.264 7.19 3.74 2.42 2.23 3.32 1.289 3.74 2.42 2.22 3.32 1.289 3.74 2.42 2.559
HEAVY RAIL agency New York-MTA-NYCT Washington D.C.WMATA Chicago-RTA-CTA Boston-MBTA Alianta-MARTA Philadephis-SEPTA San Francisco-BART New York-PATHC Miami-MOTA Balimora-MMTA Disadephis-NJ-PATC Cleveland-GCRTA New York-MTA-SIRTOA LIGHT RAIL agency Boston-MBTA San Francisco-MUNI Philadephis-SEPTA Los Angeles-LACMTA San Francisco-MUNI Philadephis-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. Si, Louis-BSDA Portand-TCMTDO Datas-DARTA Sacramerica-RTD Philadephis-SCTD	Number of Job 1,984 4,013 372 759 555 244 623 498 463 623 419 4,013 8 401 3 419 4,013 8 401 3 419 4,013	s per Square 1,985 4,105 394 773 574 864 4,105 509 480 641 426 4,105 s per Square 1985 574 641	Mile 1,986 4,178 4,178 93 593 596 884 4,178 596 433 4,178 Mile 1986 590 1155 656	4.184 436 594 288 676 908 908 4.184 515 576 441 4.184 1987 1173 676 307 161	4 235 452 840 611 299 691 4.235 536 528 691 4.50 4.235 5.246 5.247 5.247 5.247 5.247 5.247 5.247 5.247 5.247 5.247 5.247 5.247 5.247 5.247 5.247 5.247 5.247 5.257 5.247 5.257 5.257 5.257 5.257 5.257 5.257 5.257 5.2577 5.257777777777	4.262 467 509 509 544 4.252 549 541 461 4.262 1989 1227 701 337 178 126 403	4.210 472 592 311 701 982 4.210 553 545 701 465 4.210 1990 592 1245 701 344 184 184 184 8269 406 812	4.068 462 967 565 310 685 978 4.068 546 528 685 460 4.068 4.068 1991 565 1234 1294 1295 1286 346 1865 1286 346 187 189 288 402 803	4.023 460 570 318 681 962 4.023 543 521 681 457 4.023 570 1203 570 1203 570 1203 340 189 187 1240 340 189 187 786	4.023 468 802 581 335 582 960 4.023 562 524 4.023 1993 581 1199 581 1199 1953 581 1199 1216 337 196 124 273 402 452 468	4.058 476 906 595 354 696 969 4.058 572 533 1.224 696 4.76 4.058 1994 595 1205 696 1224 341 235 206 109 276 408 533 801 219	4.065 405 929 608 370 988 4.065 580 541 1.240 4.055 1995 608 1223 700 1240 3245 239 214 134 279 411 541 827	4.067 503 938 597 1714 1.017 4.067 585 554 1.282 714 488 4.067 1282 714 488 4.067 1282 1295 1246 240 240 240 240 240 240 240 240 240 240	4.027 506 950 9593 3799 714 1.023 4.027 591 554 1.273 714 492 4.027 1997 598 1264 719 1299 374 242 223 333 211 288 425 559 842 225

Congestion Index

HEAVY RAIL	Travel Rate in	dex												
agency	1,984	1,985	1,986	1,987	1,988	1,989	1,990	1,991	1,992	1,993	1,994	1,995	1,996	1,997
New York-MTA-NYCT	1.22	1.24	1.25	1.26	1.27	1.29	1.32	1.32	1.31	1.31	1.32	1.34	1.34	1.35
Washington, D.CWMATA	1.31	1.29	1.30	1.32	1.34	1.36	1.38	1.39	1.39	1.39	1.38	1.39	1.42	1.42
Chicago-RTA-CTA	1.27	1.30	1.33	1.32	1.31	1.33	1.34	1.35	1.34	1.33	1.33	1.36	1.39	1.39
Boston-MBTA	1.17	1.16	1.19	1.18	1.22	1.24	1.27	1.28	1.28	1.32	1.32	1.33	1.34	1.34
Allanta-MARTA	1.17	1.19	1.21	1.21	1.19	1.19	1.20	1.18	1.20	1.23	1.30	1.30	1.34	1.36
Philadelphia-SEPTA	1.43	1.43	1,46	1.46	1.48	1.48	1.45	1.44	1.44	1.44	1.43	1.44	1.44	1,44
San Francisco-BART	1.17	1.19	1.20	1.21	1.23	1.24	1.22	1.23	1.23	1.24	1.26	1.26	1.28	1.27
New York-PATHC	1.22	1.24	1.25	1.26	1.27	1.29	1.32	1.32	1.31	1.31	1.32	1.34	1.34	1.35
Miami-MDTA	1.22	1.24	1.24	1.26	1.29	1.31	1.30	1.31	1.34	1.36	1.34	1.34	1.33	1.36
Ballimore-MMTA	1.18	1.18	1.20	1.20	1.22	1.24	1.27	1.25	1.24	1.25	1.26	1.28	1.28	1.28
Los Angeles-LACMTA										1.47	1.46	1.50	1.50	1.51
Philadelphia-NJ-PATC	1.43	1.43	1.46	1.46	1.48	1.48	1.45	1.44	1.44	1.44	1.43	1.44	1.44	1.44
Cleveland-GCRTA	1.07	1.07	1.08	1.08	1.09	1.11	1.11	1.12	1.12	1.14	1.15	1.19	1.21	1.23
New York-MTA-SIRTOA	1.22	1.24	1.25	1.26	1.27	1.29	1.32	1.32	1.31	1.31	1.32	1.34	1.34	1.35
101704	Travel Rate in													
LIGHT RAIL	1 ravel Kale in 1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
agency Boston-MBTA	1984	1.16	1,19	1301	1.22	1903	1.27	1.28	1.28	1.32	1.32	1.33	1.34	1,34
		1.16	1.19	1.46	1.22	1.48	1.27	1.20	1.26	1.32	1.32	1.33	1.44	1,44
San Francisco-MUNI	1.17	1.19	1.46	1.46	1.48	1.48	1.45	1.23	1.44	1.44	1.43	1.26	1.44	1.27
Philadelphia-SEPTA	1.17	1.13	1.20	1.21	1.25	1.24	1.22	1.51	1.50	1.47	1.46	1.50	1.50	1.51
Los Angeles-LACMTA	1.19	1.21		1.27	1.31	1.31	1.34	1.33	1.34	1.34	1.34	1.35	1.34	1.36
San Diego Trolley Inc.	1.19	1.21		1.27	1.31	1.31	1.34	1.33	1.34	1.34	1.34	1.30	1.34	1.30
SI. Louis-BSDA				1.21	1.21	1.22	1.23	1.23	1.25	1.30	1.30	1.30	1.34	1.30
Portland-TCMTDO				1.21	1.21	1.22	1.23	1.23	1.25	1.30	1.30	1.32	1.34	1.33
Dallas-DARTA					1.21	1.21	1.24	1.26	1.23	1.23	1.25	1.26	1.20	1.30
Sacramento-RTD			1.13	1,15	1.19	1.18	1.17	1.17	1.17	1.17	1.17	1.18	1.18	1.18
Pittsburgh-PAT Buffalo-NFTS			1.13	1.06	1.06	1.07	1.08	1.08	1.08	1.09	1.09	1.09	1.09	1.09
Ballimore-MMTA			1.06	1.00	1.00	1.07	1.00	1.00	1.24	1.05	1.26	1.28	1,28	1.28
San Jose-SCTD					1.33	1.33	1.34	1.36	1.34	1.25	1.33	1.35	1.35	1.34
New Orleans-RTA					1.33	1.33	1.34	1.30	1.04	1.34	1.33	1.33	1.35	1.25
Cieveland-GCRTA	1.07	1.07	1.08	1.08	1.09	1.11	1.11	1.12	1.12	1.14	1.15	1.19	1.20	1.23
Denver-RTD	1.07	1.07	1.08	1.06	1.05	1.11	1.11	1.12	1.12	1.14	1.15	1.31	1.31	1.34
Newark-NJTC	1.22				1.27	1.29	1.32	1.32	1.31	1.31	1.32	1.34	1.34	1.35
IAMMON V-IAD I C	1.22				1.27	1.23	1.52	1.52	1.57	1.57	1.52	1.04	1.54	1.55

Employed Population of Center City

HEAVY RAIL	Employed P	opulation												
agency	1,984	1,985	1,986	1,987	1,988	1,989	1,990	1,991	1,992	1,993	1,994	1,995	1,996	1.997
New York-MTA-NYCT	2,969,365	2,990,152	3,013,404	3,039,093	3,067,197	3,097,705	3,130,608	3,165,908	3,203,610	3,243,727	3,286,279	3,331,290	3,378,790	3,428,814
Washington, D.CWMATA	288,136	287,117	286,489	286,218	286,280	286,652	287,316	288,258	289,466	290,931	292,647	294,608	296,812	299,256
Chicago-RTA-CTA	1,191,409	1,183,916	1,177,390	1.171,797	1,167,112	1,163,308	1,160,366	1,158,266	1,156,993	1,156,534	1,156,878	1,158,017	1,159,946	1.162.662
Boston-MBTA	260,859	262,820	265,013	267,438	270,096	272,987	276,115	279,482	283,092	286,950	291,062	295,434	300,073	304,987
Allania-MARTA	165,624	164,545	163,727	163,135	162,740	162,520	162,454	162,526	162,723	163,032	163,446	163,955	164,555	165.239
Philadelphia-SEPTA	619,244	619,729	620,727	622,222	624,197	626,642	629,545	632,898	636,693	640,927	645,594	650,694	656,225	662,188
San Francisco-BART	489,368	492,732	496,562	500,844	505,566	510,720	516,299	522,300	528,721	535,563	542,828	550,521	558,647	567,215
New York-PATHC	2,969,365	2,990,152	3,013,404	3,039,093	3,067,197	3,097,705	3,130,608	3,165,908	3,203.610	3,243,727	3,286,279	3,331,290	3,378,790	3,428,814
Miami-MOTA	145,459	143,493	141,785	140,298	138,999	137,864	136,871	136,001	135,241	134,576	133,997	133,495	133,063	132,694
Saltimore-MMTA	299,683	299,278	299,221	299,494	300,083	300,975	302,159	303,628	305,377	307,400	309,695	312,262	315,100	318.210
Los Angeles-LACMTA										1,644,201	1,672,638	1,702,414	1,733,581	1.766.193
Philadelphia-NJ-PATC	619,244	619,729	620,727	622,222	624,197	626,642	629,545	632,898	636,693	640,927	645,594	650,694	656,225	662,188
Cleveland-GCRTA	194,645	190,789	187,192	183,833	180,695	177,762	175,020	172,456	170.057	167,813	165,714	163,750	161,914	160,197
New York-MTA-SIRTOA	2.969.365	2,990,152	3.013,404	3,039,093	3,067,197	3.097.705	3,130,608	3,165,908	3,203,610	3.243,727	3.286,279	3,331,290	3,378,790	3,428,814

LIGHT RAIL	Employed Po	pulation												
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Boston-MBTA		265,172	267,475		272,800		279,095	282,614	286,386	290,417	281,621	285,820	290,291	295,043
San Francisco-MUNI			352,770	355,563	358,683	362,121	365,872	369,929	374,290	378,954	363,872	368,667	373,765	379,172
Philadelphia-SEPTA	621,563	623,996	625,171	626,853	629,025	631,678	634,800	638,385	642,425	646,916	631,532	636,398	641,704	647,450
Los Angeles-LACMTA								1,823,551	1,854,000	1,885,852	1,791,962	1,822,462	1,854,396	1,887,820
San Diego Trolley Inc.	405,739	423,427		453,393	469,629	486,744	504,775	523,762	543,748	564,779	553,997	575,889	598,933	623,188
SI. Louis-BSDA											147,323	146,778	146,322	145,951
Portland-TCMTDO				200,624	204,948	209,466	214,182	219,099	224,225	229,564	222,001	226,841	231.875	237,107
Dallas-DARTA													478,520	483,527
Sacramenio-RTD					147,707	152,918	158,405	164,182	170,265	176,672	175,291	181,837	188,735	196,006
Pilitsburgh-PAT			155,904	154,080	152,408	150,878	149,480	148,205	147,046	145,995	140,065	139,100	138,225	137,436
Buffalo-NFTS			127,240	127,110	127,132	127,300	127,607	128,049	128,620	129,319	125,967	126,719	127,588	128,574
Baltimore-MMTA									309,700	311,913	301,443	303,438	305,693	308,208
San Jose-SCTD					381,407	391,964	402,984	414,486	426,490	439,019	420,685	432,400	444,617	457,360
New Orleans-RTA											159,441	157,275	155,260	153,385
Cleveland-GCRTA	195.549	192,218	188.673	185,368	182,287	179,414	176,734	174,235	171,904	169,731	162,039	159,906	157,904	156,025
Denver-RTD											209,166	208,189	207,331	206,589
Newark-NJTC	2,976,172				3,082,528	3,113,209	3,146.288	3,181,765	3,219,648	3,259,947	3,162,772	3,205,433	3.250,566	3.298,205

Percentage of Black Population in Center City

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HEAVY RAIL	Percentage													
agency	1.984	1,985	1,986	1,987	1,988	1,989	1,990	1,991	1,992	1,993	1,994	1,995	1,996	1,997
New York-MTA-NYCT	26.6	27.0	27.3	27.7	28.1	28.4	28.8	29.2	29.5	29.9	30.3	30.7	31.1	31.5
Washington, D.CWMATA	68,5	68.0	67.6	67.2	66.7	66.3	65.9	65.5	65.0	64.6	64.2	63.8	63.4	63.0
Chicago-RTA-CTA	39.5	39.4	39.4	39.3	39.2	39.1	39.0	39.0	38.9	38.8	38.7	38.6	38.6	38.5
Boston-MBTA	23.6	24.0	24.3	24.6	24.9	25.2	25.5	25.9	26.2	26.6	26.9	27.3	27.6	28.0
Alianta-MARTA	66.8	66.8	66.9	66.9	67.0	67.0	67.1	67.1	67.1	67.2	67.2	67.3	67.3	67.3
Philadelphia-SEPTA	38.6	38.8	39.1	39.3	39.5	39.7	39.9	40.1	40.3	40.5	40.7	41.0	41.2	41.4
San Francisco-BART	23.4	23.2	23.0	22.8	22.5	22.3	22.1	21.9	21.7	21.5	21.3	21.1	20.9	20.7
New York-PATHC	26.6	27.0	27.3	27.7	28.1	28.4	28.8	29.2	29.5	29.9	30.3	30.7	31.1	31.5
	25.9	26.2	26.4	26.6	26.8	27.1	27.3	27.5	27.7	28.0	28.2	28.5	28.7	28.9
Baltimore-MMTA	56.5	56,9	57.4	57.8	58.3	58.7	59.2	59.7	60,1	60.6	61.1	61.5	62.0	62.5
Los Angeles-LACMTA										13.1	12.9	12.6	12.4	12.1
Philadelphia-NJ-PATC	38.6	38.8	39.1	39.3	39.5	39.7	39.9	40.1	40.3	40.5	40.7	41.0	41.2	41.4
Cleveland-GCRTA	44.8	45.1	45,4	45.7	45.9	46.2	46.5	46.8	47.1	47.3	47.6	47.9	48.2	48.5
New York-MTA-SIRTOA	26.6	27.0	27.3	27.7	28.1	28.4	28.8	29.2	29.5	29.9	30.3	30.7	31.1	40.5
			2.1.0			20.0	20.0		20.0	23.5	50.5	50.7	31.1	31.5
LIGHT RAIL	Percentage													
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Boston-MBTA	23.6	24.0	24.3	24.6	24.9	25.2	25.5	25.9	26.2	26.6	26.9	27.3	27.6	28.0
San Francisco-MUNI	11.9	11.8	11.6	11.4	11.2	11.1	10.9	10.7	10.6	10.4	10.3	10.1	10.0	9.8
Philadelphia-SEPTA	38.6	38.8	39.1	39.3	39.5	39.7	39,9	40.1	40.3	40.5	40.7	41.0	41.2	41.4
Los Angeles-LACMTA								13.7	13.5	13.3	13.1	12.9	12.7	12.5
San Diego Trolley Inc.	9,1	9,1	9.2	9.2	9.3	9.3	9.3	9.4	9.4	9,5	9.5	9.6	9.6	9.7
St. Louis-BSDA											48.2	48.4	48.6	48.8
Portland-TCMTDO				7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.5	7.5	7.5	7.5
Dallas-DARTA									1.0	7.0	7.0	7.0	29.6	29.6
Sacramento-RTD				14.7	14.9	15.1	15.3	15.5	15.7	15.9	16.1	16.4	16.6	16.8
PHIsburgh-PAT	24.7	24.9	25.1	25.3	25.5	25.7	25.9	26.1	26.3					
	24.7	24.3								26.5	26.7	26.9	27.1	27.3
Buffalo-NFTS			29.1	29.5	29.9	30.3	30.7	31.1	31.6	32.0	32.5	32.9	33.4	33.9
Ballimore-MMTA									60.1	60.6	61.1	61.5	62.0	62.5
San Jose-SCTD					4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4,7
New Orleans-RTA	57.9	58.6	59.2	59.9	60.6	61.3	62.1	62.8	63.5	64.3	65.0	65.8	66.5	67.3
Cleveland-GCRTA	44.8	45.1	45.4	45.7	45.9	46.2	46.5	46.8	47.1	47.3	47.6	47.9	48.2	48.5
Denver-RTD											13.3	13.4	13.5	13.6
Newark-NJTC	26.6	27.0	27.3	27.7	28.1	28.4	28.8	29.2	29.5	29.9	30.3	30.7	31.1	31.5
		• .•												
Percentage of]	васк Ро	pulatio	i în Mei	гороц	an Area	L								
HEAVY RAIL	Percentage													
agency	1,984	1,985	1,986	1,987	1,988	1,989	1,990	1.991	1,992	1,993	1,994	1,995	1,996	1,997
New York-MTA-NYCT	24.4	24.7	25.0	25.4	25.7	26.0	26.4	26.7	27.1	27.5	27.8	28.2	28.6	29.0
Washington, D.CWMATA	25.7	25.6	25.6	25.5	25.5	25.5	25.4	25.4	25.3	25.3	25.2	25.2	25.2	25.1
Chicago-RTA-CTA	19.5	19.5	19.4	19.4	19.3	19.3	19.2	19.2	19,1	19.1	19.0	19.0	18.9	18.9
Boston-MBTA	4.1	4.2	4.3	4.5	4.6	4.7	4.8	4.9	5.1	5.2	5.3	5.5	5,6	5.7
Atlanta-MARTA	24.5	24.6	4.3	4.5	25.0	25.1	25.2	4.3 25.4	25.5	25.6			26.0	
	18.8	18.9	18.9	19.0	19.0	19.0	25.2	25.4			25.7	25.9		26.1
Philadelphia-SEPTA San Francisco-BART	18.8	18.9	18.9	19.0	19.0	19.0	19.1	19.1	19.2	19.2	19.3	19.3	19.3	19.4
New York-PATHC			25.0						11.4	11.4	11.3	11.2	11.2	11.1
	24.4	24.7	40.0	25.4	25.7	26.0	26.4	26.7	27.1	27.5	27.8	28.2	28.6	29.0

