NEWTOWN BRANCH
RIDERSHIP ESTIMATION STUDY

JUNE 1985

Prepared for

SOUTHEASTERN PENNSYLVANIA TRANSPORTATION AUTHORITY

By

DELAWARE VALLEY REGIONAL PLANNING COMMISSION

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I. INTRODUCTION

Study Background

The Delaware Valley Regional Planning Commission (DVRPC) staff has been directed by its Board, at the request of the Southeastern Pennsylvania Transportation Authority (SEPTA), to conduct a ridership estimation study of the Newtown Branch rail line. These ridership estimates will be used by SEPTA to prepare a benefit-cost analysis of the proposed electrification of this line. This analysis is required by the Pennsylvania Department of Transportation before state and federal funds are committed for engineering and construction. The Newtown study area is shown in Figure 1.

The Newtown branch, an extension of the Philadelphia-Fox Chase line, extends through southeastern Montgomery County and Central Bucks County. Station stops are located at Walnut Hill, Huntingdon Valley, Bryn Athen, County Line, Southampton, Churchville, Holland, George School, and Newtown. Two other rail lines run in the vicinity of the Newtown line, the West Trenton line and the Warminster line. Both of these lines compete with the Newtown line for ridership.

The Newtown branch was operated as a single track, non-electrified line until January 1983 at which time service was terminated. In 1982, just prior to termination of service, ridership on the Newtown Line ranked last among Septa's fifteen branch lines. Ridership on the Newtown line reached its highest level in 1971 with just under 300 weekday boardings. By the Fall of 1982, ridership had dropped to less than 120 weekday boardings. This decline in ridership occurred even though the population of Central Bucks County increased by 29.3 percent from 1970 to 1980.

Numerous studies have been made of the Newtown Branch. Some have considered making a physical connection to the West-Trenton Line at Bethayres and eliminating service entirely from the connection to Fox Chase. Others have considered using lighter rail cars that require no electrification. All have assumed higher levels of service than had been operated during the last decade of service on the line. Each of these studies have projected ridership on the rejuvinated line using various methodologies and getting various results.

This study recognizes the fact that rail travel accounts for a significant amount of work trip travel to the Philadelphia CBD, that rail service is offered on numerous lines radiating into all of the Pennslyvania suburbs, that rail service had been offered on the Newtown Branch until recently, that service has always been low on that line, that two other rail lines with much higher levels of service operate within the market area of the line, that residential expansion in the Newtown area should provide an expanding market for improved rail service, and that suburbanization of employment is causing a change to traditional travel patterns.