HEAVY RAIL	Percentage													
agency	1,984	1,985	1,986	1,987	1,988	1,989	1,990	1.991	1,992	1.993	1.994	1,995	1,996	1,997
New York-MTA-NYCT	24.4	24.7	25.0	25.4	25.7	26.0	26.4	26.7	27.1	27.5	27.8	28.2	28.6	29.0
Washington, D.CWMAT/	25.7	25.6	25.6	25.5	25.5	25.5	25.4	25.4	25.3	25.3	25.2	25.2	25.2	25.1
Chicago-RTA-CTA	19.5	19.5	19.4	19.4	19.3	19.3	19.2	19.2	19.1	19.1	19.0	19.0	18.9	18.9
Boston-MBTA	4.1	4.2	4.3	4.5	4.6	4.7	4.8	4.9	5.1	5.2	5.3	5.5	5.6	5.7
Allanta-MARTA	24.5	24.6	24.7	24.8	25.0	25.1	25.2	25.4	25.5	25.6	25.7	25.9	26.0	26.1
Philadelphia-SEPTA	18.8	18.9	18.9	19.0	19.0	19.0	19.1	19.1	19.2	19.2	19.3	19.3	19.3	19.4
San Francisco-BART	11.9	11.9	11.8	11.7	11.7	11.6	11.5	11.5	11.4	11.4	11.3	11.2	11.2	11.1
New York-PATHC	24.4	24.7	25.0	25.4	25.7	26.0	26.4	26.7	27.1	27.5	27.8	28.2	28.6	29.0
Miami-MDTA	18.6	18.9	19.2	19.5	19.9	20.2	20.6	20.9	21.3	21.7	22.0	22.4	22.8	23.2
Baltimore-MMTA	25.6	25.6	25.7	25.7	25.8	25.8	25.8	25.9	25.9	25.9	26.0	26.0	26.1	26.1
Los Angeles-LACMTA										10.8	10.7	10.5	10.4	10.3
Philadelphia-NJ-PATC	18.8	18.9	18.9	19.0	19.0	19.0	19.1	19.1	19.2	19.2	19.3	19.3	19.3	19.4
Cleveland-GCRTA	16.6	16.7	16.8	16.9	17.0	17.1	17.2	17.3	17.4	17.6	17.7	17.8	17.9	18.0
New York-MTA-SIRTOA	24.4	24.7	25.0	25.4	25.7	26.0	26.4	26.7	27.1	27.5	27.8	28.2	28.6	29.0
LIGHT RAIL	Percentage													
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Boston-MBTA	4.1	4.2	4.3	4.5	4.6	4.7	4.8	4.9	5.1	5.2	5.3	5.5	5.6	5.7
San Francisco-MUNI	8.2	8.1	8.0	7.9	7.8	7.7	7.6	7.5	7.4	7.3	7.2	7.1	7.0	7.0
Philadelphia-SEPTA	18.8	18.9	18.9	19.0	19.0	19.0	19.1	19.1	19.2	19.2	19.3	19.3	19.3	19.4
Los Angeles-LACMTA								11.0	10.9	10.8	10.7	10.5	10.4	10.3
San Diego Trolley Inc.	5.9	6.0	6.0	6.1	6.2	6.2	6.3	6.4	6.5	6.5	6.6	6.7	6.8	6.9
St. Louis-BSDA											17.0	17.0	17.0	17.1
Portland-TCMTDO				2.7	2.7	2.7	2.7	2.7	2.7	2.8	2.8	2.8	2.8	2.8
Dallas-DARTA													15.7	15.7
Sacramento-RTD				6.9	7.1	7.2	7.3	7.5	7.6	7.8	7.9	8.1	8.3	8.4
P#Isburgh-PAT	7.3	7.3	7.3	7.4	7.4	7.5	7.5	7.6	7.6	7.6	7.7	7.7	7.8	7.8
			9.8	9.9	10.0	10.1	10.2	10.3	10.5	10.6	10.7	10.8	10.9	11.0
Buffelo-NFTS									25.9	25.9	26.0	26.0	26.1	26.1
Baltimore-MMTA														
Baltimore-MMTA San Jose-SCTD					3.6	3.7	3.7	3.7	3.8	3.8	3.9	3.9	3.9	4.0
Baltimore-MMTA San Jose-SCTD New Orleans-RTA	33.5	33.7	33.9	34.1	34.3	34.6	34.8	35.0	3.8 35.3	3.8 35.5	3.9 35.7	3.9 36.0	36.2	36.4
Ballimore-MMTA San Jose-SCTD New Orleans-RTA Cleveland-GCRTA	33.5 16.6	33.7 16.7	33.9 16.8	34.1 16.9					3.8	3.8	3.9 35.7 17.7	3.9 36.0 17.8	36.2 17.9	36.4 18.0
Baltimore-MMTA San Jose-SCTD New Orleans-RTA					34.3	34.6	34.8	35.0	3.8 35.3	3.8 35.5	3.9 35.7	3.9 36.0	36.2	36.4

Percentage of Hispanic Population in Center City

HEAVY RAIL	Percentage													
agency	1,984	1.985	1.986	1,987	1,988	1,989	1,990	1,991	1,992	1,993	1.994	1,995	1.996	1.997
New York-MTA-NYCT	21.3	21.7	22.1	22.5	22.9	23.3	23.7	24.2	24.6	25.0	25.5	25.9	26.4	26.9
Washington, D.CWMATA		3.8	4.0	4.3	4.6	4.9	5.2	5.5	5.9	6.2	6.6	7.0	7.5	8.0
Chicago-RTA-CTA	16.0	16.5	17.0	17.5	18,1	18.6	19.2	19.8	20.5	21.1	21.8	22.5	23.2	23.9
Boston-MBTA	7.8	8.2	8.6	9.0	9.5	9.9	10.4	10.9	11.4	12.0	12.6	13.2	13.8	14.5
Atlanta-MARTA	1.6	1.6	1.7	1.7	1.8	1.9	1.9	2.0	2.1	2.2	2.2	2.3	2.4	2.5
Philadelphia-SEPTA	4.4	4.5	4.7	4.8	5.0	5.1	5.3	5.5	5.7	5.9	6.1	6.3	6.5	6.7
San Francisco-BART	12.1	12.3	12.5	12.7	12.9	13.1	13.3	13.5	13.8	14.0	14.2	14.5	14.7	15.0
New York-PATHC	21.3	21.7	22.1	22.5	22.9	23.3	23.7	24.2	24.6	25.0	25.5	25.9	26.4	26.9
Miami-MDTA	58.4	59.1	59.7	60.4	61.0	61.7	62.3	63.0	63.7	64.4	65.1	65.8	66.5	67.2
Ballimore-MMTA	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Los Angeles-LACMTA										43.8	45.4	47.0	48.8	50.5
Philadelphia-NJ-PATC	4.4	4.5	4.7	4.8	5.0	5.1	5.3	5.5	5.7	5.9	6.1	6.3	6.5	6.7
Cleveland-GCRTA	3.6	3.7	3.8	4.0	4.1	4.3	4.4	4.6	4.7	4.9	5.1	5.3	5.4	5.6
New York-MTA-SIRTOA	21.3	21.7	22.1	22.5	22.9	23.3	23.7	24.2	24.6	25.0	25.5	25.9	26.4	26.9
LIGHT RAIL	Percentage													
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Boston-MBTA	7.8	8.2	8.6	9.0	9.5	9.9	10.4	10.9	11.4	12.0	12.6	13.2	13.8	14.5
San Francisco-MUN	12.8	12.9	13.0	13.1	13.2	13.3	13.3	13.5	13.6	13.7	13.8	13.9	14.0	14.1
Philadelphia-SEPTA	4.4	4.5	4.7	4.8	5.0	5.1	5.3	5.5	5.7	5.9	6.1	6.3	6.5	6.7
Los Angeles-LACMTA								39.0	40.4	42.0	43.5	45.2	46.9	48.6
San Diego Trolley Inc.	16.8	17.3	17.8	18.4	18.9	19.5	20.1	20.8	21.4	22.1	22.7	23.4	24.2	24.9
SI. Louis-BSDA											1.2	1.2	1.2	1.2
Portland-TCMTDO				2.7	2.8	2.9	3.0	3.1	3.2	3.4	3.5	3.6	3.8	3.9
Dailas-DARTA													27.6	29.0
Sacramento-RTD				15.3	15.5	15.7	15.9	16.1	16.3	16.5	16.7	16.9	17.1	17.3
Pittsburgh-PAT	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0
Buffalo-NFTS			3.6	3.9	4.1	4.4	4.7	5.0	5.3	5.6	6.0	6.4	6.8	7.2
Ballimore-MMTA									1.0	1.0	1.0	1.0	1.0	1.0
San Jose-SCTD					25.3	25.7	26.1	26.5	26.9	27.3	27.8	28.2	28.7	29.1
New Orleans-RTA	3.3	3.3	3.3	3.3	3.3	3.2	3.2	3.2	3.2	3.1	3.1	3.1	3.1	3.1
Cleveland-GCRTA	3.6	3.7	3.8	4.0	4.1	4.3	4.4	4.6	4.7	4.9	5.1	5.3	5.4	5.6
Denver-RTD											24.7	25.1	25.6	26.2
Newark-NJTC	21.3	21.7	22.1	22.5	22.9	23.3	23.7	24.2	24.6	25.0	25.5	25.9	26.4	26.9
Percentage of	Hispanic	Popula	tion in 1	Metrop	olitan A	rea								
HEAVY RAIL	Percentage													
agency	1,984	1,985	1,986	1,987	1,988	1,989	1,990	1,991	1,992	1,993	1,994	1,995	1,996	1,997
New York-MTA-NYCT	19.2	19.5	19,9	20.3	20.7	21.1	21.6	22.0	22.4	22.9	23.3	23.8	24.2	24.7
Washington, D.CWMATA		3.8	4.1	4.3	4.6	4.9	5.2	5.6	6.0	6.4	6.8	7.2	7.7	8.2
Chicago-RTA-CTA	9.2	9.5	9.8	10.1	10.4	10.8	11.1	11.4	11.8	12.2	12.6	13.0	13.4	13.8

New York-MTA-NYCT 19.2 19.5 19.9 20.3 20.7 21.1 21.6 22.0 22.4 22.9 23.3 23.8 24.2 24.7 24.7 New York-MTA 36 3.8 4.1 4.3 4.6 4.9 5.2 5.6 6.0 6.4 6.8 7.2 7.7 8.2 Cheape-RTA-CTA 3.2 3.5 3.8 4.0 1.1 11.4 11.8 12.2 12.6 13.0 13.4 13.8 Boston-MBTA 3.0 3.1 3.3 3.6 3.8 4.0 4.2 4.5 4.8 5.1 5.4 5.8 6.2 6.5 San Francisco-BART 1.8 1.9 2.0 2.1 2.2 2.3 2.4 <t< th=""></t<>
Chicago-RTA-CTA 3.2 9.5 9.8 10.1 10.4 10.8 11.1 11.4 11.8 12.2 12.6 13.0 13.4 13.4 Deston-MARTA 1.4 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.6 2.7 Philadelphie-SEPTA 2.8 2.9 3.0 3.1 2.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.2 San Francisco-BART 11.8 12.0 12.3 12.6 12.8 13.1 13.4 13.7 13.9 14.2 14.6 14.9 15.5 New York-PATHC 19.2 19.5 19.9 20.3 20.7 21.1 21.6 22.0 22.4 22.9 23.3 23.8 24.2 24.7 Lis Angels-LATTA 1.0 1.0 1.1 1.1 1.1 1.2 1.2 1.3 1.3 1.3 1.4 1.4
Boston-MBTA 3.0 3.1 3.3 3.6 3.8 4.0 4.2 4.5 4.8 5.1 5.4 5.8 6.2 6.5 Marta-MARTA 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.6 2.7 PhedaphiPisSEPTA 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.2 San Francisco-BART 11.8 12.0 12.3 12.6 12.8 13.1 13.4 13.7 13.9 14.2 14.6 14.9 15.2 15.5 Battmore-MOTA 40.5 41.8 45.2 44.6 46.0 47.5 49.0 50.6 52.2 53.9 55.7 57.5 59.3 61.3 Diatophit-MOTA 1.0 1.1 1.1 1.1 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.3 1.3
Internet-MARTA 1.4 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.6 2.7 Philadebphi-SETA 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.2 San Francisco-BART 11.8 12.0 12.3 12.6 12.8 13.1 13.4 13.7 13.9 14.2 14.6 14.9 15.2 15.5 New York-PATHC 19.2 15.5 19.9 20.3 20.7 21.1 21.6 22.0 22.4 22.3 23.8 24.2 24.7 Balimore-MITA 1.0 1.0 1.1 1.1 1.1 1.2 1.2 1.3 1.3 1.4 1.4 1.4 Classing-GORTA 2.0 2.0 2.1 2.1 2.2 2.2 2.3 2.3 2.3 2.4 2.4 2.5 2.5 2.6 2.7
Philadelphi-SEPTA 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.2 3.5 3.6 3.7 3.8 5.9 4.0 4.2 3.5 3.6 3.7 3.8 3.9 4.0 4.2 3.5 3.6 3.7 3.8 3.9 4.0 4.2 3.5 3.6 3.7 3.8 3.9 4.0 4.2 3.5 3.6 3.7 3.8 3.9 4.0 4.2 3.5 3.5 3.6 3.7 3.8 3.9 4.0 4.2 3.5 3.5 3.6 3.7 3.8 3.9 4.0 4.2 3.5 3.5 3.6 3.7 3.8 3.9 4.0 4.2 3.5 3.5 3.6 3.7 3.8 3.9 4.0 4.2 3.5 3.5 3.6 3.7 3.8 3.9 4.0 4.2 3.5 3.8 3.7 3.8 3.9 4.0 4.2 3.5 3.7 3.8 3.9 4.0 4.2 3.5 3.7 3.8 3.9 4.0 4.2 3.5 3.7 3.8 3.9 4.0 4.2 3.5 3.7 3.8 3.9 4.0 4.2 3.5 3.8 3.7 3.8 3.9 4.0 4.2 4.5 4.8 5.1 5.5 5.9 5.1 5.9
San Francisco-BART 11.8 12.0 12.3 12.6 12.8 13.1 13.4 13.7 13.9 14.2 14.6 14.9 15.2 15.2 New York-MTAC 19.2 19.5 19.9 20.3 20.7 21.1 21.6 22.4 22.9 22.3 23.8 24.2 24.7 Memi-MDTA 1.0 1.0 1.1 1.1 1.2 1.2 1.3 1.3 1.4 1.4 1.4 1.4 Diad Angele-LACMTA 1.0 1.0 1.1 1.1 1.2 1.2 1.3 1.3 1.3 1.4 1.4 1.4 Philedelphile-NJ-PATC 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.2 Clevelend-GCRTA 2.0 2.1 2.1 2.2 2.2 2.3 2.3 2.3 2.3 2.3 2.3 2.3 2.3 2.3 2.3 2.3 <t< th=""></t<>
New York-PATHC 19.2 19.5 19.9 20.3 20.7 21.1 21.6 22.0 22.4 22.3 23.3 23.8 24.2 24.7 Mami-MDTA 40.5 41.8 43.2 44.6 46.0 47.5 49.0 50.6 52.2 53.9 55.7 57.5 59.3 61.3 Balmore-MMTA 1.0 1.0 1.1 1.1 1.2 1.2 1.2 1.3 1.3 1.4 1.4 1.4 Los Angeles-LACMTA 2.9 3.0 3.1 3.2 2.3 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.2 2.7 2.8 2.9 2.3 2.3 2.4 2.4 2.5 2.5 2.6 2.7 New York-MTA-SIRTOA 19.2 19.5 19.9 20.3 20.7 21.1 21.6 22.0 22.4 22.9 23.3 23.8 24.2 24.7 New York-MTA-SIRTOA 19.2 19.5 19.
Niem-MOTA 40.5 41.8 43.2 44.6 46.0 47.5 49.0 50.6 52.2 53.9 55.7 57.5 59.3 61.3 Balmors-MMTA 1.0 1.0 1.1 1.1 1.1 1.2 1.2 1.3 1.3 1.4 1
Light FAL Percentage agency 1985 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 LiGHT RAL Percentage agency 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 BedicryMBTA 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.2 LiGHT RAL Percentage agency 19.2 19.5 19.9 20.3 20.7 21.1 21.6 22.0 22.4 22.9 23.3 23.8 24.2 24.7 LIGHT RAL Percentage agency 1994 1995 1996 1990 1991 1992 1993 1994 1995 1996 1997 Bedior-MBTA 3.0 3.1 3.3 3.8 4.0 4.2 4.5 4.6
Philadephile-NJ-PATC 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.2 Cinveigen-GERTA 2.0 2.1 2.1 2.2 2.2 2.3 2.3 2.4 2.4 2.5 2.5 2.6 2.7 New York-MTA-SIRTOA 19.2 19.5 19.9 20.3 20.7 21.1 21.6 22.0 22.4 22.9 23.3 23.8 24.2 24.7 LIGHT RAL Percentage agency 1994 1965 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 Bedion-MBTA 3.0 3.1 3.3 3.6 3.8 4.0 4.2 4.5 4.8 5.1 5.4 5.8 6.2 6.5 San Francisco-MUNI 12.3 12.6 12.9 13.2 13.8 13.8 4.0 4.2 4.5 4.8 5.1 5.4 5.9 6.2 6.5 San Francisco-MUNI 12.3 12.6 12.9 13.2 13.5 13.8 14.1 14.5 14.8 15.2 15.5 15.9 16.3 16.7 Philedephile-SEPTA 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.2 Data 3.5 3.6 3.7 3.8 3.9 4.0 4.2 4.5 4.8 5.1 5.4 5.9 6.2 6.5 Control Control Contr
Clewelend-GCRTA 2.0 2.0 2.1 2.1 2.2 2.2 2.3 2.3 2.4 2.4 2.5 2.5 2.6 2.7 New York-MTA-SIRTOA 19.2 19.5 19.9 20.3 20.7 21.1 21.6 22.0 22.4 22.9 23.3 23.8 24.2 24.7 LIGHT RAL Percentage 3 3.1 3.3 3.6 1989 1990 1991 1992 1993 1994 1995 1996 1997 Bedor-MBTA 3.0 3.1 3.3 3.6 3.8 4.0 4.2 4.5 4.8 5.1 5.4 5.6 6.2 6.5 Sen Francisco-MUNI 12.3 12.6 12.2 13.2 13.8 13.4 13.4 3.5 3.6 3.7 3.8 3.9 4.0 4.2 LIGHT RAL Percentage 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.1 5.5 15.9
New York-MTA-SIRTOA 19.2 19.5 19.9 20.3 20.7 21.1 21.6 22.0 22.4 22.9 23.3 23.8 24.2 24.7 LIGHT RAL Percentage agency 1984 1985 1987 1988 1989 1991 1992 1993 1994 1995 1996 1997 Bedion-MBTA 3.0 3.1 3.3 3.6 3.8 4.0 4.2 4.5 4.8 5.1 5.4 5.8 6.2 6.5 5.6 5.6 7.6
LIGHT RAL Percentage egency 1994 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1996 Boaton-MBTA 3.0 3.1 3.3 3.6 3.8 4.0 4.2 4.5 4.8 5.1 5.4 5.8 6.2 6.5 San Francisco-MUNI 12.3 12.6 12.9 13.2 13.5 13.8 14.1 14.5 14.8 15.2 15.5 15.9 16.3 16.7 Philedephile-SEPTA 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.2 Dot Angeles-LACMTA
agency 1984 1985 1986 1987 1988 1980 1991 1992 1994 1995 1996 1997 Boston-MBTA 3.0 3.1 3.3 3.6 3.8 4.0 4.2 4.5 4.8 5.1 5.4 5.9 6.2 6.5 San Francisco-MUNI 12.3 12.6 12.9 13.2 13.8 14.1 14.5 14.8 15.2 15.5 15.9 16.3 16.7 Phileophin-SEPTA 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.2 Los Angeles-LACMTA 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.2 Los Angeles-LACMTA 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.2 4.3 4.3 4.5
agency 1984 1985 1986 1987 1988 1980 1991 1992 1994 1995 1996 1997 Boston-MBTA 3.0 3.1 3.3 3.6 3.8 4.0 4.2 4.5 4.8 5.1 5.4 5.9 6.2 6.5 San Francisco-MUNI 12.3 12.6 12.9 13.2 13.8 14.1 14.5 14.8 15.2 15.5 15.9 16.3 16.7 Phileophin-SEPTA 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.2 Los Angeles-LACMTA 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.2 Los Angeles-LACMTA 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.2 4.3 4.3 4.5
Bostor-MBTA 3.0 3.1 3.3 3.6 3.8 4.0 4.2 4.5 4.8 5.1 5.4 5.8 6.2 6.5 San Francisco-MUNI 12.3 12.6 12.9 13.2 13.5 13.8 14.1 14.5 14.8 15.2 15.5 15.9 16.3 16.7 Philadelphia-SEPTA 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.2 Los Angeles-LCAMTA 38.4 39.6 40.8 42.1 43.3 44.7 46.0
San Francisco-MUMI 12.3 12.6 12.9 13.2 13.5 13.8 14.1 14.5 14.8 15.2 15.5 15.9 16.3 16.7 Philadephile-SEPTA 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.2 Los Angeles-LACMTA 39.6 40.8 42.1 43.3 44.7 46.0
Philadelphila-SEPTA 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.2 Los Angeles-LACMTA 38.4 39.6 40.8 42.1 43.3 44.7 46.0
Los Angeles-LACMTA 38.4 39.6 40.8 42.1 43.3 44.7 46.0
SI, Louis-BSDA 1,1 1,1 1,1 1,1 1,1
Pontiend-TCMTDO 2.8 3.0 3.1 3.3 3.4 3.6 3.8 4.0 4.2 4.4 4.5
Dallas-DARTA 17.9 18.8
Sacramento-RTD 9.9 10.1 10.3 10.5 10.7 10.8 11.0 11.2 11.4 11.7 11.9
PMsburgh-PAT 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5
Buffalo-NFTS 1.7 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7
Bailmore-MMTA 1.3 1.3 1.4 1.4 1.4
San Jose-SCTD 19.9 20.2 20.5 20.8 21.2 21.5 21.9 22.2 22.6 22.9
New Orleans-RTA 4.0 4.0 4.0 4.1 4.1 4.1 4.1 4.1 4.1 4.1 4.2 4.2 4.2 4.2 4.2 4.2
Claveland-GCRTA 2.0 2.0 2.1 2.1 2.2 2.2 2.3 2.3 2.4 2.4 2.5 2.5 2.6 2.7
Deriver-RTD 13.4 13.6 13.7 13.9
Newark-NJTC 19.2 19.5 19.9 20.3 20.7 21.1 21.6 22.0 22.4 22.9 23.3 23.8 24.2 24.7

Number of Jobs in Metropolitan Area

HEAVY RAIL	Jobs													
agency	1,984	1,985	1,986	1,987	1,988	1,989	1,990	1,991	1,992	1,993	1,994	1,995	1,996	1,997
New York-MTA-NYCT	4,601,584	4,708,416	4,792,992	4,801,198	4,859,662	4,892,119	4,832,896	4,670,637	4,620,274	4,620,552	4,661,403	4,671,130	4,673,282	4,628,369
Washington, D.CWMATA	2,422,529	2,564,801	2,701,614	2,835,363	2,943,828	3,038,489	3,071,296	3,008,139	2,997,982	3,048,575	3,102,994	3,140,108	3,274,598	3.294,740
Chicago-RTA-CTA	3,863,554	3,929,891	4.029,840	4,148,809	4,258,287	4,359,732	4,411,398	4,386,803	4,363,636	4,459,983	4,575,764	4,688,845	4,730,926	4,787,600
Boston-MBTA	3,090,831	3,199,294	3,289,204	3,309,358	3,403,869	3,395,230	3,298,289	3,148,345	3,178,044	3,240,294	3,317,678	3,393,515	3,329,553	3,310,310
Allanta-MARTA	1,516,510	1,623,714	1,717,144	1,773,095	1,839,049	1,878,220	1,905,095	1,892,126	1,938,450	2,039,914	2,153,029	2,242,761	2,240,794	2,285,813
Philadelphia-SEPTA	2,409,130	2,477,791	2,531,514	2,609,663	2,666,988	2,705,872	2,703,983	2,639,800	2,624,711	2,643,654	2,679,488	2,694,783	2,745,938	2,745,579
San Francisco-BART	2,084,415	2,141,470	2,189,430	2,247,706	2,328,198	2,385,948	2,429,198	2,418,701	2,379,073	2,373,692	2,395,223	2,441,093	2,510,315	2,524,956
New York-PATHC	4,601,584	4,708,415	4,792,992	4,801,198	4,859,662	4,892,119	4,832,896	4,670,637	4,620,274	4,620,552	4,661,403	4,671,130	4,673,282	4,628,369
Miami-MDTA	972,325	991,884	1,006,932	1,004,705	1,044,305	1,067,868	1,075,103	1,060,670	1,055,119	1,092,261	1,110,842	1,126,128	1,134,046	1,145,214
Ballimore-MMTA	1,211,010	1,253,618	1,287,409	1,346,113	1,379,632	1,412,982	1,421,386	1,376,301	1,357,350	1,365,256	1,389,747	1,408,806	1,441,720	1,442,374
Los Angeles-LACMTA										4,932,443	4,962,749	5,029,233	5,197,116	5,160,461
Philadelphia-NJ-PATC	2,409,130	2,477,791	2,531,514	2,609,663	2,666,988	2,705,872	2,703,983	2,639,800	2,624,711	2,643,654	2,679,488	2,694,783	2,745,938	2,745,579
Cleveland-GCRTA	1,138,432	1,156,766	1,174,302	1,196,136	1,220,008	1,249,407	1,258,259	1,246,291	1,237,188	1,253,388	1,286,483	1,315,889	1,317,850	1,328,957
New York-MTA-SIRTOA	4,601,584	4,708,416	4,792,992	4,801,198	4,859,662	4,892,119	4,832,896	4,670,637	4,620,274	4,620,552	4,661,403	4,671,130	4,673,282	4,628,369

LIGHT RAIL	Jobs													
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Boston-MBTA	3,090,831	3,199,294	3,289,204	3,309,358	3,403,869	3,395,230	3,298,289	3,148,345	3,178,044	3,240,294	3,317,678	3,393,515	3,329,553	3,338,408
San Francisco-MUNI	1,136,959	1,155,361	1,173,415	1,191,667	1,221,920	1,247,069	1,265,074	1,253,238	1,222,508	1,218,362	1,224,149	1,242,127	1,266,216	1,274,457
Philadelphia-SEPTA	2,409,130	2,477,791	2,531,514	2,609,663	2,666,988	2,705,872	2,703,983	2,639,800	2,624,711	2,643,654	2,679,488	2,694,783	2,745,938	2,765,988
Los Angeles-LACMTA								5,221,163	5,031,195	4,932,443	4,962,749	5,029,233	5,197,116	5,223,485
San Diego Trolley Inc.	1,109,205	1,172,684	1,227,519	1,291,061	1,360,782	1,417,145	1,446,052	1,455,502	1,429,037	1,416,348	1,431,053	1,449,526	1,541,257	1.570,605
St. Louis-BSDA											1,500,678	1,528,016	1,533,223	1.550,264
Portland-TCMTDO				809,016	849,471	892,602	926,296	937,894	950,228	984,087	1,031,830	1,075,250	1,089,940	1,120,013
Dailas-DARTA													2,016,593	2.049,815
Sacramento-RTD				655,804	688,391	725,545	767,941	769,206	761,420	750,950	770,391	790,808	839,026	859,848
Pillsburgh-PAT	1,118,863	1,131,422	1,136,343	1,160,831	1,190,229	1.217,269	1,244,165	1,239,257	1,249,703	1,259,393	1,275,452	1,286,659	1,314,171	1,330,331
Buffalo-NFTS			592,278	599,034	616,371	631,625	637,300	629,867	630,595	630,388	638,475	644,147	658,402	664,863
Ballimore-MMTA									1,357,350	1,365,256	1,389,747	1,408,806	1,441,720	1,455,708
San Jose-SCTD					1,015,933	1,034,633	1.048,807	1.036,610	1,014,866	1,013,603	1.033,147	1,066,839	1,074,509	1.085.252
New Orleans-RTA	699,003	688,178	667,619	657,232	669,664	677,758	690,106	693,502	692,285	702,005	719,243	734,349	717,462	721,547
Cleveland-GCRTA	1,138,432	1,156,766	1,174,302	1,196,136	1,220,008	1,249,407	1,258,259	1,246,291	1,237,188	1,253,388	1,286,483	1,315,889	1,317,850	1.331,717
Denver-RTD											1,222,783	1,259,964	1,234,951	1.254,215
Newark-NJTC	4.601,584	4,708,416	4,792,992	4,801,198	4,859,662	4,892,119	4,832,896	4,670,637	4,620,274	4,620,552	4,661,403	4,671,130	4,673,282	4,664,904

Employed Persons in Metropolitan Area

HEAVY RAIL	Employed P	ersons												
agency	1,984	1,985	1,986	1,987	1,988	1,989	1,990	1,991	1,992	1,993	1,994	1,995	1.996	1,997
New York-MTA-NYCT	3,321,257	3,343,792	3,369,183	3,397,397	3,428,410	3,462,204	3,498,771	3,538,110	3,580.228	3.625,137	3,672,858	3,723,417	3,776,849	3,833,193
Washington, D.CWMATA	1,758,856	1,807,423	1,858,993	1,913,662	1,971,539	2,032,744	2,097,411	2,165,686	2,237,730	2,313,715	2,393,829	2,478,274	2,567,269	2,661,048
Chicago-RTA-CTA	3,181,430	3,197,486	3,215,786	3,236,340	3,259,164	3,284,280	3,311,716	3,341,505	3,373,686	3,408,307	3,445,418	3,485,078	3,527,353	3,572,314
Boston-MBTA	2,352,508	2,376,131	2,402,014	2,430,193	2,460,715	2,493,632	2,529,006	2,566,904	2,607,404	2,650,591	2,696,556	2,745,404	2,797,244	2.852,198
Allanta-MARTA	1,136,775	1,176,797	1,219,131	1,263,859	1,311,074	1,360,872	1,413,363	1,468,663	1,526,897	1,588,202	1,652,724	1,720,619	1,792,054	1.867,209
Philadelphia-SEPTA	1,993,683	2.016.920	2,041,964	2,068,843	2,097,590	2,128,244	2,160,848	2,195,452	2,232,109	2,270,880	2,311,829	2,355,027	2,400,550	2,448,482
San Francisco-BART	1,564,030	1,585,232	1,607,837	1,631,849	1,657,283	1,684,156	1,712,494	1,742,325	1,773,685	1,806,613	1,841,157	1,877,366	1,915,298	1,955,014
New York-PATHC	3,321,257	3,343,792	3,369,183	3,397,397	3,428,410	3,462,204	3,498,771	3,538,110	3,580,228	3,625,137	3,672,858	3,723,417	3,776,849	3,833,193
Miami-MDTA	732,874	742,430	752,806	763,962	775,867	788,494	801,821	815,832	830,515	845,860	861,862	878,519	895,832	913,803
Baltimore-MMTA	992,906	1,008,083	1,024,321	1,041,641	1,060,070	1,079,638	1,100,380	1,122,334	1,145,543	1,170,054	1,195,920	1,223,197	1,251,947	1.282,237
Los Angeles-LACMTA										3,975,147	4,047,127	4,122,065	4,200,069	4,281,254
Philadelphia-NJ-PATC	1,993,683	2.016,920	2,041,964	2,068,843	2,097,590	2,128,244	2,160,848	2,195,452	2,232,109	2,270,880	2,311,829	2,355,027	2,400,550	2,448,482
Cleveland-GCRTA	938,837	935,796	933,398	931,622	930,447	929,855	929,830	930,357	931,423	933,017	935,129	937,751	940,875	944,495
New York-MTA-SIRTOA	3,321,257	3,343,792	3,369,183	3,397,397	3,428,410	3,462,204	3,498,771	3,538,110	3,580,228	3,625,137	3,672,858	3,723,417	3,776.849	3,833,193

LIGHT RAIL	Employed P	ersons												
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Boston-MBTA	2,352,508	2,376,131	2,402.014	2,430,193	2,460,715	2,493,632	2,529,006	2,566,904	2,607,404	2,650,591	2,696,556	2,745,404	2,797,244	2,852,198
San Francisco-MUNI	730,102	734,274	739,037	744,374	750,274	756,729	763,732	771,281	779,377	788.022	797,220	806,981	817,312	828,228
Philadelphia-SEPTA	1,993,683	2,016,920	2,041,964	2,068,843	2,097,590	2,128,244	2,160,848	2,195,452	2,232,109	2,270,880	2,311,829	2,355,027	2,400,550	2,448,482
Los Angeles-LACMTA								3,839,657	3,906,023	3,975,147	4,047,127	4,122,065	4,200,069	4,281,254
San Diego Trolley Inc.	818,574	849,003	881,191	915,217	951,162	989,117	1,029,178	1,071,450	1,116,045	1,163,083	1,212,692	1,265,011	1,320,188	1.378,381
St. Louis-BSDA											1,138,869	1,154,264	1,170,396	1,187,263
Portland-TCMTDO				658,243	669,271	680,747	692,682	705,085	717,968	731.345	745,229	759,637	774,586	790,094
Dallas-DARTA													1,449,264	1,493,528
Sacramenio-RTD				513,005	531,901	551,884	573,012	595,345	618,951	643,900	670,271	698,148	727,619	758,783
Pilitsburgh-PAT	966,207	961,215	957.627	955,374	954,396	954,635	956,041	956,571	962,184	966,847	972,529	979,204	986,852	995,454
Buffelo-NFTS			498,228	499,783	501,752	504,130	506,908	510,083	513,649	517,606	521,951	526,684	531,806	537.317
Baltimore-MMTA									1,145,543	1,170,054	1,195,920	1,223,197	1.251.947	1.282,237
San Jose-SCTD					708,423	721,546	735,248	749,554	764,490	780,085	796,369	813,377	831,144	849,709
New Orleans-RTA	489,240	484,804	481,083	478,014	475,543	473,623	472,214	471,280	470,790	470,719	471.045	471,747	472,810	474,221
Cleveland-GCRTA	938,837	935,796	933,398	931,622	930,447	929,855	929,830	930,357	931,423	933.017	935,129	937,751	940,875	944,495
Denver-RTD											808,897	823.278	838,399	854,281
Newark-NJTC	3,321,257	3.343,792	3,369,183	3,397,397	3,428,410	3,462,204	3,498,771	3,538,110	3,580,228	3,625,137	3,672,858	3,723,417	3,776.849	3,833,193

Population of Center City

HEAVY RAIL	Population													
agency	1,984	1,985	1,986	1,987	1,988	1,989	1,990	1,991	1,992	1,993	1,994	1,995	1,996	1,997
New York-MTA-NYCT	7,170,960	7,196,008	7,221,143	7,246,366	7,271,677	7,297,076	7,322,564	7,348,141	7,373,807	7,399,564	7,333,253	7,359,941	7,386,726	7,413,608
Washington, D.CWMATA	625,569	622,418	619,283	616,164	613,060	\$09,972	606,900	603,843	600,802	597,775	567,094	560,423	553,830	547,315
Chicago-RTA-CTA	2,914,500	2,892,285	2,870,240	2,848,363	2,826,652	2,805,107	2,783,726	2,762,508	2,741,452	2,720,556	2,731,743	2,705,816	2,680,135	2,654,698
Boston-MBTA	567,483	568,610	569,740	570,873	572,007	573,144	574,283	575,424	576,568	577,714	547,725	546,221	544,721	543,226
Atianta-MARTA	412,337	409,226	406,138	403,073	400,032	397,013	394,017	391,044	388,093	385,164	396,052	393,266	390,499	387,752
Philadelphia-SEPTA	1,646,383	1,636,089	1,625,859	1,615,694	1,605,592	1,595,553	1,585,577	1,575,663	1,565,812	1,556,022	1,524,249	1,508,755	1,493,419	1,478,239
San Francisco-BART	1,048,757	1,056,515	1,064,331	1,072,208	1,080,145	1,088,142	1,096,201	1,104,321	1,112,504	1,120,749	1,101,602	1,110,297	1,119,061	1,127,893
New York-PATHC	7,170,960	7,196,008	7,221,143	7,246,366	7,271,677	7,297,076	7,322,564	7,348,141	7,373,807	7,399,564	7,333,253	7,359,941	7,386,726	7,413,608
Mami-MDTA	351,492	352,658	353,828	355,002	356,180	357,362	358,548	359,738	360,931	362,129	373,024	375,746	378,488	381,250
Ballimore-MMTA	766,063	760,971	755,913	750,888	745,897	740,939	736,014	731,122	726,262	721,434	702,979	695,107	687,323	679,626
Los Angeles-LACMTA										3,657,964	3,448,613	3,500,897	3,553,974	3,607,855
Philadelphia-NJ-PATC	1.646.383	1.636.089	1.625.859	1.615.694	1,605,592	1,595,553	1,585,577	1,575,663	1,565,812	1,556,022	1,524,249	1,508,755	1,493,419	1,478,239
Cleveland-GCRTA	545,500	538,641	531,867	525,179	518,576	512,055	505,616	499,258	492,980	486,781	492,901	485,465	478,141	470,928
New York-MTA-SIRTOA	7,170,960	7,196,008	7,221,143	7,246,366	7,271,677	7,297,076	7,322,564	7,348,141	7,373,807	7,399,564	7,333,253	7,359,941	7,386,726	7,413,608