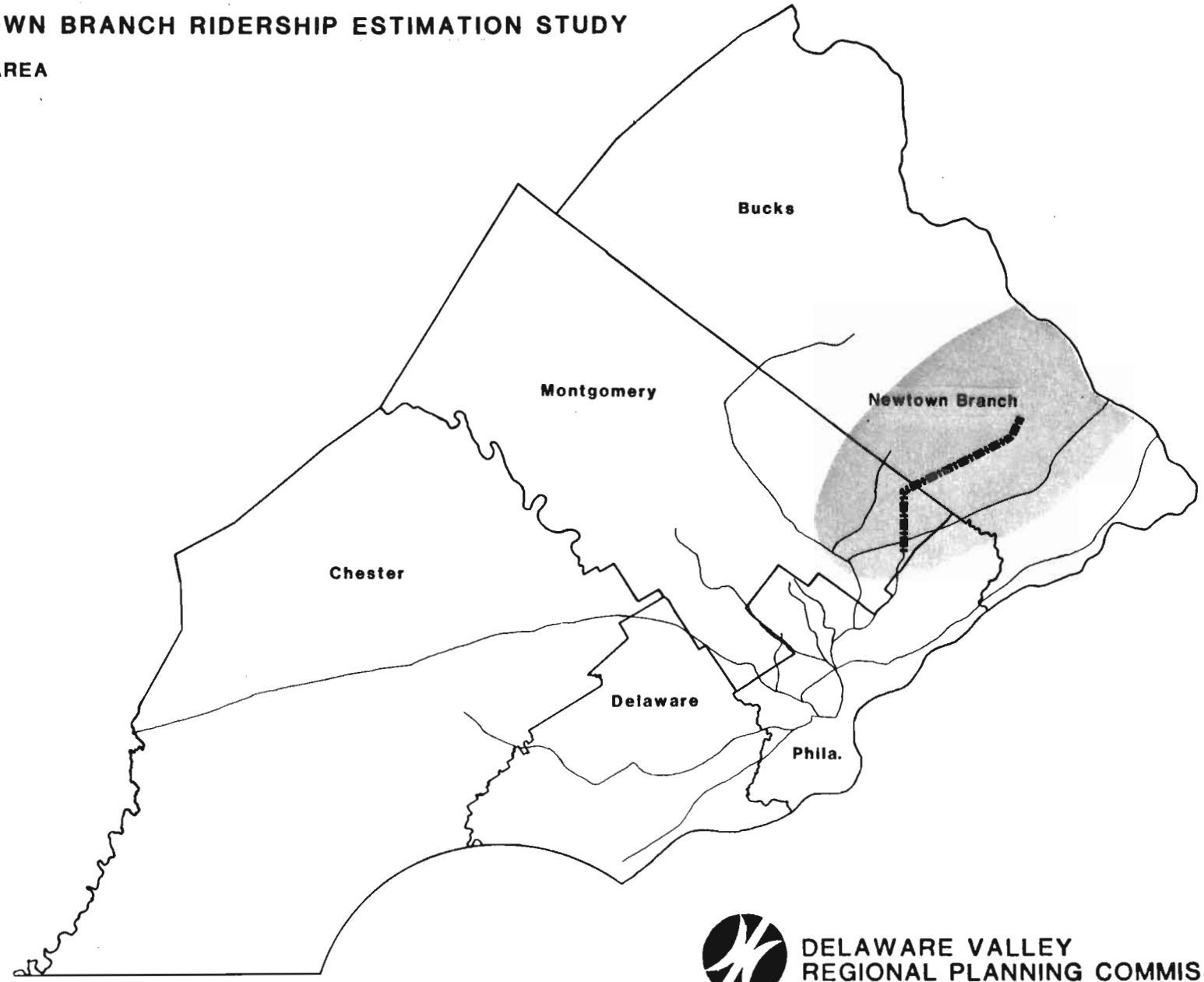
The approach employed in this study looks at the market penetration rates already exhibited by rail service in the region and postulates the potential of the Newtown Branch based on alternative scenarios. The results are not so much a definitive statement of projected ridership as they are a range of the potential ridership given certain policy directions. However, for the purpose of providing SEPTA with the ridership estimates necessary to conduct their benefit/cost analysis, DVRPC has identified a single scenario titled "Electrification".

The conduct of the Newtown Line Study has been guided by a steering committee composed of the Planning Commission of Bucks, Montgomery and Philadelphia Counties, the Pennsylvania Department of Transportation, UMTA, SEPTA, and the Newtown Area Rail Action, a non-profit citizens group working for improved rail service. At the initial meeting of the Steering Committee on January 29, 1985, DVRPC introduced this study by stating its purpose and backround and described the study approach. Following a question and answer session, the committee formally approved the study approach which is outlined in the next section of this chapter. A second meeting of the committee was held on March 3, 1985 at which DVRPC presented the preliminary findings of the comparative analysis of branch line market segments and trip rates. On May 31, 1985, a third Steering Committee meeting was held to present the draft study report, including the ridership estimates and staff conclusions.

Figure 1.

NEWTOWN BRANCH RIDERSHIP ESTIMATION STUDY

STUDY AREA



Study Approach

The approach chosen for this study is a comparative analysis of market penetration rates approved by the Steering Committee at its initial meeting. The approach includes these five steps:

I. Rail Passenger Approach Distance Analysis

Using the DVRPC survey of rail passengers (1982), analyze by area type and branch line the station approach trip length frequencies for walk and auto approach trips. Also determine percentages by access mode and trip purpose. Conduct a license plate survey of the study area park and ride lots to confirm the approach distances.

II. Market Area Profiles

Using the 1980 Census data, accumulate household data at the block group level for the market areas around comparative branch line segments as defined by access distances determined in Task I.