LIGHT RAIL	Population													
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Boston-MBTA	567,483	568,610	569,740	570,873	572,007	573,144	574,283	575,424	576,568	577,714	578,862	580,012	581,165	582,320
San Francisco-MUNI	696,622	701,106	705,618	710,159	714,730	719.330	723,959	728,618	733,308	738,027	742.777	747,557	752,368	757,210
Philadelphia-SEPTA	1,646,383	1,636,089	1,625,859	1,615,694	1,605,592	1,595,553	1,585,577	1,575,663	1,565,812	1,556,022	1,546,293	1,536,625	1.527,017	1,517,469
Los Angeles-LACMTA								3.978,908	4,044,034	4,110,227	4,177,504	4,245,883	4,315,381	4,386,018
San Diego Trolley Inc.	962,898	986,067	1,009,794	1,034,091	1,058,974	1.084,455	1,110,549	1,137,271	1,164,636	1,192,660	1,221,358	1,250,746	1,280,841	1.311.661
SI. Louis-BSDA											376,142	371,175	366,273	361,437
Portland-TCMTDO				414,771	422,180	429,722	437,398	445,211	453,164	461,259	469,499	477,885	486,422	495,111
Dallas-DARTA													1,074,010	1,085,634
Sacramento-RTD				338,353	348,389	358,724	369,365	380,322	391,604	403,220	415,181	427,497	440,178	453,235
Pitisburgh-PAT	401,426	395,987	390,622	385,330	380,109	374,959	369,879	364,868	359,924	355,048	350,237	345,492	340,811	336,194
Buffalo-NFTS			339,713	336,778	333,868	330,983	328,123	325,288	322,477	319,691	316,928	314,190	311,475	308,784
Baltimore-MMTA									726,262	721,434	716,639	711,875	707,143	702,443
San Jose-SCTD					748,956	765,410	782,225	799,409	816,971	834,919	853,261	872,006	891,163	910,741
New Orleans-RTA	532,445	526,356	520,336	514,385	508,502	502,687	496,938	491,255	485,637	480,083	474,592	469,164	463,799	458,495
Cleveland-GCRTA	545,500	538,641	531,867	525,179	518,576	512,055	505,616	499,258	492,980	486,781	480,660	474,616	468,648	462,755
Denver-RTD											458,060	455,703	453,359	451,026
Newark-NJTC	7,170,960	7,196,008	7,221,143	7,246,366	7.271,677	7,297,076	7,322,564	7,348,141	7,373,807	7,399,564	7,425,410	7,451,346	7,477,373	7,503,491

Population of Metropolitan Area

HEAVY RAIL	Population													
agency	1,984	1,985	1,986	1,987	1,988	1,989	1,990	1,991	1,992	1,993	1,994	1,995	1,996	1,997
New York-MTA-NYCT	8,452,488	8,491,429	8,536,768	8,560,842	8,575,866	8,567,356	8,547,307	8,538,328	8,554,100	8,594,455	8,616,335	8,631,273	8.631,187	8,634,540
Washington, D.CWMATA	3,811,686	3,895,283	3,992,731	4,099,557	4,203,296	4,283,270	4,337,837	4,397,252	4,459,504	4,520,978	4,580,420	4,630,957	4,752,097	4,816,816
Chicago-RTA-CTA	7,289,936	7,301,085	7,319,224	7,343,845	7,357,678	7,387,481	7,424,644	7,476,636	7,538,046	7,594,695	7,643,864	7,685,517	7,690,745	7,738,738
Boston-MBTA	5,173,652	5,216,797	5,243,357	5,274,203	5,315,442	5,348,803	5,351,729	5,330,791	5,333,792	5,357,004	5,383,759	5,416,699	5,433,047	5,443,957
Atlanta-MARTA	2.483.526	2,577,191	2,671,021	2,764,493	2,846,202	2,912,195	2,977,832	3,054,316	3,136,415	3,231,521	3,337,767	3,440,738	3,494,759	3,575,887
Philadelphia-SEPTA	4.807.372	4,818,838	4,853,388	4,893,959	4,922,173	4,926,849	4,925,373	4,934,257	4,935,701	4,943,678	4,951,447	4,952,955	4,988,918	4,995,909
San Francisco-BART	3,428,080	3,479,465	3,523,866	3,558,999	3,603,440	3,656,981	3,690,431	3,727,581	3,769,599	3,802,057	3,819,448	3,837,896	3,907,563	3,941,897
New York-PATHC	8,452,488	8,491,429	8,536,768	8,560,842	8,575,866	8,567,356	8,547,307	8,538,328	8,554,100	8,594,455	8,616,335	8,631,273	8,631,187	8,634,540
Miami-MDTA	1,755,583	1,776,908	1,801,410	1,831,362	1,868,311	1,908,921	1,942,135	1,971,193	1,993,473	1,985,373	2,011,571	2,046,078	2.083,774	2,110,202
Baltimore-MMTA	2,244,735	2,255,970	2,285,633	2,309,719	2,340,870	2,360,610	2.389.232	2,412,214	2,430,166	2,444,430	2,458,234	2,468,007	2,508,307	2,529,664
Los Angeles-LACMTA										9,087,015	9,080,732	9,077,853	9,355,763	9,419,682
Philadelphia-NJ-PATC	4.807.372	4,818,838	4,853,388	4,893,959	4,922,173	4,926,849	4,925,373	4,934,257	4,935,701	4,943,678	4,951,447	4,952,955	4,988,918	4,995,909
Cleveland-GCRTA	2,242,677	2,232,001	2,220,801	2,213,756	2,202,004	2,203,366	2,203,406	2,210,342	2,217,328	2,220,392	2,231,773	2,232,199	2,217,415	2,221,815
New York-MTA-SIRTOA	8,452,488	8,491,429	8,536,768	8,560,842	8,575,866	8,567,356	8,547,307	8,538,328	8,554,100	8,594,455	8,616,335	8,631,273	8,631,187	8,634,540

LIGHT RAIL agency	Population 1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Boston-MBTA	5,173,652	5,216,797	5.243,357	5,274,203	5,315,442	5,348,803	5,351,729	5,330,791	5,333,792	5,357,004	5,383,759	5,416,699	5,433,047	5,451,643
San Francisco-MUNI	1,550,134	1,570,618	1,582,993	1,589,693	1,593,098	1,601,143	1,602,932	1,612,308	1,623,019	1,633,918	1,639,458	1,645,160	1,654,783	1,662,641
Philadelphia-SEPTA	4,807,372	4,818,838	4,853,388	4,893,959	4,922,173	4,926,849	4,925,373	4,934,257	4,935,701	4,943,678	4,951,447	4,952,955	4,988,918	5,001,751
Los Angeles-LACMTA								8,939,252	9,036,378	9,087,015	9,080,732	9,077,853	9,355,763	9,452,412
San Diego Trolley Inc.	2,066,419	2,126,090	2,196,834	2,275,309	2,364,284	2,444,380	2,513,581	2,551,105	2,597,117	2,606,660	2,614,669	2,626,714	2,771,353	2,826,136
St. Louis-BSDA											2,531,322	2,539,844	2,554,984	2,564,828
Portland-TCMTDO				1,415,447	1,446,277	1,479,070	1,526,705	1,571,587	1,608,201	1,647,739	1,681,796	1,717,079	1,738,718	1,772,209
Dalles-DARTA													3,019,322	3,072,855
Sacramento-RTD				1.202,738	1,245,576	1,290,239	1,353,507	1,394,468	1,416,112	1,429,828	1,441,490	1,460,302	1.535,357	1,571,326
Pittsburgh-PAT	2,504,749	2,466,170	2,440,272	2,419,507	2,405,482	2,396,221	2,395,128	2,399,270	2,405,450	2,407,588	2,400,458	2,389,475	2,369,642	2,362,026
Buffalo-NFTS			1,184,555	1,179,756	1,181,174	1,185,954	1,190,145	1,191,447	1,192,273	1,191,879	1,187,849	1,181,974	1,186,707	1,186,503
Ballimora-MMTA									2,430,166	2,444,430	2,458,234	2,468,007	2,508,307	2,530,100
San Jose-SCTD					1,472,234	1,498,121	1,497,905	1,509,924	1,527,179	1,543,841	1,555,229	1,573,606	1,591,110	1,606,777
New Orleans-RTA	1,350,467	1,349,897	1,347,337	1,327,369	1,310,318	1,296,918	1,284,037	1,290,503	1,299,527	1,304,787	1,310,282	1,314,167	1,286,712	1,282,289
Cleveland-GCRTA	2,242,677	2,232,001	2,220,801	2,213,756	2,202,004	2,203,366	2,203,406	2,210,342	2,217,328	2,220,392	2.231,773	2,232,199	2,217,415	2,217,144
Denver-RTD											1,795,112	1,830,343	1,811,171	1,833,153
Newark-NJTC	8,452,488	8,491,429	8,536,768	8,560,842	8,575,866	8,567,356	8,547,307	8,538,328	8,554,100	8,594,455	8,616,335	8,631,273	8,631,187	8,642,824

Employed Population Density of Center City

Employed Pop														
	-													
HEAVY RAIL agency	Employed pers 1,984	1,985	1,986	1,987	1,988	1,989	1,990	1,991	1,992	1,993	1,994	1,995	1,996	1
New York-MTA-NYCT	7,935	7,971	8,012	8,057	8,106	8,158	8,215	8,275	8,340	8,409	8,482	8,559 3,506	8,640	8
Washington, D.CWMATA	3,530 4,493	3,523 4,451	3,516 4,411	3,510 4,373	3,506 4,338	3,502 4,304	3,500 4,271	3,499 4,241	3,499 4,212	3,500 4,185	3,503 4,160	4,136	3,511 4,113	4
Chicago-RTA-CTA Boston-MBTA	4,540	4,548	4,558	4,570	4,583	4,597	4,614	4,631	4,651	4,672	4,694	4,719	4,744	- 4
Atlanta-MARTA	1,025	1,020	1,016	1,011	1,007	1,003	1,000	997	994 3.979	991 3,991	988 4.005	985 4.020	983 4.037	4
Philadelphia-SEPTA San Francisco-BART	3,937 3,820	3,936 3,834	3,937 3,849	3,940 3,864	3,945 3,880	3,951 3,897	3,959 3,914	3,968 3,933	3,952	3,971	3,992	4,013	4,036	-
New York-PATHC	7,935	7,971	8,012	8,057	8,106	8,158	8,215	8,275	8,340	8,409	8,482	8,559	8,640	
Miami-MDTA	3,496	3,452	3,410	3,370	3,330	3,292 3,205	3,255 3,201	3,220 3,198	3,185 3,197	3,152 3,197	3,119 3,198	3,088 3,201	3.056 3.205	:
Beltimore-MMTA Los Angeles-LACMTA	3,249	3,237	3,227	3,218	3,211	3,205	3,201	3,130	3,197	2,749	2,787	2,825	2,865	:
Philadelphia-NJ-PATC	3,937	3,936	3,937	3,940	3,945	3,951	3,959	3,968	3,979	3,991	4,005	4,020	4,037	4
Cleveland-GCRTA	2,175 7,935	2,136 7,971	2,099 8,012	2,064 8,057	2,031 8,106	1,999 8,158	1,969 8,215	1,941 8,275	1,914 8,340	1,889 8,409	1,864 8,482	1,842 8,559	1,820 8,640	•
New York-MTA-SIRTOA	7,935	7,371	0,012	0,007	0,100	0,100	0,210	0,270	0,010					
	Employed pers	sons per squa	ire mile											
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995 5.833	1996 5,910	
Boston-MBTA San Francisco-MUNI	5,490 7,457	5,548 7,526	5,582 7,573	5,621 7,628	5,664 7,690	5,713 7,759	5,766 7,835	5,825 7,916	5,888 8,004	5,956 8,099	5,761 7,772	5,833 7,869	7,973	
San Francisco-MON Philadelphia-SEPTA	4,582	4,603	4,615	4,631	4,650	4,673	4,699	4,728	4,762	4,798	4,687	4,726	4,769	
Los Angeles-LACMTA								3,508	3,564	3,621	3,438	3,493 1,767	3,551 1,835	
San Diego Trolley Inc. St. Louis-BSDA	1,262	1,315	1,359	1,405	1,453	1,504	1,558	1,615	1,674	1,737	1,701 2,372	1,767 2,362	1,835	
Portland-TCMTDO				1,702	1,706	1,712	1,718	1,724	1,732	1,740	1,651	1,656	1,661	
Dailas-DARTA							1,645	1.705	1.767	1,833	1,819	1,886	1,374 1,957	
Sacramento-RTD Pittsburgh-PAT	2,881	2,845	2,808	1,483 2,774	1.534 2.743	1,588 2,715	1,645 2,688	1,705	2,643	1,833	2,516	2,497	2,481	
Buffalo-NFTS	2,001	-,	3,097	3,103	3,113	3,126	3,143	3,163	3,187	3,214	3,140	3,168	3,199	
Baltimore-MMTA					2,263	2,307	2,353	2,400	3,828 2,450	3,853 2,502	3,722 2,378	3,744 2,424	3,769 2,473	
San Jose-SCTD New Orleans-RTA	1,013	997	964	973	2,263	2,307 955	947	941	936	932	918	915	912	
Cleveland-GCRTA	2,501			2,389	2,355	2.324	2,295	2,269	2,244	2,222	2,126	2,104	2,083	
	2,001	2,464	2,425	2,000										
	9,776	9,847	9,899	9,960	10,028	10,103	10,185	10,275	10,373	10,477	1,197 10,140	1,153 10,252	1,112 10.371	
Newark-NJTC	9,776	9,847	9,899	9,960	10,028						1,197	1,153		
Newark-NJTC Employed Pop	9.776 Dulation I	9,847 Density (9,899 of Metr	9,960	10,028						1,197	1,153		
Newark-NJTC Employed Pop HEAVY RAIL 899ncy	9,776 pulation I Employed perr 1,984	9,847 Density (sons per sque 1,985	9,899 of Metr are mile 1,986	9,960 O polita : 1,987	10,028 n Area 1,988	10,103	10,185	10,275	10,373	10,477	1,197 10,140 1,994	1,153 10,252 1,995	10,371	1
Newark-NJTC Employed Pop Heavy Ral agancy New York-MTA-NYCT	9.776 Dulation I Employed pers 1.984 2.896	9,847 Density (sons per squa 1,985 2,915	9,899 of Metr 1,986 2,937	9,960 Po polita 1,987 2,961	10,028 n Area 1,968 2,987	10,103 1,989 3,016	10,185 1,990 3,048	10,275 1,991 3,081	10,373 1,992 3,118	10,477 1,993 3,156	1,197 10,140 1,994 3,197	1.153 10.252 1.995 3.241	10.371 1.996 3.287	1
Newark-NJTC Employed Pop HEAVY RAL agency New York-MTA-NYCT Washington, D.GWMATA	9.776 pulation I Employed per 1.984 2.896 270	9,847 Density (sons per sque 1,985 2,915 278	9,899 of Metr 1,986 2,937 286	9,960 Opolita 1,987 2,961 294	10,028 n Area 1,968 2,967 303	10,103 1,989 3,016 312	10,185	10,275	10,373	10,477	1,197 10,140 1,994	1,153 10,252 1,995	10,371	1
Newark-NJTC Employed Pop HEAVY RAL agancy New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Baston-META	9.776 pulation I Employed per 1.984 2.896 270 625 422	9,847 Density (sons per sque 1,985 2,915 278 629 426	9,899 of Metr 1,986 2,937 286 633 431	9,960 opolita 1,987 2,961 294 638 436	10,028 n Area 1,968 2,967 303 643 441	1,989 3,016 312 648 447	10,185 1,990 3,048 322 654 4,54	1,991 3,001 333 660 460	10,373 1,992 3,118 344 667 468	10,477 1,993 3,156 355 674 475	1,197 10,140 1,994 3,197 368 682 483	1.153 10.252 1.995 3.241 380 691 492	10.371 1.996 3.287 394 699 501	1
Newark-NJTC Employed Pop HEAVY RAL sgancy New York-MTA-NYCT Washington, D.CWMATA Onlago-RTA-CTA Boston-MBTA Alianta-MBTA	9.776 Dulation I Employed per 1.984 2.896 2.70 625 422 183	9,847 Density (1,995 2,915 278 629 426 190	9,899 of Metr 1,996 2,937 286 633 431 197	9,960 9,960 9,960 1,987 2,961 294 638 436 205	10,028 n Area 1,968 2,967 303 643 441 213	1,989 3,016 312 648 447 222	1.990 3.048 322 554 454 231	1.991 3.081 333 660 460 240	10,373 1,992 3,118 344 667 468 250	10,477 1,993 3,156 355 674	1,197 10,140 1,994 3,197 368 662	1.153 10.252 1.995 3.241 380 691	1.996 3.287 394 699	1
Newark-NJTC Employed Pop HEAVY RAL agoncy New York MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Jalanta-MARTA Allanta-MARTA	9.776 pulation I Employed per 1.984 2.896 270 625 422	9,847 Density (sons per sque 1,985 2,915 278 629 426	9,899 of Metr 1,996 2,937 286 633 431 197 529 649	9,960 opolita 1,987 2,961 294 638 436	10,028 n Area 1,968 2,967 303 643 441	1,989 3,016 312 648 447	10,185 1,990 3,048 322 654 4,54	1,991 3,001 333 660 460	10,373 1,992 3,118 344 667 468	1.993 3.156 355 674 475 261	1,197 10,140 1,994 3,197 368 682 483 272 600 745	1.153 10,252 1,995 3,241 380 691 492 284 612 760	1.996 3.287 394 699 501 296 624 776	1
Newark-NJTC Employed Pop HEAVY RAL agency New York-MTA-NYCT Washington, D.CWAATA Nokago-RTA-CTA Boston-MBTA Allanta-MRTA Philadephia SEPTA Sen Francisco-BART New York-PATHC	9.776 pulation I Employed per- 2.896 2.70 625 422 183 516 631 2.896	9,847 Density (1,985 2,915 2,915 2,78 622 426 190 522 640 2,915	9,899 of Metr 1,986 2.937 286 633 431 197 529 643 2.937	9,960 opolita: 1,987 2.961 2.961 2.961 2.961 2.951 5.36 6.59 2.961	10,028 n Area 1,988 2,997 303 643 441 213 544 669 2,987	1,989 3,016 312 648 447 222 552 681 3,016	10,185 1,990 3,048 322 654 454 231 560 692 3,048	1.991 3.061 33.031 33.05 460 240 570 704 3.061	10,373 1,992 3,118 344 667 468 250 579 717 3,118	10,477 1,993 3,156 555 674 475 261 590 731 3,156	1,197 10,140 1,994 3,197 368 662 483 272 600 745 3,197	1.153 10,252 1.995 3.241 380 691 492 284 612 760 3.241	1.996 3.287 399 501 296 624 776 3.287	1
Newark-NJTC Employed Pop HEAVY RAL agency New York-MTA-NYCT Washington, D.CWMATA Chicago RTA-CTA Boston-MBTA Alanta-MARTA Philadephia-SEPTA San Francisco-BART New York-PATHC Mam-MATA	9,776 Dulation I 1,964 2,896 270 625 422 183 516 631 2,896 376	9,847 Density (1,995 2,915 2,78 629 426 190 522 640 2,915 381	9,899 of Metr 1,996 2,937 286 633 431 197 529 649 2,937 529 649 386	9,960 opolita: 1,987 2.961 294 638 436 205 536 659 2.961 392	10,028 n Area 1,988 2,987 303 643 441 213 544 669 2,987 398	10,103 1,989 3,016 312 648 447 222 552 661 3,016 405	10,185 1,990 3,048 322 654 454 231 560 692 3,048 412	1,991 3,081 333 660 240 570 704	10,373 1,992 3,118 344 667 468 250 579 717	10,477 1,993 3,156 355 674 475 261 590 731	1,197 10,140 1,994 3,197 368 682 483 272 600 745 3,197 444	1.153 10,252 1,995 3.241 380 691 492 284 612 760 3.241 453	10,371 1,996 3,287 394 699 501 296 624 776 3,287 462	1
Newark-NJTC Employed Pop HEAVY RAL agancy Nork-MTA-NYCT Washington, D.CWMATA Okiaga-RTA-CTA Boston-MBTA Alianta-MARTA Philadephia-SEPTA San Francisco-BART Nava York-ATHC Miamt-MATA Baitmor-MMTA	9.776 pulation I Employed per- 2.896 2.70 625 422 183 516 631 2.896	9,847 Density (1,985 2,915 2,915 2,78 622 426 190 522 640 2,915	9,899 of Metr 1,966 2.937 286 633 431 197 529 649 2.937 386 392	9,960 opolita: 1,987 2,961 294 638 436 205 536 659 2,961 392 399	10,028 n Area 1,988 2,987 303 643 441 213 543 441 669 2,987 398 406	10,103 1,989 3,016 312 648 447 225 552 661 3,016 405 414	10,185 1,990 3,048 322 654 231 560 692 3,048 412 422	1.991 3.081 333 660 240 570 704 3.081 420 430	10,373 1,992 3,118 344 667 468 250 579 717 3,118 427 439	10,477 1,993 3,156 355 674 475 261 590 731 3,156 436 436 439 980	1,197 10,140 1,994 3,197 368 668 682 680 745 3,197 444 459 998	1.153 10,252 1.995 3.241 380 691 492 284 612 760 3.241 453 470 1.017	1.996 3.287 399 501 296 624 776 3.287 462 462 462 461 1.036	,
Newark-NJTC Employed Pop HEAVY RAL agency New York-MTA-NYCT Washington, D.CWMATA Okcago-RTA-CTA Boston-MBTA Allanta-MARTA Philadephia-SEPTA San Francisco-BART New York-PATHC Marti-MATA Los Angeles-LACMTA Philadephia-NJ-PATC	9,776 Dulation I 2,994 2,994 2,994 2,994 270 625 270 635 515 6316 376 376 376 376	9,847 Density (1,985 2,915 2,915 2,915 2,915 2,915 2,915 2,915 3,911 3,866 522	9,899 of Metr 1,966 2,937 286 633 431 197 529 649 2,937 386 392 529	9,960 0 polita 1,987 2,961 294 638 436 659 2,961 392 399 536	10,028 n Area 1,988 2.997 303 643 441 213 544 659 2.987 398 406 406 544	1,989 3,016 312 552 681 3,016 3,016 3,016 4,05 4,14 552	10,185 1,990 3,048 302 654 454 231 560 692 3,048 412 422 560	1,991 3,001 333 660 460 570 704 3,001 420 570 704 3,001 430 570	10,373 1,992 3,118 344 667 468 250 679 717 3,118 427 717 3,118 439 579	10,477 1,993 3,156 3,55 674 475 261 590 731 3,156 436 449 980 590	1,197 10,140 1,994 3,197 368 682 483 272 600 745 3,197 444 459 998 600	1,153 10,252 1,995 3,241 380 691 492 284 612 760 3,241 453 760 3,241 453 470 1,017 612	1,996 3,267 394 699 501 296 624 776 3,267 462 481 1,036 624	,
Derwerk-NJTC Newerk-NJTC Employed Pop HEAVY RAL agency New York-MTA-NYCT Washington, D.CWAATA New York-MTA- New York-MTA- Baitmore-MMTA Baitmore-MMTA Baitmore-MMTA Baitmore-MMTA Baitmore-MMTA Baitmore-MMTA San Francisco-BART New York-PATHC Marth-MDTA Baitmore-MMTA Baitmore-MMTA Baitmore-MMTA Baitmore-MMTA Baitmore-MMTA Baitmore-Signed-Signed Signed-Signed-Signed Signed-Signed-Signed Signed-Signed-Signed Baitmore-Signed-Signed Baitmore-Signed-Signed Baitmore-Signed-Signed Baitmore-Signed-Signed Baitmore-Signed-Signed Baitmore-Signed-Sign	9,776 Dulation I Employed peri 1,984 2,896 270 625 422 183 516 631 2,896 376 380	9,847 Density of 1,985 2,915 2,78 629 4,26 190 2,315 3,81 3,86	9,899 of Metr 1,966 2.937 286 633 431 197 529 649 2.937 386 392	9,960 opolita: 1,987 2,961 294 638 436 205 536 659 2,961 392 399	10,028 n Area 1,988 2,987 303 643 441 213 543 441 669 2,987 398 406	10,103 1,989 3,016 312 648 447 225 552 661 3,016 405 414	10,185 1,990 3,048 322 654 231 560 692 3,048 412 422	1.991 3.081 333 660 240 570 704 3.081 420 430	10,373 1,992 3,118 344 667 468 250 579 717 3,118 427 439	10,477 1,993 3,156 355 674 475 261 590 731 3,156 436 436 439 980	1,197 10,140 1,994 3,197 368 668 682 680 745 3,197 444 459 998	1.153 10,252 1.995 3.241 380 691 492 284 612 760 3.241 453 470 1.017	1.996 3.287 399 501 296 624 776 3.287 462 462 462 461 1.036	1
Newark-NJTC Employed Pop HEAVY RAL agency New York-MTA-NYCT Washington, DcWMATA Chicago RTA-CTA Boston-MBTA Boston-MBTA Balimor-MMTA Balimor-MMTA Balimor-MMTA Balimor-MMTA New York-PATHCC Save Januar - MMTA New York-MTA-SIRTOA	9,776 Employed peri 1,984 270 625 422 183 516 386 380 516 346 2,895	9,847 Density (1,986 2,78 278 279 426 190 522 640 2,915 386 522 345 2,315	9,899 of Metr 1,996 1,996 1,996 2,937 286 649 2,937 396 392 392 392 392 392 392 393	9,960 opolita: 1,987 2,961 294 436 205 538 436 205 538 436 205 539 2,961 392 399 399 339	10,028 n Area 1,988 2,987 303 643 441 213 544 669 2,987 398 406 544 406 544	1,989 3,016 312 648 447 252 661 3,016 405 414 452 252 343	10,185 1,990 3,048 322 654 454 231 560 692 3,046 412 422 560 343	10,275 1,991 3,081 333 660 240 570 704 3,081 420 430 570 344	10,373 1,992 3,118 344 667 468 250 579 717 3,118 427 439 579 344	10,477 1,993 3,156 355 674 475 261 590 731 3,156 436 449 990 990 345	1,197 10,140 1,994 3,197 368 682 483 272 683 272 683 272 53,197 444 459 996 500 745 3,197 444	1.153 10.252 1.995 3.241 380 691 492 284 612 760 3.241 453 470 1.017 612 347	1.996 3.287 334 699 501 296 624 776 3.287 481 1.036 624 42 481 1.036 624 348	1
Newark-NJTC Employed Pop HEAVY RAL agency New York-MTA-NYCT Washington, D.CWMATA Chicago RTA-CTA Bestor-MBTA Alarata-MRTA Philadephia-SEPTA San Francisco-BART New York-MTA-SIRTOA Baltimora-MMTA Los Angeles-LACMTA New York-MTA-SIRTOA	9,776 Dulation I 1,964 2,896 200 625 422 183 516 531 2,896 376 330 516 346	9,847 Density (1,985 2,915 2,915 2,915 2,915 2,915 3,915 3,915 3,915 3,915 3,915 3,915 3,915 3,915 3,915 3,915	9,899 of Metr 1,996 1,996 1,996 2,937 286 649 2,937 396 392 392 392 392 392 392 393	9,960 opolita: 1,987 2,961 294 659 2,961 392 399 536 659 2,961 392 399 536 344 2,961	10,028 n Area 1,988 2,987 303 643 441 213 544 669 2,987 398 406 544 406 544	1,989 3,016 312 648 447 252 661 3,016 405 414 452 252 661 3,016 405 414	10,185 1,990 3,048 322 654 454 231 560 692 3,046 412 422 560 343	10,275 1,991 3,081 333 660 240 570 704 3,081 420 430 570 344	10,373 1,992 3,118 344 667 468 250 579 717 3,118 427 439 579 344	10,477 1,993 3,156 355 674 475 261 590 731 3,156 436 449 990 990 345	1,197 10,140 1,994 3,197 368 682 483 272 683 272 683 272 53,197 444 459 996 500 745 3,197 444	1.153 10.252 1.995 3.241 380 691 492 284 612 760 3.241 453 470 1.017 612 347	1.996 3.287 334 699 501 296 624 776 3.287 481 1.036 624 42 481 1.036 624 348	1