III. Trip Rate Analysis

Using the 1980 Census Journey-to-Work data, determine trip rates for branch line market areas and area types. Rates will include work trips per household (t/hhd), percent of trips to the CBD, and percent to the CBD by rail, plus factors to account for non-work and non-CBD travel.

IV. Trend Analysis

Using regional population and employment estimates, establish future year rates of work trips per household (t/hhd) and percent to the CBD to account for shifts in employment concentrations and work trip patterns.

V. Ridership Estimation

Using trip rates developed in Tasks III and IV, estimate branch line ridership based on market area data from Task II. Adjust for market area overlap using license plate survey data. Compare to existing ridership levels.

II. MARKET DEFINITION ANALYSIS

DVRPC Rail Ridership Study

To determine the potential market area of a branch rail line, reference was made to DVRPC's Survey of Rail Passengers (1982). This survey provided a unique oppertunity to study commuter rail service areas in a long established system. Of particular importance to this study were the questions which identified the address and station of origin and destination, trip purpose, and mode used to reach the access station. Surveys (12,000) were distributed to riders at 50 stations and over fifty percent were returned. Responses from 27 stations with a destination in the Philadelphia CBD were selected for detailed study of trip origins. The exact location of the trip origin was determined by digitizing the given address in Universal Transverse Mercator (UTM) coordinates using an address-matching computer program. Manual coding of unmatched addresses and other editing resulted in an accurate file. Approach distances were calculated by triangulation between origin address and access station.

From this survey it was concluded that approach distance to a rail station can be stratified by station type with all stations falling into one of four station types: urban with no parking, suburban with no parking, urban with parking, and suburban with parking. The term "urban" is used to describe station settings in older built-up areas where local street patterns are dense and speeds are lower. "Suburban" implies a more open setting with higher approach speeds possible. The "no parking" category includes any station with less than one-hundred public parking spaces. All stations considered in this study are listed in Figure 2 with their corresponding station types. Each of these station types have different approach distances associated with them. Figure 3 graphically depicts approach distance versus the cumulative percentage of rail riders which originate within that distance. Using this graph and the data used to produce it, the potential market area of a branch rail line can be determined.

Market Size

From the data contained in the 1982 DVRPC survey of rail riders, it was found that seventy percent of the rail riders who use an urban station with no significant amount of parking (type 1) originate within 0.45 miles of the station. The seventy percent figure was used as a base because the market area which lies beyond this limit is distorted by "stragglers". This market area reaches a distance of 1.15 miles from a suburban station with no significant parking (type 2), 1.64 miles from an urban station with parking (type 3) and 2.78 miles from a suburban station with parking facilities (type 4).