Newark-NJTC Employed Pop HEAVY RAL agency New York-MTA-NYCT Washington, D.CWMATA Chicagor TA-CTA Baston-MBTA Baston-MBTA Baston-MBTA San Francisco-BART New York-MTA-SIRTOA Bailmore-MMTA Los Angeles-LACMTA Philadephia-NPATC Claveland-GCRTA New York-MTA-SIRTOA	9,776 Employed peri 1,994 2,996 270 625 270 635 156 631 516 631 2,896 376 3376 346 2,896 516 346 2,896 Employed peri 1984 422	9,847 Density (1,985 2,915 2,915 2,915 2,915 2,915 3,915 3,915 3,915 3,915 3,915 3,915 3,915 3,915 3,915 3,915 3,915 3,915	9,899 of Metr 1,966 2,967 2,967 2,937 2,937 3,966 3,92 5,29 3,44 2,937 3,96 3,92 5,29 3,44 2,937 3,96 3,92 5,29 3,44 2,937	9,960 opolita: 1,987 2,961 2,961 2,961 3,92 3,99 5,36 3,44 2,961 3,92 3,99 5,36 3,44 2,961	10,028 n Area 1,988 2,987 303 643 544 669 2,987 398 406 544 343 2,987 1988 441	1,989 3,016 3,016 3,12 648 447 2552 661 405 414 552 343 3,016 1989 447	10,185 1.990 3,048 3,048 254 254 2560 692 3,048 412 422 2560 343 3,048	10,275 1,991 3,001 3,001 3,001 4,00 240 570 7,04 3,001 4,20 4,30 570 3,001 570 3,001 1991 460	10,373 1,992 3,118 3,44 468 250 579 717 3,118 427 439 579 3,44 3,118	10,477 1,993 3,156 3,156 550 731 590 731 3,156 439 990 345 3,156 1993 475	1,197 10,140 1,994 3,197 368 668 683 272 600 745 3,197 444 459 998 600 346 3,197	1,153 10,252 1,995 3,241 3,241 3,241 4,52 2,264 6,12 7,50 3,241 4,53 4,70 1,017 6,12 3,241 3,241 3,241 4,53 4,73 3,241	10.371 1.996 3.267 3.94 501 2.956 524 7.76 3.267 4.81 1.035 6.24 4.81 3.287 1.9956 501	1
Newark-NJTC Employed Pop HEAVY RAL agency New York-MTA-NYCT Washington, DcWMATA Chicago-RTA-CTA Washington, DcWMATA Alianta-MARTA Philadeiphia-SEPTA San Francisco BART New York-PATHC Milliadeiphia-NJEATA Batimora-MMTA Batimora-MMTA Batimora-MMTA Batimora-MMTA San Francisco-MMTA San Francisco-MMTA San Francisco-MMTA	9,776 Pulation I Employed per 1,986 2,896 270 625 422 183 516 380 516 342 2,896 376 380 516 342 2,896 376 380 516 342 2,896 376 380 516 342 2,896 376 376 380 516 342 2,896 376 346 2,896 376 380 516 342 2,896 376 380 516 342 2,896 376 346 2,896 376 347 347 347 347 347 347 347 347	9,847 Density (1,985 2,915 2,915 2,915 2,915 426 190 2,915 386 522 446 2,915 386 522 345 2,915 396 2,915 346 346 2,915 346 346 346 346 346 346 346 346	9,899 of Metr 1,966 1,966 2,937 286 649 2,937 299 649 2,937 392 529 549 2,937 392 529 344 2,937 392 529 344 2,937	9,960 opolita 1,987 2,961 294 638 436 205 536 659 2,961 392 399 536 344 2,961 1987 436 733	10,028 n Area 1,988 2,987 303 643 643 2,987 398 406 544 343 2,987 1988 441 738	10,103 1,989 3,016 310 648 447 7222 552 681 3,016 414 552 343 3,016 1989 447 745	10,185 1,990 3,048 322 654 454 454 423 3,048 422 560 343 3,048 1990 454 752	10,275 1,991 3,001 3,001 3,001 450 240 570 704 430 570 3,001 420 430 570 3,001 420 430 570 3,001 440 430 570 570 570 570 570 570 570 57	10,373 1,992 3,118 344 667 468 250 579 717 3,118 427 439 579 3,44 3,118 1992 468 767	10,477 1,993 3,156 3,55 674 475 590 7,31 3,156 436 436 436 590 7,31 3,156 436 436 436 436 436 436 436 436 435 3,156	1,197 10,140 1,994 3,197 3,682 483 272 600 745 3,197 444 459 998 600 3,46 3,197 444 459 998 500 3,46 3,197	1,153 10,252 1,995 3,241 3,80 6,91 4,92 2,84 6,61 2,760 3,241 4,53 4,70 1,017 3,741 1,915 4,92 3,241	10.371 1.996 3.207 3.94 599 501 296 624 481 1.036 624 3.287 1.996 501 804	1
Newark-NJTC Employed Pop HEAVY RAL agency New York-MTA-NYCT Washington, D.CWMATA Chicagor TA-CTA Beston-MBTA Allanta-MARTA Philadephia-SEPTA San Francisco-BART New York-MTA-SIRTOA Bailmora-MMTA Los Angeles-LACMTA Philadephia-NPATC Clavaland-GCRTA New York-MTA-SIRTOA	9,776 Employed peri 1,994 2,996 270 625 270 635 156 631 516 631 2,896 376 3376 346 2,896 516 346 2,896 Employed peri 1984 422	9,847 Density (1,985 2,915 2,915 2,915 2,915 2,915 3,915 3,915 3,915 3,915 3,915 3,915 3,915 3,915 3,915 3,915 3,915 3,915	9,899 of Metr 1,966 2,967 2,967 2,937 2,937 3,966 3,92 5,29 3,44 2,937 3,96 3,92 5,29 3,44 2,937 3,96 3,92 5,29 3,44 2,937	9,960 opolita: 1,987 2,961 2,961 2,961 3,92 3,99 5,36 3,44 2,961 3,92 3,99 5,36 3,44 2,961	10,028 n Area 1,988 2,987 303 643 544 669 2,987 398 406 544 343 2,987	1,989 3,016 3,016 3,12 648 447 2552 661 405 414 552 343 3,016 1989 447	10,185 1.990 3,048 3,048 254 254 2560 692 3,048 412 422 2560 343 3,048	10,275 1,991 3,001 3,001 3,001 4,00 240 570 7,04 3,001 4,20 4,30 570 3,001 4,20 4,30 570 3,001 4,20 4,30 570 3,001 4,20 4,30 570 3,001 4,20 4,40 5,70 5	10,373 1,992 3,118 3,44 468 250 579 717 3,118 427 439 579 3,44 3,118	10,477 1,993 3,156 3,156 550 731 590 731 3,156 439 990 345 3,156 1993 475	1,197 10,140 1,994 3,197 368 668 683 272 600 745 3,197 444 459 998 600 346 3,197	1,153 10,252 1,995 3,241 3,241 3,241 4,52 2,264 6,12 7,50 3,241 4,53 4,70 1,017 6,12 3,241 3,241 3,241 4,53 4,70 3,241 1,915 4,92	10.371 1.996 3.287 3.94 501 2.95 501 2.95 524 7.76 3.287 3.287 3.287 1.995 501	1
Newark-NJTC Employed Pop HEAVY RAL agency New York-MTA-NYCT Washington, D.CWMATA ChicagoRTA-CTA Beston-MBTA Alanta-MARTA Philadephia-SEPTA San Francisco-BART New York-MTA-SIRTOA Bailmora-MMTA Los Angeiss-LACHTA New York-MTA-SIRTOA Bailmora-MMTA Los Angeiss-LACHTA New York-MTA-SIRTOA	9,776 Pulation I Employed per 1,996 2,896 270 625 422 183 516 380 516 342 2,896 376 380 516 342 2,896 376 380 516 342 2,896 376 380 516 342 2,896 376 376 380 516 342 2,896 376 346 2,896 376 380 516 342 2,896 376 380 516 342 2,896 376 346 2,896 376 347 347 347 347 347 347 347 347	9,847 Density (1,985 2,915 2,915 2,915 2,915 426 190 2,915 386 522 446 2,915 386 522 345 2,915 396 2,915 346 346 2,915 346 346 346 346 346 346 346 346	9,899 of Metr 1,966 1,966 2,937 286 649 2,937 299 649 2,937 392 529 549 2,937 392 529 344 2,937 392 529 344 2,937	9,960 opolita 1,987 2,961 294 638 436 205 536 659 2,961 392 399 536 344 2,961 1987 436 733	10,028 n Area 1,988 2,987 303 643 643 2,987 398 406 544 343 2,987 544 343 2,987	10,103 1,989 3,016 312 648 447 222 552 681 3,016 414 552 343 3,016 414 552 414 552 444 3,016 414	10,185 1,990 3,048 322 654 454 454 423 3,048 422 560 343 3,048 1990 454 752	10,275 1,991 3,081 3,081 3,081 4,00 240 240 3,081 570 3,081 1991 440 759 570	10,373 1,992 3,118 344 468 250 579 717 3,118 427 427 427 427 3,118 579 344 3,118 1992 468 767 579	10,477 1,993 3,156 355 674 475 261 3,156 436 449 980 345 3,156 1993 475 776 590	1.197 10.140 1.994 3.197 368 483 272 670 483 272 745 500 745 3.197 444 459 998 249 346 3.197	1,153 10,252 1,995 3,241 3,241 3,241 4,53 4,70 1,017 5,241 4,53 4,70 1,017 3,241 4,53 4,70 1,017 3,241 4,53 4,70 1,017 3,241 1,995 4,92 7,94 4,92 7,94 4,92 7,94 4,92 7,94 4,92 7,94 4,92 7,94 4,92 7,95 4,92 7,95 6,92 7,95 6,92 7,95 6,92 7,95 6,92 7,95 6,92 7,95 6,92 7,95 6,92 7,95 7,95 7,95 7,95 7,95 7,95 7,95 7,95	1.996 3.267 3.947 3.947 3.947 3.947 5.01 2.96 5.624 4.62 4.62 4.62 4.62 4.62 4.62 4.62	1
Newark-NJTC Employed Pop HEAVY RAL agency New York-MTA-NYCT Washington, D.CYWATA Chicago RTA-CTA Boston-MBTA San Francisco-BART New York-PATHC Marin-MUTA Bailmore-MMTA Bailmore-MMTA Bailmore-MMTA Bailmore-MMTA Bailmore-MMTA New York-MTA-SIRTOA	9,776 Pulation I 1,994 2,896 270 625 422 183 516 380 516 386 2,896 376 380 516 380 516 386 2,896 376 380 516 386 2,896 376 386 2,896 376 380 516 386 2,896 376 386 2,896 376 386 2,896 376 386 2,896 376 386 2,896 376 386 2,896 376 386 2,896 376 386 376 386 376 386 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 386 386 386 386 386 386 38	9,847 Density (1,985 2,915 2,915 2,915 2,915 426 190 2,915 386 522 446 2,915 386 522 345 2,915 345 2,915 345 2,915 345 2,915 346 2,915 345 2,915 345 2,915 345 2,915 345 2,915 345 2,915 345 2,915 345 2,915 352 2,915 352 2,915 352 2,915 352 2,915 352 2,915 352 2,915 352 2,915 352 2,915 352 2,915 352 2,915 352 2,915 352 2,915 352 352 352 352 352 352 352 35	9,899 of Metr 1,966 2,937 286 392 2,937 392 529 344 2,937 392 529 344 2,937 394 2,937 344 2,937	9,960 opolita 1,997 2,961 2961 2961 2961 392 399 536 344 2,961 392 399 536 344 2,961 392 399 536 344 2,961 392 399 536 2,961 392 399 536 2,961 392 399 536 2,961 392 399 536 2,961 392 399 536 2,961 392 399 536 2,961 392 399 536 2,961 392 399 536 2,961 392 399 536 2,961 392 399 536 2,961 392 399 536 2,961 392 399 536 2,961 399 536 346 2,961 399 536 346 2,961 399 536 346 2,961 399 536 346 2,961 399 536 346 2,961 399 536 346 2,961 399 536 346 346 2,961 399 536 346 346 2,961 399 536 346 346 2,961 399 536 346 2,961 399 536 346 2,961 399 536 346 346 2,961 399 536 346 2,961 399 536 336 2,961 398 536 336 2,961	10,028 n Area 1,988 2,987 303 643 441 213 544 659 2,987 398 406 544 333 2,987 1988 441 738 544 225	1,989 3,016 312 648 447 252 661 3,016 3,016 3,016 552 343 3,016	10,185 1,990 3,048 322 554 454 454 423 3,048 422 560 343 3,048 1990 454 752 560 245	10,275 1,991 3,081 3,081 3,081 420 430 570 704 420 430 570 3,081 420 570 3,081 420 570 3,44 3,081 420 570 570 570 570 570 570 570 57	10,373 1,992 3,118 344 667 468 250 579 717 3,118 427 439 579 3,44 3,118 1992 468 767 579 344 3,118	10,477 1,993 3,156 3,55 674 4,75 2,61 5,90 7,71 3,156 4,36 4,36 4,36 5,90 5,90 5,90 5,90 5,90 5,90 5,90 5,90	1,197 10,140 1,994 3,197 368 682 483 272 600 745 3,197 444 459 998 600 745 3,197 444 459 998 600 346 3,197	1,153 10,252 1,995 3,241 380 691 492 284 612 760 3,241 453 470 1,017 612 3,241 453 470 1,017 612 3,241 453 470 1,017 612 3,241 453 470 1,017 612 1,017 1,017 612 1,017 1	1.996 3.287 3.94 699 501 296 624 776 3.297 462 481 1.036 624 3.287 1996 501 804 624 3.287	1
Newark-NJTC Employed Pop HEAVY RAL agency New York-MTA-NYCT Washington, DcWMATA Chicago-RTA-CTA Boston-MBTA Bastimora-MATA Bastimora-MATA Bastimora-MATA Bastimora-MATA Desan Francisco-MAR New York-PATHCC Mam-MDTA Bastimora-MATA Light RAL agency Boston-MBTA San Francisco-MIN Philadelphia-SEPTA New York-MTA-SIRTOA	9,776 Pulation I 1,994 2,896 270 625 422 183 516 380 516 386 2,896 376 380 516 380 516 386 2,896 376 380 516 386 2,896 376 386 2,896 376 380 516 386 2,896 376 386 2,896 376 386 2,896 376 386 2,896 376 386 2,896 376 386 2,896 376 386 2,896 376 386 376 386 376 386 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 386 386 386 386 386 386 38	9,847 Density (1,985 2,915 2,915 2,915 2,915 426 190 2,915 386 522 446 2,915 386 522 345 2,915 345 2,915 345 2,915 345 2,915 346 2,915 345 2,915 345 2,915 345 2,915 345 2,915 345 2,915 345 2,915 345 2,915 352 2,915 352 2,915 352 2,915 352 2,915 352 2,915 352 2,915 352 2,915 352 2,915 352 2,915 352 2,915 352 2,915 352 2,915 352 352 352 352 352 352 352 35	9,899 of Metr 1,966 2,937 286 392 2,937 392 529 344 2,937 392 529 344 2,937 394 2,937 344 2,937	9,960 opolita: 1,987 2,361 294 336 2,961 392 339 536 344 2,961 	10,028 n Area 1,988 2,987 303 643 643 2,987 398 406 544 343 2,987 1988 441 738 544	1,989 3,016 312 648 447 222 681 3,016 405 414 552 343 3,016	10,185 1,990 3,048 322 654 454 454 423 3,048 422 560 343 3,048 1990 454 752 560	1,991 3,081 3,081 3,081 3,081 4,20 5,70 7,704 4,30 5,70 3,44 3,081 3,081 4,20 5,70 3,44 3,081 1,991 4,60 7,59 5,70 9,946	10,373 1,992 3,118 344 667 468 250 579 717 3,118 427 439 579 3,44 3,118 1992 468 767 579 953	10,477 1,993 3,156 3,55 674 4,75 2,61 5,90 7,71 3,156 4,36 4,36 4,36 5,90 5,90 5,90 5,90 5,90 4,45 5,156	1.197 10.140 1.994 3.197 368 483 272 670 483 272 745 500 745 3.197 444 459 998 586 3.197	1,153 10,252 1,995 3,241 380 691 492 284 612 760 3,241 451 760 3,241 453 470 1,017 3,241 453 470 1,017 3,241 453 470 1,017 3,241 1,995 1,997 1,995 1,995 1,997 1,997 1,9	1.996 3.287 3.94 501 295 501 295 624 481 1.036 624 481 1.036 624 3.287 19996 501 804 624 3.287	1
Newark-NJTC Employed Pop HEAVY RAL agency New York-MTA-NYCT Washington, DcWMATA ChicagorTA-CTA Boston-MBTA Baltimort-MMTA Baltimort-MMTA Baltimort-MMTA Baltimort-MMTA Baltimort-MMTA Baltimort-MMTA LightT RAL agency Boston-MBTA Son Francisco-MICN New York-MTA-SIRTOA	9,776 Employed peri 1,994 2,994 270 625 422 183 516 346 2,895 356 346 2,895 516 346 2,895 516 346 2,895 516 346 2,895 516 346 2,895 1944 1956 1956	9,847 Density (1,995 2,995 2,78 629 426 1995 2,915 386 522 345 2,915 386 522 345 2,915 386 522 345 2,915	9,899 of Metr 1,996 1,996 2,937 286 392 2,937 386 392 529 344 2,937 364 392 529 344 2,937 364 392 529 344 2,937	9,960 opolita : 1,987 2,961 294 636 399 2,961 399 536 344 2,961 1987 436 733 536 218 131 125	10,028 n Area 1,988 2.987 303 644 2.987 303 644 2.987 399 406 544 343 2.987 399 406 544 343 2.987	10,103 1,989 3,016 312 552 661 3,016 405 414 552 343 3,016 1989 447 745 552 235 135	10,185 1,990 3,048 322 554 454 454 423 3,048 412 560 343 3,048 1990 454 752 560 245 138 140	10,275 1,991 3,081 3,081 3,081 420 570 3,081 420 570 3,081 420 570 3,081 1991 450 759 570 344 3,081 1991 1991 450 759 570 346 1991 1995 1995 1991 1991 1995	10,373 1,992 3,118 3,118 3,118 427 439 579 3,44 3,118 1992 468 767 579 344 3,118 1992 468 767 579 363 265 143 152	10,477 1,993 3,156 355 449 380 3,156 435 449 380 3,156 435 3,156 435 3,156 435 3,156 1993 475 776 590 390 3277 145 158	1,197 10,140 1,994 3,197 368 483 272 600 745 3,197 444 459 996 600 346 3,197 444 83 765 3,197	1,153 10,252 1,995 3,241 3,241 3,241 4,92 2,244 6,12 7,60 3,241 4,51 2,244 6,12 3,241 4,51 3,241 1,915 4,92 3,241 1,915 4,92 7,94 4,92 7,94 4,92 3,241 1,995 3,241 3,241 3,241 3,241 1,995 3,241	10.371 1.996 3.267 3.94 599 501 296 624 776 3.287 462 481 1.036 524 3.287 1996 501 804 624 1.036 3.14 183 3.14 183 195 195 195 195 195 195 195 195	1