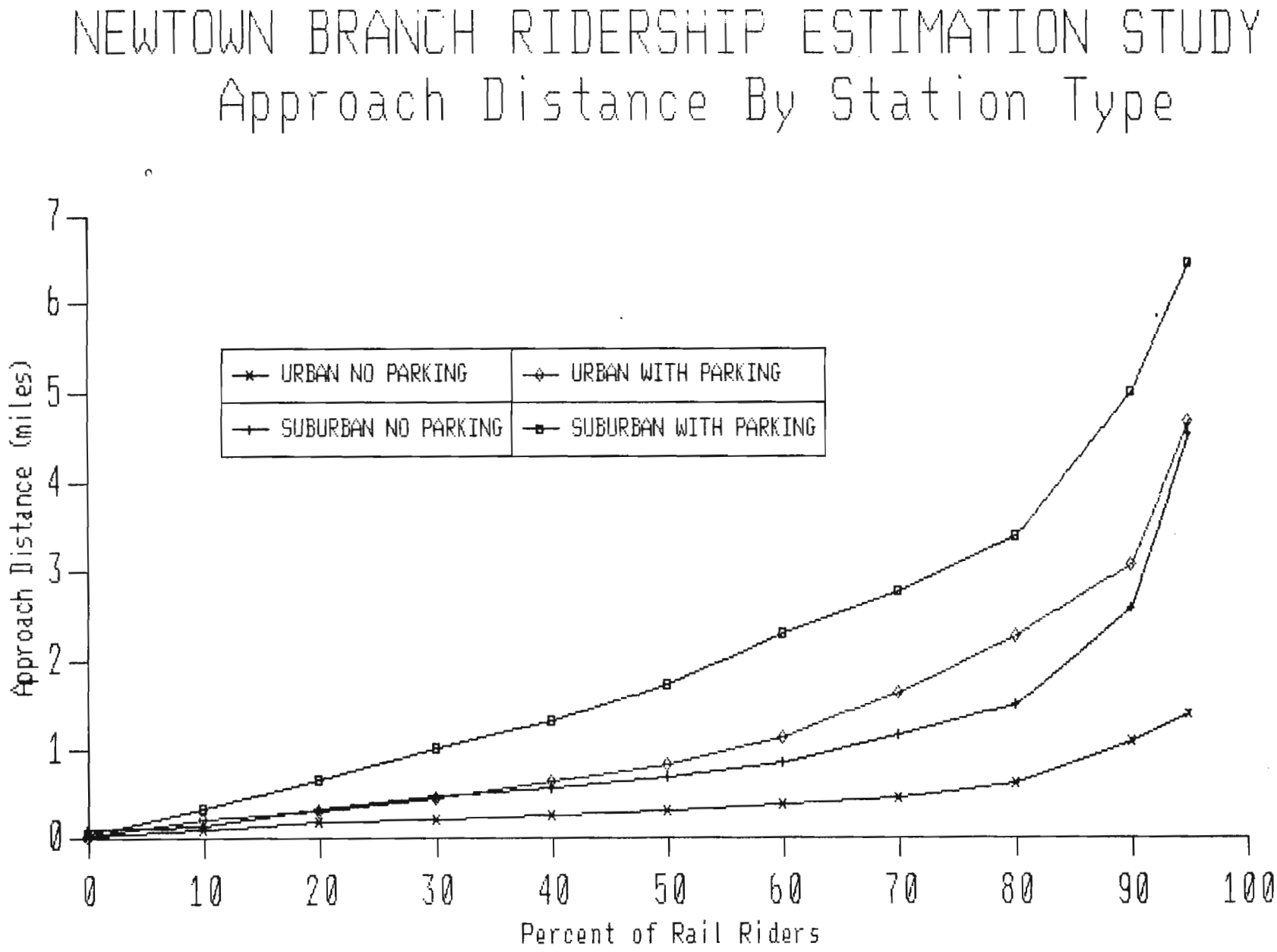
Figure 2. DVRPC RAIL SURVEY - STATIONS ANALYZED

Survey Number	Station Name	Station Type	Rail Line	Distance To CBD
1	Marcus Hook	4	Marcus Hook	16.44
5	Darby	1	Marcus Hook	5.64
6	Swarthmore	4	Media - West Chester	10.64
7	Secane	2	Media - West Chester	8.19
10	Paoli	4	Paoli	18.12
12	Strafford	4	Paoli	14.44
17	Overbrook	3	Paoli	5.30
20	Chestnut Hill	3	Chestnut Hill (West)	8.85
22	Chelten Ave	1	Chestnut Hill (west)	5.45
24	Cornwells Hts	4	Trenton	13.81
25	Torresdale	3	Trenton	11.67
27	Elm St	3	Norristown	15.16
30	Wyndmoor	3	Chestnut Hill (West)	8.47
32	Doylestown	2	Doylestown	24.38
33	Lansdale	4	Lansdale	21.11
34	Ambler	2	Landsdale	14.29
36	Warminster	4	Warminster	17.10
39	Fox Chase	3	Fox Chase	9.46
40	Olney	1	Fox Chase	5.88
42	Langhorne	4	West Trenton	19.52
46	Melrose	3	Reading Trunk	7.56

NOTE: Station Type 1. Urban With No Parking*
Station Type 2. Suburban With No Parking*
Station Type 3. Urban With Parking
Station Type 4. Suburban With Parking

* No parking includes stations with less than one hundred parking spaces

Figure 3.



Source: DVRPC Commuter Rail Survey 1982

Trip Purpose

Since rail trips are made into center city for different reasons, all survey trip records were grouped into one of five trip purposes: work trips, school trips, shopping trips, recreational trips, and other trips. The percentages of total rail trips made for each trip purpose and from each of the four station types are shown in Figure 4. Eighty-nine percent of all rail trips are work trips. All other trip purposes combined account for only eleven percent of trip making. Shopping, often thought to be a significant contributor to rail trip making, accounts for only 3% of all rail trips. The variations among station types are minor.

Figure 4. DVRPC RAIL SURVEY - TRIP PURPOSE BY STATION TYPE (Percent)

STATION TYPE	WORK TRIPS	SCHOOL TRIPS	SHOPPING TRIPS	RECRE. TRIPS	OTHER TRIPS
TYPE 1:	91.4	3.80	3.80	0.00	0.50
TYPE 2:	90.1	4.20	1.90	1.40	1.90
TYPE 3:	88.6	4.80	3.30	0.50	1.90
TYPE 4:	85.8	5.70	2.30	1.10	2.00
AVERAGE	88.8	5.00	2.90	0.90	2.10

NOTE:
Station Type 1. Urban With No Parking*
Station Type 2. Suburban With No Parking*
Station Type 3. Urban With Parking
Station Type 4. Suburban With Parking

* No parking includes stations with less than one hundred parking spaces

Source: DVRPC Rail Survey (1982)

III. TRIP RATE ANALYSIS

Ridership estimation is based on the extent of the potential market area (as determined in the previous tasks), the order of magnitude of the market base, and the range of penetration rates that can be achieved by the service provided to that market base. Given the extensive commuter rail system presently operating in the Delaware Valley, it is reasonable to expect that any revised service in the Newtown area will achieve market penetration rates similar to those achieved by similar rail service in comparable areas. To determine the magnitude of trips in the market base and the penetration rates which could be expected by the Newtown line, other line segments in comparable areas were analyzed.

Comparative Line Segments

Six line segments which are similar to the Newtown branch were selected. These six segments represent sections of the Doylestown Branch, the West Trenton Branch, the Warminster Branch, the West Chester Branch, the Paoli Line, and the Lansdale Branch. These segments are similar in that they are all radial routes serving suburban areas of approximately equal housing density. Figure 5 is a map showing all seven line segments.

Figure 6 lists each of the line segments studied in the comparative rate analysis. The table shows the extent of the segment, the Spring, 1980 ridership (boardings) along the segment, the number of trains serving the segment, and a comparison of rail and highway travel times from the outermost station to the CBD. Highway times were derived from the DVRPC highway network simulation.

There is a strong relationship evidenced in the data between the number of trains serving the line and the magnitude of ridership. However, the relationship may not be direct, since the operator is able to adjust the amount of service provided to match the demand. More straightforward is the ratio of rail to highway times, which indicates one aspect of the ability of the train to compete against the private auto. The Paoli line is the only line to win the travel time competition.

Figure 5.