Newark-NJTC Employed Pop HEAVY RAL agency New York-MTA-NYCT Washington, D.GWMATA ChicagoRTA-CTA Boston-MBTA San Francisco-BART New York-MTA-SRTOA Miant-MARTA Philadephia-NJ-PATC Chicago Tolive, NATA San Francisco-MATA Lisk Angeles-LACMTA New York-MTA-SRTOA LightT RAL agency Philadephia-NJ-PATC Chicago Tolive, MCA San Standson, Stand	9,776 Pulation I 1,994 2,896 270 625 422 183 516 380 516 386 2,896 376 380 516 380 516 386 2,896 376 380 516 386 2,896 376 386 2,896 376 380 516 386 2,896 376 386 2,896 376 386 2,896 376 386 2,896 376 386 2,896 376 386 2,896 376 386 2,896 376 386 376 386 376 386 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 376 386 386 386 386 386 386 386 38	9,847 Density (1,985 2,915 2,915 2,915 2,915 2,915 386 522 640 2,915 386 522 345 2,915 395 2,915 396 522 345 2,915 345 2,915 346 2,915 345 2,915 345 2,915 345 2,915 345 2,915 345 2,915 345 2,915 345 2,915 345 2,915 345 2,915 345 2,915 352 2,915 352 2,915 352 2,915 352 2,915 352 2,915 352 2,915 352 2,915 352 2,915 352 2,915 352 2,915 352 2,915 352 352 352 352 352 352 352 35	9,899 of Metr 1,966 2,937 226 633 431 197 529 649 2,937 386 392 529 344 2,937 386 392 529 344 2,937	9,960 opolita: 1,987 2,961 294 638 436 295 339 2,961 392 399 536 344 2,961 1987 436 733 536 733 536 218 131 125 206	10,028 1,968 2.967 303 643 544 669 2.987 398 406 544 343 2.987 1968 441 738 544 441 738 544 215 133 130 226	1,989 3,016 312 648 447 2552 681 3,016 405 414 552 343 3,016 1989 447 745 552 235 135 135 135	10,185 1,990 3,048 322 654 454 231 560 3,048 412 422 560 343 3,048 1990 454 752 560 245 138 140 207	10,275 1,991 3,001 3,001 3,001 420 430 570 3,001 420 430 570 3,001 420 430 570 3,001 420 430 570 3,001 420 430 570 3,001 420 430 570 3,001 420 430 570 3,001 420 430 570 3,001 420 430 570 3,001 420 430 570 3,001 420 430 570 3,001 420 430 570 570 3,001 420 430 570 570 3,001 420 430 570 570 3,001 420 430 570 3,001 420 430 570 570 3,001 144 3,001 144 3,001 144 3,001 144 3,001 144 3,001 144 3,001 144 3,001 144 3,001 144 140 140 140 140 140 140	10,373 1,992 3,118 3,118 344 667 779 3,118 427 439 579 3,44 3,118 579 3,44 3,118 1992 468 767 579 344 3,118 1992 468 767 579 344 1992 468 767 757 963 265 143 152 208	10,477 1,993 3,156 3,555 674 475 261 3,156 436 449 980 345 3,156 1993 345 3,156 1993 445 3,156 1993 445 1993 445 1993 445 1993 445 1993 445 1993 445 1993 445 1993 445 1993 1995 1993 1995 19	1,197 10,140 1,994 3,197 3,68 662 483 272 600 745 3,197 444 453 3,197 444 453 3,197 1994 483 785 600 346 3,197 1994 483 785 600 346 3,197 1994 483 785 600 346 3,197 3,197 3,197 444 444 453 785 600 346 3,197 3,197 444 444 453 785 800 346 3,197 3,197 444 444 444 444 444 444 444 444 444 4	1,153 10,252 1,995 3,241 3,241 452 284 612 760 3,241 453 470 1,017 612 3,241 453 470 1,017 512 472 3,241 1995 492 784 612 2,324 1995 1,995	1.996 3.287 394 599 501 296 624 776 3.287 481 1.036 624 483 3.287 19996 501 804 624 1.035 314 183 154 125 1199 214	1
Newark-NJTC Employed Pop HEAVY RAL agency New York-MTA-NYCT Washington, Dc. JWATA Milarita-MARTA Milarita-MARTA Milarita-MARTA Milarita-MARTA Milarita-MARTA Milarita-MARTA Milarita-MARTA Milarita-MARTA Baltimora-MARTA Baltimora-MARTA Baltimora-MARTA Baltimora-MARTA Baltimora-MARTA Baltimora-MARTA San Francisco-MARN New York-MTA-SIRTOA	9,776 Employed peri 1,994 2,994 270 625 422 183 516 346 2,895 356 346 2,895 516 346 2,895 516 346 2,895 516 346 2,895 516 346 2,895 1944 1956 1956	9,847 Density (1,995 2,995 2,78 629 426 1995 2,915 386 522 345 2,915 386 522 345 2,915 386 522 345 2,915	9,899 of Metr 1,996 1,996 2,937 286 392 2,937 386 392 529 344 2,937 364 392 529 344 2,937 364 392 529 344 2,937	9,960 opolita : 1,987 2,961 294 636 399 2,961 399 536 344 2,961 1987 436 733 536 218 131 125	10,028 n Area 1,988 2.987 303 644 2.987 303 644 2.987 399 406 544 343 2.987 399 406 544 343 2.987	10,103 1,989 3,016 312 552 661 3,016 405 414 552 343 3,016 1989 447 745 552 235 135	10,185 1,990 3,048 322 554 454 454 423 3,048 412 560 343 3,048 1990 454 752 560 245 138 140	10,275 1,991 3,081 3,081 3,081 420 570 3,081 420 570 3,081 420 570 3,081 1991 450 759 570 344 3,081 1991 1991 450 759 570 346 1991 1995 1995 1991 1991 1995	10,373 1,992 3,118 3,118 3,118 427 439 579 3,44 3,118 1992 468 767 579 344 3,118 1992 468 767 579 363 265 143 152	10,477 1,993 3,156 355 475 3,156 435 449 980 345 3,156 435 590 345 3,156 1993 475 776 590 390 207 145	1,197 10,140 1,994 3,197 368 483 272 600 745 3,197 444 459 996 600 346 3,197 444 83 765 3,197	1,153 10,252 1,995 3,241 3,241 3,241 4,92 2,244 6,12 7,60 3,241 4,51 2,244 6,12 3,241 4,51 3,241 1,915 4,92 3,241 1,915 4,92 7,94 4,92 7,94 4,92 3,241 1,995 3,241 3,241 3,241 3,241 1,995 3,241	10.371 1.996 3.267 3.94 599 501 296 624 776 3.287 462 481 1.036 524 3.287 1996 501 804 624 1.036 3.14 183 3.14 183 195 195 195 195 195 195 195 195	1
Newark-NJTC Employed Pop HEAVY RAL agency New York-MTA-NYCT Washington, D.GWMATA ChicagoRTA-CTA Boston-MBTA San Francisco-BART New York-MTA-SRTOA Miant-MARTA Philadephia-NJ-PATC Chicago Tolive, NATA San Francisco-MATA Lisk Angeles-LACMTA New York-MTA-SRTOA LightT RAL agency Philadephia-NJ-PATC Chicago Tolive, MCA San Standson, Stand	9,776 Employed peri 1,994 2,994 270 625 422 183 516 346 2,895 356 346 2,895 516 346 2,895 516 346 2,895 516 346 2,895 516 346 2,895 1944 1956 1956	9,847 Density (1,986 2,78 640 2,915 386 2,915 2,915 386 2,915 386 2,915 326 2,915 326 2,915 326 2,915 326 2,915 326 2,915 326 2,915 326 2,915 326 2,915 326 2,915 326 2,915	9,899 of Metr 1,996 1,996 2,937 286 639 2,937 386 392 529 544 2,937 364 392 2,937 364 2,937 364 392 2,937 344 2,937 364 392 2,937 344 2,937 364 392 2,937 344 2,937 229 344 2,937 209 209 207 317	9,960 opolita: 1,987 2,961 294 436 205 536 399 536 344 2,961 1987 436 344 2,961 1987 436 356 248 131 125 206 318	10,028 n Area 1,988 2,987 303 544 659 2,987 398 406 544 343 2,987 398 406 544 343 2,987 398 406 544 228 139 544 226 133 130 206 205 549	1,989 3,016 312 684 447 222 552 681 3,016 405 414 552 343 3,016 405 414 552 343 3,016 405 552 235 135 135 206 135 201 559	10,185 1,990 3,048 322 554 454 423 3,048 412 560 592 3,048 412 560 343 3,048 412 560 245 138 140 207 327 327 560 555 138 140 207 327 560 560 570	10,275 1,991 3,001 3,001 3,001 420 570 704 430 570 344 3,001 420 570 344 430 570 344 430 570 344 1991 460 255 140 146 207 325 581	10,373 1,992 3,118 344 668 250 579 717 3,118 427 439 579 344 3,118 427 717 3,118 427 717 1992 468 767 759 344 1992 468 767 757 952 143 152 208 328 328 328 328 328 328 328 32	10,477 1,993 3,156 355 261 590 731 3,156 436 436 436 439 990 345 3,156 1993 475 776 590 940 277 145 158 209 330 449 900 277	1,197 10,140 1,994 3,197 3682 483 272 600 745 3,197 444 459 996 3,197 444 483 785 600 346 3,197 1994 483 785 600 998 1994 483 785 600 998 148 165 219 148 165 219 148 165 213 3 489 617	1,153 10,252 1,995 3,241 3,241 3,800 6,512 7,600 3,241 4,922 2,844 6,12 7,600 3,241 4,922 3,241 1,017 6,12 3,441 1,995 4,922 7,944 6,12 3,041 1,995 1,995 4,922 7,944 6,12 3,041 1,995 1,212 1,212 3,014 1,995 1,212 1,2	1.996 3.207 3.94 599 501 296 624 481 1.036 624 3.287 1996 501 804 624 3.287 1996 501 804 624 3.287 1995 501 804 624 1.035 501 804 624 1.036 501 804 624 1.036 501 804 624 1.036 501 804 624 1.036 501 804 624 1.036 501 804 624 1.036 501 804 624 1.036 501 804 624 1.036 501 804 624 1.036 501 804 624 1.036 501 804 624 1.036 501 804 624 1.036 501 804 624 1.036 501 804 804 804 805 805 805 805 805 805 805 805 805 805	1
Newark-NJTC Employed Pop HEAVY RAL agancy New York-MTA-NYCT Washington, D.CWMATA Chicago-RTA-CTA Bastor-MBTA San Francisco-BART New York-MTA-SIRTOA Bailmore-MMTA Los Angeles-LACMTA Philodephia-NPATC Cleveland-GCRTA New York-MTA-SIRTOA Light RAL agency Bastor-MBTA San Francisco-MUNA San Francisco-MUNA San Francisco-MUNA San Disgo Trolivy Inc. Si Louiz-SSDA Portland-T CDWIPNT Bailmore-MUTA San Jane SCTD Dalas-SCTD Dalas-SCTD	9,776 Employed per 1,994 2,896 270 622 183 516 3376 336 3376 346 2,896 516 346 2,896 516 346 2,896 516 346 2,896 516 346 2,896 516 346 2,896 516 346 2,896 516 346 2,896 316 346 2,896 316 346 2,896 316 346 2,896 316 346 2,896 316 346 2,896 316 346 2,896 316 346 2,896 316 346 2,896 316 346 2,896 316 346 2,896 316 346 2,896 316 346 2,896 316 346 2,896 316 346 2,896 316 346 2,896 346 2,896 316 346 2,896 346 2,896 346 2,896 346 2,896 346 2,896 346 2,896 346 2,896 346 2,896 346 2,896 346 2,896 346 346 2,896 316 346 346 2,896 316 346 346 316 316 346 316 316 346 316 316 316 346 316 316 346 316 316 316 346 316 316 346 316 316 316 346 316 316 346 316 316 316 346 316 316 316 346 316 316 316 316 346 316 316 316 316 316 316 316 31	9,847 Density (1,995 2,915 2,915 2,915 2,915 2,915 3,915 3,915 3,915 3,915 3,915 3,915 3,915 3,915 3,915 3,915 3,915 2,915 3,915 2,915	9,899 of Metr 1,966 2.307 2.837 2.837 2.937 3.96 3.92 5.29 3.44 2.337 3.96 3.92 5.29 3.44 2.337 3.96 3.92 5.29 3.44 2.337 3.96 3.92 5.29 3.44 2.337 3.96 3.92 5.29 3.44 2.337 2.09 2.09 2.09 2.07 3.17 3.17	9,960 opolita : 1,997 2,961 294 636 295 2,961 392 399 2,961 392 399 536 344 2,961 1967 436 733 536 218 131 125 206 318 137	10,028 1,968 2,967 303 643 2,967 396 406 544 333 2,967 396 406 544 343 2,987 1968 441 738 544 343 2,987	1,989 3,016 3,016 312 684 447 2552 681 3,016 405 414 405 414 405 414 405 414 405 414 405 414 405 414 405 414 2552 343 3,016 321 135 206 321 155 206 321 155 206 321	10,185 1,990 3,048 3,048 254 451 3,048 412 422 560 343 3,048 1990 454 752 560 245 138 140 207 323 570 139	1.991 3.081 3.081 3.33 660 240 3.081 4.20 4.30 570 3.44 3.081 1991 4.40 759 570 3.44 3.081	10,373 1,992 3,118 3,118 3,44 468 250 579 717 3,118 427 437 3,118 579 3,44 3,118 1992 468 767 579 963 265 143 152 208 328 439 528 143	10,477 1,993 3,156 3,156 475 261 590 731 3,156 436 449 990 345 3,156 1993 445 3,156 1993 445 1993 449 800 277 145 158 209 330 449 605 449 605 145 145 145 158 209 330 449 605 145 145 145 145 145 145 145 14	1.994 1.994 3.197 3.682 483 272 3.197 368 483 272 3.197 444 459 996 3.197 444 459 996 3.46 3.197 346 3.197 1994 483 785 600 346 3.197 1994 483 785 600 998 289 289 289 289 289 289 289 289 289	1,153 10,252 1,995 3,241 3,241 3,241 4,52 2,264 4,612 7,561 3,241 4,53 4,70 1,017 6,12 3,241 4,53 4,70 1,017 3,241 1,995 4,92 7,94 6,12 1,995 4,92 7,94 6,12 1,995 4,92 7,94 6,12 1,915 4,92 7,94 6,12 1,915 4,92 7,94 6,12 1,915 4,92 7,94 1,955 1,95	1.996 3.207 3.94 599 501 2.956 6.24 4.91 1.036 6.24 4.91 1.036 5.01 804 6.24 1.036 5.01 804 6.24 1.035 5.179 1.995 6.255 1.799 2.14 4.035 3.155 1.799 2.245 4.035 3.155 1.799 2.245 4.035 3.287 3.297	1
Newark-NJTC Employed Pop HEAVY RAL agency New York-MTA-NYCT Washington, D.GYWATA Chicago-RTA-CTA Baston-MBTA San Francisco-BART New York-MTA-SRTOA Baston-MBTA San Francisco-BART New York-MTA-SRTOA Miamt-MOTA Bastmore-MMTA Los Angeles-LACMTA New York-MTA-SRTOA New York-MTA-SRTOA LightT RAL agency Boston-MBTA San Diego Trolley Inc. Si, Loude-SDA Porliand TCMTDO Delas-DARTA San Campon College Inc. Si, Loude-SDA Porland TCMTDO Delas-DARTA Buffato-NFTS Buffato-NFTS Buffato-NFTS	9,776 Pulation I 1,994 270 625 422 183 516 380 516 346 2,895 376 1984 422 719 516 346 1984 422 719 516 1984 422 719 516 346 1984 229	9,847 Density (1,986 2,78 640 2,915 386 2,915 2,915 386 2,915 386 2,915 326 2,915 326 2,915 326 2,915 326 2,915 326 2,915 326 2,915 326 2,915 326 2,915 326 2,915 326 2,915	9,899 of Metr 1,996 1,996 2,937 286 639 2,937 386 392 529 544 2,937 364 392 2,937 364 2,937 364 392 2,937 344 2,937 364 392 2,937 344 2,937 364 392 2,937 344 2,937 229 344 2,937 209 209 207 317	9,960 opolita: 1,987 2,961 294 436 205 536 399 536 344 2,961 1987 436 344 2,961 1987 436 356 248 131 125 206 318	10,028 n Area 1,988 2,987 303 544 659 2,987 398 406 544 343 2,987 398 406 544 343 2,987 398 406 544 228 139 544 226 133 130 206 205 549	1,989 3,016 312 684 447 222 552 681 3,016 405 414 552 343 3,016 405 414 552 343 3,016 405 552 235 135 135 206 135 201 559	10,185 1,990 3,048 322 554 454 423 3,048 412 560 592 3,048 412 560 343 3,048 412 560 245 138 140 207 327 327 560 555 138 140 207 327 560 560 570	10,275 1,991 3,001 3,001 3,001 420 570 704 430 570 344 3,001 420 570 344 430 570 344 430 570 344 1991 460 255 140 146 207 325 581	10,373 1,992 3,118 344 668 250 579 717 3,118 427 439 579 344 3,118 427 717 3,118 427 717 1992 468 767 759 344 1992 468 767 757 952 143 152 208 328 328 328 328 328 328 328 32	10,477 1,993 3,156 355 261 590 731 3,156 436 436 436 439 990 345 3,156 1993 475 776 590 940 277 145 158 209 330 449 900 277	1,197 10,140 1,994 3,197 3682 483 272 600 745 3,197 444 459 996 3,197 444 483 785 600 346 3,197 1994 483 785 600 998 1994 483 785 600 998 148 165 219 148 165 219 148 165 213 3 489 617	1,153 10,252 1,995 3,241 3,241 3,800 6,512 7,600 3,241 4,922 2,844 6,12 7,600 3,241 4,922 3,241 1,017 6,12 3,441 1,995 4,922 7,944 6,12 3,041 1,995 1,995 4,922 7,944 6,12 3,041 1,995 1,212 1,212 3,014 1,995 1,212 1,2	1.996 3.207 3.94 599 501 296 624 481 1.036 624 3.287 1996 501 804 624 3.287 1996 501 804 624 1.035 511 804 624 1.035 501 804 624 1.036 501 804 624 1.036 501 804 624 1.036 501 804 624 1.036 501 804 624 1.036 501 804 624 1.036 501 804 624 1.036 501 804 624 1.036 501 804 624 1.036 501 804 63 804 63 807 807 807 807 807 807 807 807 807 807	