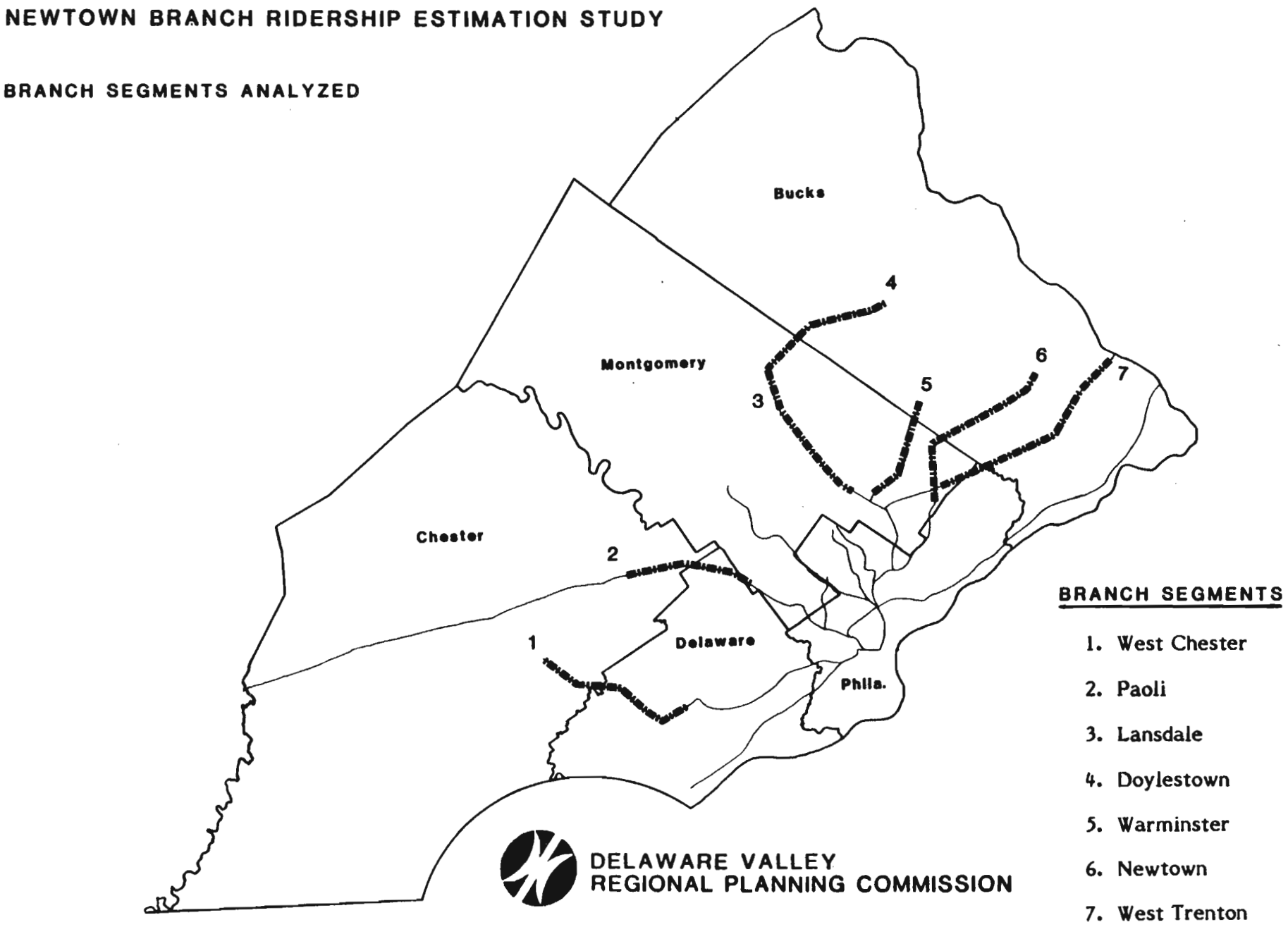

NEWTOWN BRANCH RIDERSHIP ESTIMATION STUDY
BRANCH SEGMENTS ANALYZED
Bucks
Montgomery
Chester
Delaware
Phila.
1
2
3
4
5
6
7
BRANCH SEGMENTS
1. West Chester
2. Paoli
3. Lansdale
4. Doylestown
5. Warminster
6. Newtown
7. West Trenton
DELAWARE VALLEY
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Figure 6. COMPARATIVE LINE SEGMENTS

Segment Name	Branch Line	From Station	To Station	Spring 1980 (1) Ridership: Daily Boardings	Spring 1980 (1) Number of Trains: Am Peak Inbound	Spring 1980 (1) Number of Trains: Pm Peak Outbound	Spring 1980 (1) Number of Trains: Total Daily	Travel Time Comparison (Min.): From Terminus Station to CBD: Rail (2)	Travel Time Comparison (Min.): From Terminus Station to CBD: Highway (3)	Travel Time Comparison (Min.): Ratio
WCHS	West Chester	West Chester	Elwyn	690	3	2	11	68	58	1.17
PAOL	Paoli	Paoli	Rosemont	5974	10	8	35	42	48	0.88
LANS	Lansdale	Lansdale	North Hills	3411	9	5	30	58	55	1.05
DOYL	Doylestown	Doylestown	Fortuna	467	5	4	15	79	63	1.25
WARM	Warminster	Warminster	Ardsley	2514	6	4	23	56	43	1.30
NWTN	Newtown	Newtown	Walnut Hill	169	2	1	7	68	57	1.19
WTRN	West Trenton	Yardley	Bethayres	2742	7	5	22	62	58	1.07

Sources: (1) DVRPC Commuter Rail Statistics - Spring 1980
(2) SEPTA Schedules
(3) DVRPC Highway Network Simulation

Comparative Market Areas

Using the parameters set forth in step II (Market Definition Analysis), socio-economic data for each comparative line segment's market area was accumulated from census block group statistics. Figure 7 shows the comparative socio-economic data for the line segments. Population density ranges from a low of 1383 persons per square mile in the Doylestown market area to a high of 3909 persons per square mile in the Warminster market area. Note that the population density of the Newtown market area is 2119 persons per square mile, very close to the average of 2233 persons per square mile for all segment areas. It should also be noted that the percentage of three-plus car households is highest for the Newtown market area, demonstrating that automobiles are available to residents for automobile travel.

Figure 7. DEMOGRAPHIC ANALYSIS OF COMPARATIVE LINE SEGMENTS

SEGMENT	POP DENS	HHD SIZE	AUTO OWNERSHIP (%) 0	1	2	3+	EMP. RES. PER HHD	INCOME (%) <15	15-25	25-35	35-50	50+
WCHS	1473	2.99	0.092	0.367	0.395	0.155	1.42	0.321	0.250	0.203	0.140	0.087
PAOL	1552	2.94	0.071	0.350	0.438	0.151	1.41	0.216	0.215	0.185	0.183	0.201
LANS	2252	2.92	0.086	0.363	0.403	0.155	1.42	0.263	0.276	0.209	0.148	0.104
DOYL	1383	2.95	0.102	0.319	0.428	0.166	1.42	0.288	0.290	0.252	0.128	0.043
WARM	3909	3.01	0.066	0.338	0.405	0.187	1.46	0.281	0.295	0.221	0.143	0.060
NWTN	2119	3.17	0.065	0.266	0.468	0.222	1.47	0.210	0.239	0.229	0.187	0.134
WTRN	2793	3.00	0.070	0.342	0.427	0.170	1.39	0.273	0.282	0.213	0.149	0.083
AVERAGE	2233	2.98	0.079	0.344	0.418	0.169	1.42	0.267	0.269	0.211	0.153	0.100

Source: 1980 Census

Comparative Trip Rates

The work trips made by the resident population were analyzed for each of the line segment market areas. Using the 1980 Census "Urban Transportation Planning Package (UTPP) data set (also referred to as the Journey-to Work data), the total work trips to all locations, those trips made to the Philadelphia CBD by all modes, and those trips to the CBD made on the rail system were accumulated. For the purpose of developing trip rates, the total number of households in each line segment market area associated with the work trip data was also accumulated.

The rate "Work Trips per Household" was calculated for each comparative market area. This value is used to estimate the magnitude of the total travel market. The rate "Percent CBD" was calculated and is used to determine the amount of the total travel market that can potentially use the Newtown Branch. Finally, the rate "Percent Rail" was calculated for each comparative line segment market area. These rates represent the range of market penetration achieved by the existing rail system and are used as guides to determine the penetration likely on the Newtown Branch.

Figure 8 presents the Journey-to-Work and trip rate data for each comparative line segment. Rail usage rates derived from the DVRPC Commuter Rail Statistics data bank for Spring 1980 are also presented. Very little variation exists in the rate of Work Trips per Household (wt/hhd), suggesting that an average rate of 1.356 could be used to represent 1980 behavior.

The rate "Percent CBD" shows considerably more variation. Five of the seven markets are within 2 percentage points of the mean value of 8.3%, with the Newtown Branch nearly equal to the mean. Two markets are significantly different from the mean value. Paoli exhibits a very strong CBD orientation, while the Doylestown market shows a very weak CBD orientation. The extreme distance of the Doylestown Branch from the CBD and the fact that is serves the County seat may account for its low rate. The high Paoli rate is possibly attributable to the corridor's long tradition as the Philadelphia Main Line, the prestigious home of CBD executives. Nearly a century of top quality rail service and later the Schuylkill Expressway have given this area its CBD orientation. However, as the Pennsylvania Turnpike Corridor intensifies as an employment center this high rate may decline toward the regional average.

The rate "Percent Rail" also shows more variation than the workers per household rate. Again, five of the markets are within 7 percentage points of each other, ranging from nearly 53% to just under 60%. Newtown is included within this group, though at the lower end of the range. Two markets are significantly outside this range: the Paoli area is the leader in attracting trips to the rail system at a 67% market share, while the West Trenton market attracts only half as much of the market (34%). Analysis of the West Trenton market area indicates strong competitive forces from I-95, US 1, and the City Transit Division which could account for its low market share. It has also been found that the West Trenton Line is only able to capture 60% of the rail trips. The other 40% are drawn to other rail lines which compete with the West Trenton in the northeast Philadelphia / lower Bucks County area.