Population Density of Center City

HEAVY RAIL	Persons per s	quare mile												
agency	1,984	1,985	1,986	1,987	1,988	1,989	1,990	1,991	1,992	1,993	1,994	1,995	1,996	1,997
New York-MTA-NYCT	23,555	23,580	23,605	23,630	23,655	23,680	23,705	23,730	23,756	23,781	23,511	23,539	23,567	23,596
Washington, D.CWMATA	10,061	10,031	10,001	9,972	9,943	9,913	9,884	9,855	9,827	9,798	9,315	9,225	9,136	9,048
Chicago-RTA-CTA	12,797	12,705	12,613	12,522	12,431	12,342	12,252	12,164	12,076	11,989	12,043	11,933	11,824	11,717
Boston-MBTA	11,902	11,896	11,889	11,883	11,877	11,871	11,865	11,860	11,854	11,848	11,206	11,147	11,090	11,032
Allenta-MARTA	3,140	3,114	3,089	3,064	3,039	3,014	2,990	2,965	2,941	2,917	2,998	2,975	2,952	2,930
Philadelphia-SEPTA	12,138	12,070	12,003	11,935	11,869	11,802	11,736	11,671	11,605	11,541	11,313	11,205	11,099	10,993
San Francisco-BART	10,353	10,404	10,455	10,507	10,559	10,611	10,663	10,716	10,769	10,821	10,610	10,667	10,724	10,782
New York-PATHC	23,555	23,580	23,605	23,630	23,655	23,680	23,705	23,730	23,756	23,781	23,511	23,539	23,567	23,596
Miami-MDTA	10,095	10,090	10,086	10,082	10,079	10,075	10,072	10,068	10,065	10,062	10,327	10,365	10,401	10,437
Ballimore-MMTA	9,516	9,447	9,379	9,310	9,243	9,176	9,109	9,043	8,977	8,912	8,679	8,576	8,475	8,375
Los Angeles-LACMTA										7,772	7,320	7,423	7,529	7,635
Philadelphia-NJ-PATC	12,138	12,070	12,003	11,935	11,869	11,802	11,736	11,671	11,605	11,541	11,313	11,205	11,099	10,993
Cleveland-GCRTA	6,976	6,906	6,836	6,768	6,700	6,633	6,566	6,501	6,436	6,371	6,469	6,388	6,307	6,228
New York-MTA-SIRTOA	23,555	23,580	23,605	23,630	23,655	23,680	23,705	23,730	23,756	23,781	23,511	23,539	23,567	23,596
	Parrons nar s	quere mile												
LIGHT RAIL	Persons per s		1986	1987	1986	1989	1990	1991	1992	1993	1994	1995	1996	1997
agency	1984	1985	1986 11,889	1987 11,883	1986 11.877	1989 11,871	1990 11,865	1991 11,860	1992 11,854	1993 11,848	1994 11,843	1995 11,837	1996 11,832	1997 11,826
agency Boston-MBTA	1984 11,902	1985 11,896	11,889	11,883	11,877	11,871								
agency Boston-MBTA San Francisco-MUNI	1984 11,902 14,975	1985 11,896 15,061	11,889 15,149	11,883 15,236	11,877 15,324	11,871 15,413	11,865	11,860	11,854	11,848	11,843	11,837	11,832	11,826
agency Boston-MBTA San Francisco-MUNI Philadelphia-SEPTA	1984 11,902	1985 11,896	11,889	11,883	11,877	11,871	11,865 15,502	11,860 15,592	11,854 15,682	11,848 15,773	11,843 15,865	11,837 15,956	11,832 16,049	11,826 16,142
agency Boston-MBTA San Francisco-MUNI Philadelphia-SEPTA Los Angeles-LACMTA	1984 11,902 14,975 12,138	1985 11,896 15,061	11,889 15,149	11,883 15,236	11,877 15,324	11,871 15,413	11,865 15,502	11,860 15,592 11,671	11,854 15,682 11,605	11,848 15,773 11,541	11,843 15,865 11,476	11,837 15,956 11,412	11,832 16,049 11,348	11,826 16,142 11,285
agency Boston-MBTA San Francisco-MUNI Philadelphia-SEPTA	1984 11,902 14,975	1985 11,896 15,061 12,070	11,889 15,149 12,003	11,883 15,236 11,935	11,877 15,324 11,869	11,871 15,413 11,802	11,865 15,502 11,736	11,860 15,592 11,671 7,655	11,854 15,682 11,605 7,773	11,848 15,773 11,541 7,893	11,843 15,865 11,476 8,015	11,837 15,956 11,412 8,139	11,832 16,049 11,348 8,264	11,826 16,142 11,285 8,392
agency Boston-MBTA San Francisco-MUNI Philadelphia-SEPTA Los Angeles-LACMTA San Diego Trolley Inc.	1984 11,902 14,975 12,138	1985 11,896 15,061 12,070	11,889 15,149 12,003	11,883 15,236 11,935	11,877 15,324 11,869	11,871 15,413 11,802	11,865 15,502 11,736	11,860 15,592 11,671 7,655	11,854 15,682 11,605 7,773	11,848 15,773 11,541 7,893	11,843 15,865 11,476 8,015 3,751	11,837 15,956 11,412 8,139 3,837	11,832 16,049 11,348 8,264 3,924	11,826 16,142 11,285 8,392 4,013
agency Boston-MBTA San Francisco-MUNI Philadelphia-SEPTA Los Angeles-LACMTA San Diego Troiley Inc. St. Louis-BSDA	1984 11,902 14,975 12,138	1985 11,896 15,061 12,070	11,889 15,149 12,003	11,883 15,236 11,935 3,204	11,877 15,324 11,869 3,277	11,871 15,413 11,802 3,351	11,865 15,502 11,736 3,428	11,860 15,592 11,671 7,655 3,506	11,854 15,682 11,605 7,773 3,586	11,848 15,773 11,541 7,893 3,667	11,843 15,865 11,476 8,015 3,751 6,057	11,837 15,956 11,412 8,139 3,837 5,972	11,832 16,049 11,348 8,264 3,924 5,889	11,826 16,142 11,285 8,392 4,013 5,806
agency Boston-MBTA San Francisco-MUNI Philadeiphia-SEPTA Los Angeles-LACMTA San Diego Troitey Inc. St. Louis-BSDA Portland-TCMTDO	1984 11,902 14,975 12,138	1985 11,896 15,061 12,070	11,889 15,149 12,003	11,883 15,236 11,935 3,204	11,877 15,324 11,869 3,277	11,871 15,413 11,802 3,351	11,865 15,502 11,736 3,428	11,860 15,592 11,671 7,655 3,506	11,854 15,682 11,605 7,773 3,586	11,848 15,773 11,541 7,893 3,667	11,843 15,865 11,476 8,015 3,751 6,057	11,837 15,956 11,412 8,139 3,837 5,972	11,832 16,049 11,348 8,264 3,924 5,889 3,484	11,826 16,142 11,285 8,392 4,013 5,806 3,480
agency Boston-MBTA San Francisco-MUNI Philadelphia-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA Portland-TCMTDO Dates-DARTA Sacrametio-RTD	1984 11,902 14,975 12,138	1985 11,896 15,061 12,070	11,889 15,149 12,003	11,883 15,236 11,935 3,204 3,519	11,877 15,324 11,869 3,277 3,515	11,871 15,413 11,802 3,351 3,511	11,865 15,502 11,736 3,428 3,508	11,860 15,592 11,671 7,655 3,506 3,504	11,854 15,682 11,605 7,773 3,586 3,500	11,848 15,773 11,541 7,893 3,667 3,496	11,843 15,865 11,476 8,015 3,751 6,057 3,492	11,837 15,956 11,412 8,139 3,837 5,972 3,488	11,832 16,049 11,348 8,264 3,924 5,889 3,484 3,085	11,826 16,142 11,285 8,392 4,013 5,806 3,480 3,109
agency Boston-MBTA San Francisco-MUNI Philadeliphia-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA Portland-TCMTDO Dellas-DARTA	1984 11,902 14,975 12,138 2,994	1985 11,896 15,061 12,070 3,062	11,889 15,149 12,003 3,132	11,883 15,236 11,935 3,204 3,519 3,516	11,877 15,324 11,869 3,277 3,515 3,619	11,871 15,413 11,802 3,351 3,511 3,726	11,865 15,502 11,736 3,428 3,508 3,836	11,860 15,592 11,671 7,655 3,506 3,504 3,949	11,854 15,682 11,605 7,773 3,586 3,500 4,065	11,848 15,773 11,541 7,893 3,667 3,496 4,185	11,843 15,865 11,476 8,015 3,751 6,057 3,492 4,308	11,837 15,956 11,412 8,139 3,837 5,972 3,488 4,435	11,832 16,049 11,348 8,264 3,924 5,889 3,484 3,085 4,565	11,826 16,142 11,285 8,392 4,013 5,806 3,480 3,109 4,700
agency Boston-MBTA San Francisco-MUNI Philadelphia-SEPTA Los Angelas-LACMTA San Diego Trolley Inc. St. Louis-BSDA Poritian-TCMTO0 Dallas-DARTA Sacramento-RTD Pittsburgh-PAT	1984 11,902 14,975 12,138 2,994	1985 11,896 15,061 12,070 3,062	11,889 15,149 12,003 3,132 7,036	11,883 15,236 11,935 3,204 3,519 3,516 6,938	11,877 15,324 11,869 3,277 3,515 3,619 6,841	11,871 15,413 11,802 3,351 3,511 3,726 6,746	11,865 15,502 11,736 3,428 3,508 3,836 6,653	11,860 15,592 11,671 7,655 3,506 3,504 3,504 3,949 6,560	11,854 15,682 11,605 7,773 3,586 3,500 4,065 6,469	11,848 15,773 11,541 7,893 3,667 3,496 4,185 6,379	11,843 15,865 11,476 8,015 3,751 6,057 3,492 4,308 6,290	11,837 15,956 11,412 8,139 3,837 5,972 3,488 4,435 6,203	11,832 16,049 11,348 8,264 3,924 5,889 3,484 3,085 4,565 6,116	11,826 16,142 11,285 8,392 4,013 5,806 3,480 3,109 4,700 6,031 7,766 8,656
egency Boston-MBTA San Francisco-MUNI Philedephie-SEPTA Los Angeles-LACMTA San Diego Trolley Inc. St. Louis-BSDA Portland-TCMTDO Dates-DARTA Sacrametio-RTD Philsburgh-PAT Buffelo-NTS	1984 11,902 14,975 12,138 2,994	1985 11,896 15,061 12,070 3,062	11,889 15,149 12,003 3,132 7,036	11,883 15,236 11,935 3,204 3,519 3,516 6,938	11,877 15,324 11,869 3,277 3,515 3,619 6,841	11,871 15,413 11,802 3,351 3,511 3,726 6,746	11,865 15,502 11,736 3,428 3,508 3,836 6,653	11,860 15,592 11,671 7,655 3,506 3,504 3,504 3,949 6,560	11,854 15,682 11,605 7,773 3,586 3,500 4,065 6,469 7,990	11,848 15,773 11,541 7,893 3,667 3,496 4,185 6,379 7,945	11,843 15,865 11,476 8,015 3,751 6,057 3,492 4,308 6,290 7,900	11,837 15,956 11,412 8,139 3,837 5,972 3,488 4,435 6,203 7,855	11,832 16,049 11,348 8,264 3,924 5,889 3,484 3,085 4,565 6,116 7,810	11,826 16,142 11,285 8,392 4,013 5,806 3,480 3,109 4,700 6,031 7,766 8,656 5,024
sgency Boston-MBTA San Francisco-MUNI Philadelphia-SEPTA Los Angelas-LACMTA San Diego Troley Inc. St. Louis-BSDA Portiand-TCMTDO Dales-DARTA Secramento-RTD Pittsburgh-PAT Butflato-NFTS Bellinot-NFTS	1984 11,902 14,975 12,138 2,994	1985 11,896 15,061 12,070 3,062	11,889 15,149 12,003 3,132 7,036	11,883 15,236 11,935 3,204 3,519 3,516 6,938	11,877 15,324 11,869 3,277 3,515 3,619 6,841 8,175	11,871 15,413 11,802 3,351 3,511 3,726 6,746 8,128	11,865 15,502 11,736 3,428 3,508 3,836 6,653 8,082	11,860 15,592 11,671 7,655 3,506 3,504 3,949 6,560 8,036	11,854 15,682 11,605 7,773 3,586 3,500 4,065 6,469 7,990 8,977 4,693 2,743	11,848 15,773 11,541 7,893 3,667 3,496 4,185 6,379 7,945 8,912 4,757 2,738	11,943 15,865 11,476 8,015 3,751 6,057 3,492 4,308 6,290 7,900 8,847 4,823 2,734	11,837 15,956 11,412 8,139 3,837 5,972 3,488 4,435 6,203 7,855 8,783 4,869 2,730	11,832 16,049 11,348 8,264 3,924 5,889 3,484 4,565 6,116 7,810 8,719 4,956 2,725	11,826 16,142 11,285 8,392 4,013 5,806 3,480 3,109 4,700 6,031 7,766 8,656 5,024 2,721
egency Boston-MBTA San Francisco-MUNI Philadelphie-SEPTA Los Angeles-LACMTA San Diego Troley Inc. St. Louis-BSDA Portland-TCMTDO Dallas-DARTA Sacramento-RTD Philaburgh-PAT Buffelo-NTS Bellinore-MMTA Sen Jose-SCTD	1984 11,902 14,975 12,138 2,994 7,236	1985 11,896 15,061 12,070 3,062 7,135	11,889 15,149 12,003 3,132 7,036 8,270	11,883 15,236 11,935 3,204 3,519 3,516 6,938 8,222	11,877 15,324 11,869 3,277 3,515 3,619 6,841 8,175 4,444	11,871 15,413 11,802 3,351 3,511 3,726 6,746 8,128 4,505	11,865 15,502 11,736 3,428 3,508 3,836 6,653 8,082 4,566	11,860 15,592 11,671 7,655 3,506 3,504 3,949 6,560 8,036 4,629	11,854 15,682 11,605 7,773 3,586 3,500 4,065 6,469 7,990 8,977 4,693	11,848 15,773 11,541 7,893 3,667 3,496 4,185 6,379 7,945 8,912 4,757	11,943 15,865 11,476 8,015 3,751 6,057 3,492 4,308 6,290 7,900 8,847 4,823	11,837 15,956 11,412 8,139 3,837 5,972 3,488 4,435 6,203 7,855 8,783 4,889	11,832 16,049 11,348 8,264 3,924 5,889 3,484 3,085 4,565 6,116 7,810 8,719 4,956	11,826 16,142 11,285 8,392 4,013 5,806 3,480 3,109 4,700 6,031 7,766 8,656 5,024
sgency Boston-MBTA San Francisco-MUNI Philadelphia-SEPTA Los Angelas-LACMTA San Diego Troley Inc. Si. Louis-BSDA Portiano-TCMTDO Delas-DARTA Secramento-RTD Pittsburgh-PAT Butflaci-NFTS Bellinora-MMTA San Jose-SCTD New Oriems-RTA	1984 11,902 14,975 12,138 2,994 7,236 2,778	1985 11,896 15,061 12,070 3,062 7,135 2,774	11,889 15,149 12,003 3,132 7,036 8,270 2,769	11,883 15,236 11,935 3,204 3,519 3,516 6,938 8,222 2,765	11,877 15,324 11,869 3,277 3,515 3,619 6,841 8,175 4,444 2,760	11,871 15,413 11,802 3,351 3,511 3,726 6,746 8,128 4,505 2,756	11,865 15,502 11,736 3,428 3,508 3,836 6,653 8,082 4,566 2,752	11,860 15,592 11,671 7,655 3,506 3,504 3,949 6,560 8,036 4,629 2,747	11,854 15,682 11,605 7,773 3,586 3,500 4,065 6,469 7,990 8,977 4,693 2,743	11,848 15,773 11,541 7,893 3,667 3,496 4,185 6,379 7,945 8,912 4,757 2,738	11,943 15,865 11,476 8,015 3,751 6,057 3,492 4,308 6,290 7,900 8,847 4,823 2,734	11,837 15,956 11,412 8,139 3,837 5,972 3,488 4,435 6,203 7,855 8,783 4,869 2,730	11,832 16,049 11,348 8,264 3,924 5,889 3,484 4,565 6,116 7,810 8,719 4,956 2,725	11,826 16,142 11,285 8,392 4,013 5,806 3,480 3,109 4,700 6,031 7,766 8,656 5,024 2,721

Population Density of Metropolitan Area

	Persons per s	quare mile												
agency	1,984	1,985	1,986	1,987	1,988	1,989	1,990	1,991	1,992	1,993	1,994	1,995	1,996	1,997
New York-MTA-NYCT	7,370	7,403	7,441	7,461	7,473	7,464	7,445	7.436	7,449	7,483	7,500	7,512	7.511	7,512
Washington, D.CWMATA	586	599	613	630	646	658	666	675	685	694	703	711	729	739
Chicago-RTA-CTA	1,433	1,436	1,441	1,447	1,451	1,457	1,466	1,477	1,490	1,503	1,514	1,523	1,525	1,536
Boston-MBTA	929	936	941	946	954	960	960	956	956	961	965	971	974	976
Atlanta-MARTA	400	416	432	448	463	474	486	500	514	531	550	568	578	593
Philadelphia-SEPTA	1,244	1,247	1,257	1,268	1,276	1,277	1,277	1,280	1,281	1,283	1,286	1,287	1,297	1,29
San Francisco-BART	1,383	1,404	1,423	1,437	1,456	1,478	1,492	1,507	1,525	1,538	1,546	1,554	1,583	1,59
New York-PATHC	7,370	7,403	7,441	7,461	7,473	7,464	7,445	7,436	7,449	7,483	7,500	7,512	7,511	7,51
Mami-MDTA	900	911	924	940	960	981	999	1,014	1,026	1,022	1,036	1,055	1,075	1,08
Bellimore-MMTA	858	863	875	884	897	904	916	925	932	938	944	948	964	97
os Angeles-LACMTA										2,240	2,239	2,239	2,308	2,32
Philadelphia-NJ-PATC	1,244	1,247	1,257	1,268	1.276	1,277	1,277	1,280	1,281	1,283	1,286	1,287	1,297	1,29
Cleveland-GCRTA	826	823	619	817	813	813	814	817	819	821	825	826	821	82
New York-MTA-SIRTOA	7.370	7,403	7.441	7.461	7.473	7.464	7.445	7,436	7,449	7,483	7,500	7,512	7,511	7,51:
LIGHT RAIL	Persons per s							1991	1992	1993	1994	1995	1996	199
gency	1984	1985	1986	1987	1988	1989	1990 960	1991 956	956		965	971	974	97
Boston-MBTA	929	936	941	946	954	960			1,597	961 1.608	1.614	1,619	1,629	1.63
San Francisco-MUNI	1,526	1,546	1,558	1,565	1,568	1,576	1,578 1,277	1,587 1,280	1,597	1,283	1,286	1.287	1.297	1.83
Philadelphia-SEPTA	1.244	1,247	1.257	1,268	1,276	1,211	1,277	2,202	2.227	2,240	2.239	2,239	2,308	2,33
os Angeles-LACMTA		505	522	541	562	581	598	607	618	620	622	625	660	2.55
San Diego Trolley Inc.	491	505	522	541	562	561	239	607	610	620	396	397	399	40
SI. Louis-BSDA				282	288	294	304	313	320	328	334	341	345	35
Portland-TCMTDO				282	288	234	304	313	320	320	334	341	490	49
Dellas-DARTA				294	305	316	332	342	347	351	354	359	377	38
Sacramento-RTD				523	520	518	518	519	521	521	520	517	513	51
Msburgh-PAT	541	533	527 755	523 752	753	756	759	760	761	761	758	755	758	75
Buffalo-NFTS			/55	/52	155	/36	/59	/60	932	938	944	948	964	97
Baltimore-MMTA					1,140	1,160	1,160	1,170	1,183	1,196	1.205	1.220	1.234	1,24
	378	381	204	201	1,140	1,160	1,160	383	1,183	393	398	403	397	39
			384	381					366	821	825	826	821	
New Orleans-RTA			040	817										
New Orleans-RTA Cleveland-GCRTA	826	823	819	817	813	813	814	817	819	021				82
San Jose-SCTD New Orleans-RTA Cleveland-GCRTA Denver-RTD Newark-NJTC			819 7.441	817 7,461	813 7,473	813 7.464	814 7.445	817 7.436	819 7,449	7,463	477 7,500	486 7.512	481 7.511	48 7.51

Consumption of Electric Energy

HEAVY RAIL	Annuai Kilow	att hours of p	ower (000)											
agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
New York CTA	1,960,107	1,669,871	1,740,907	1,857,533	1,851,099	1,911,512	1,891,786	1,805,034	1,745,754	1,772,756	1.875.576	1,836,096	1,705,161	1.634.226
Washington, D.CWMATA		249,356	276,650	290,345	298,413	295,241	298,755	306,975	317,333	328,559	341.832	346,380	336,666	328,621
Chicago-CTA	297,358	322,617	326,683	334,275	345,043	343,786	332,779	340,708	330.947	327,716	315,134	306,052	337.677	334,060
Boston-MBTA	158,810	170,209	167,539	174,843	185,707	148,853	143,853	162,623	170,737	178,933	183,739	191,402	195.398	179.744
Allania-MARTA	40,451	60,516	66.618	62,096	68,989	73,717	75,227	73,838	72,741	73,468	86,828	93,706	95.854	109,495
Philadelphia-SEP TA	120,042	116,887	121,053	119,010	121,881	123,043	119,050	112,415	107,113	128,922	132,670	129,199	138,260	123,589
San Francisco-BART	169,484	175,336	179,144	174,289	172,502	172,260	199,420	190,824	199,449	211,001	210,173	215.046	231,457	245,172
New York-PATH	75,590	73,958	75,463	77,617	86,306	88,051	88,090	94,240	93,240	95,700	98,100	97,580	97,670	96,252
New York-PATH	8,410	18,265	39,686	44,278	35,739	43,187	43,600	44,463	42,851	43,375	44,513	44.067	44,847	44,732
Baltimore-MTA	15,732	14,862	14,809	19,989	31,218	24,328	31,622	30,956	28,483	29,576	28,794	29.338	26,946	23,845
LA-LACMTA/SCRTD										11,150	25,305	25,990	27.771	48,065
Lindenwold-PATCO	31,011	31,012	31,219	38,603	31,981	34,047	33,043	34,300	33,140	35,404	36,167	36,167	42,884	34,414
Cleveland RTA	22,903	24,908	25,999	26,357	27,313	28,000	27,150	29,642	32,799	30,821	29,615	28,075	28,266	28,557
NY-MTA-SIRTOA	16.564	17,016	18,883	18,755	17,750	18,807	19,379	22,142	18,671	19,202	22,996	22,400	23,427	21,739
LIGHT RAIL	Annual Kilow													
	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Boston-MBTA	18,000	19,342	19,596	20,450	54,085	49,543	36,146	36,394	36,565	37,917	38,936	40,550	41,397	61,055
San Francisco-MUNI	33,064	38,881	40,970	40,531	40,223	40,503	43,338	43,150	53,126	52,684	32,669	29,706	33,677	34,809
Philadelphia-SEPTA	62,455	61,001	62,831	61,293	63,247	63,188	60,751	57,094	54,427	29,081	26,831	28,563	32,132	29,122
LA-SCRTD								25,029	31,492	32,578	31,841	31,299	41,789	46,707
San Diego Trolley	7,790	7,631	8,138	9,831	9,670	11,298	19,728	25,164	25,518	24,497	24,175	22,818	24,590	29,305
St. Louis-Bi-State Portland Tri-County MTD											11,762	16,006	18,618	17,716
Dallas-DART				7,988	9,205	8,615	8,957	9,993	10,257	10,234	10,593	13,621	10,977	10,963
Sacramento RTD				3									7.627	18,577
Pittsburgh-PAT	7,642	9.784	14,137	24.817	8,645 24,817	6,899 24,828	7,200	10,643	11.600	12.327	12,081	11,901	15,097	15,407
Buffalo-Niagara Frontier	7,042	9,784	6,666	8,295	24,817 9,665	9,302	25,461 9,503	24,479	22.770	24.275	22,151	21,058	21,058	20,201
Ballimore-Maryland DOT			0.000	0,255	3,665	9,302	9,503	9,451	9,017	8,868	8.832	8,744	8,744	9,007
Santa Clara County TD					3,295	7,411	6,585	10.934	1,615 17,791	11,818	18,234	17,384	17.349	19,175
New Orleans Public Svc	2.890	2.858	2.859	2,974	3,295	2,120	6,585 2,817	2,909	2,987	15,546 2,626	16,706	16,656	17.664	18,540
Cleveland RTA	9,576	11,405	11.872	12,187	12,678	13,726	13,217	13,503	2,987	2,626	3,300 14,715	3,244	3,130	2,966
Denver-RTD	3,370		,,,0/2	12.107	12,070	(3,726	13,217	13,503	14,934	12,838	14,/15	16,479	17,117	16,907
Newark-NJT Corp	3,008	3.320	469	959	2,167	2.470	2.894	2,601	2,703	2,586	3.173	3,909 3,116	4,205 3,086	4,892 2,929
	5,000	3,320	403	555	2,107	2,470	2,034	2,001	2,703	2,006	3,173	3,116	3,086	2,929

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