The Rail Usage rates in Figure 8 were drawn from the Spring 1980 Commuter Rail Statisics Report published by DVRPC. The rate "CBD Egress" shows the percent of inbound boardings on the entire line, (of which the segment is a part) destined for one of the CBD stations. This rate averages over 90%. The other rates shown under "Period-of-Day" show the percentage of boardings that occur during the AM (6:00-9:00) and PM (4:00-6:00) peak periods versus all other off-peak periods. These rates tend to average around a 70/30 split. Only the Lansdale Branch is significantly different with a more even 55/45 split. These Usage Rates are used to account for non-CBD rail ridership and to determine the peak loads used to calculate car and power requirements in an engineering study.

Figure 8. TRIP RATES FOR COMPARATIVE LINE SEGMENTS

	--------WORK TRIPS---(1)--				------TRIP RATES--(1)--			-------RAIL USAGE--(2)------		
SEGMENT	HOUSE HOLDS	TOTAL ORIGINS	TO CBD	TO CBD BY RAIL	WT /HHD	PERCENT CBD	PERCENT RAIL	CBD Egress	---PERIOD OF DAY--- PEAK	OFF-PEAK
WCHS	25107.	33223.	2285.	1356.	1.323	6.9	59.3	98.0	72.8	27.2
PAOL	29798.	39546.	4902.	3294.	1.327	12.4	67.2	95.1	66.4	33.6
LANS	53905.	74264.	6368.	3529.	1.378	8.6	55.4	90.3	54.7	45.3
DOYL	8674.	11812.	274.	147.	1.362	2.3	53.6	87.6	73.3	26.7
WARM	45888.	64726.	3949.	2366.	1.411	6.1	59.9	88.9	69.8	30.2
NWTN	12306.	16654.	1363.	719.	1.353	8.2	52.8	90.3	72.1	27.9
WTRN	67325.	89175.	8215.	2786.	1.325	9.2	33.9	90.1	72.8	27.2

Source: (1) 1980 Census Journey-to-Work
(2) DVRPC Commuter Rail Statistics - Spring 1980

IV. NEWTOWN BRANCH PROFILE

Line Description

The Newtown Branch rail line is an extension of the Philadelphia - Fox Chase Line, running 15.2 miles from Newtown Boro in Bucks County through central Bucks and eastern Montgomery Counties to the Fox Chase section of northeast Philadelphia. It is a single track, non-electrified line that potentially serves eight municipalities in Bucks County: Lower Makefield, Lower Southampton, Middletown, Newtown, Northampton, Upper Southampton and Warminster Townships as well as Newtown Boro. Three municipalities are potentially served in Montgomery County: Abington, Lower Moreland and Upper Moreland Townships.

Passenger service on the Newtown Branch was provided by Conrail (formally the Reading Railroad) until July 1981. SEPTA took over the lines, suspended service, and initiated rail and tie improvements which took until October of that year. Temporary bus service was provided by SEPTA during this time. SEPTA re-initiates rail service on the Newtown branch in October 1981 using their own personnel. Service was disconnected in January 1983 as a cost cutting measure. Bus service was reinstated in place of the rail service. In 1980, a full year before the SEPTA takeover, ridership on the Newtown Branch was the lowest of all branch lines operated by Conrail.

There are nine stations on the Newtown Branch, three in Montgomery County: Walnut Hill, Huntingdon Valley, and Bryn Athyn; and six in Bucks County: County Line, Southampton, Churchville, Holland, George School, and Newtown. The Montgomery County stations have had a combined ridership of about 15 riders per day during the three decades prior to the discontinuation of service. One station, Walnut Hill, has not had more than 3 riders at any time in the past 20 years. Of the Bucks County stations, only one, Southampton, has consistently attracted more than 50 riders per day in the past two decades. None of these stations provide for a significant amount of patron parking: Southampton (43), Churchville (38), Newtown (32) and Holland (15). Stations on the line typically are small, wooden, three-sided shelters without hard-surface platforms.

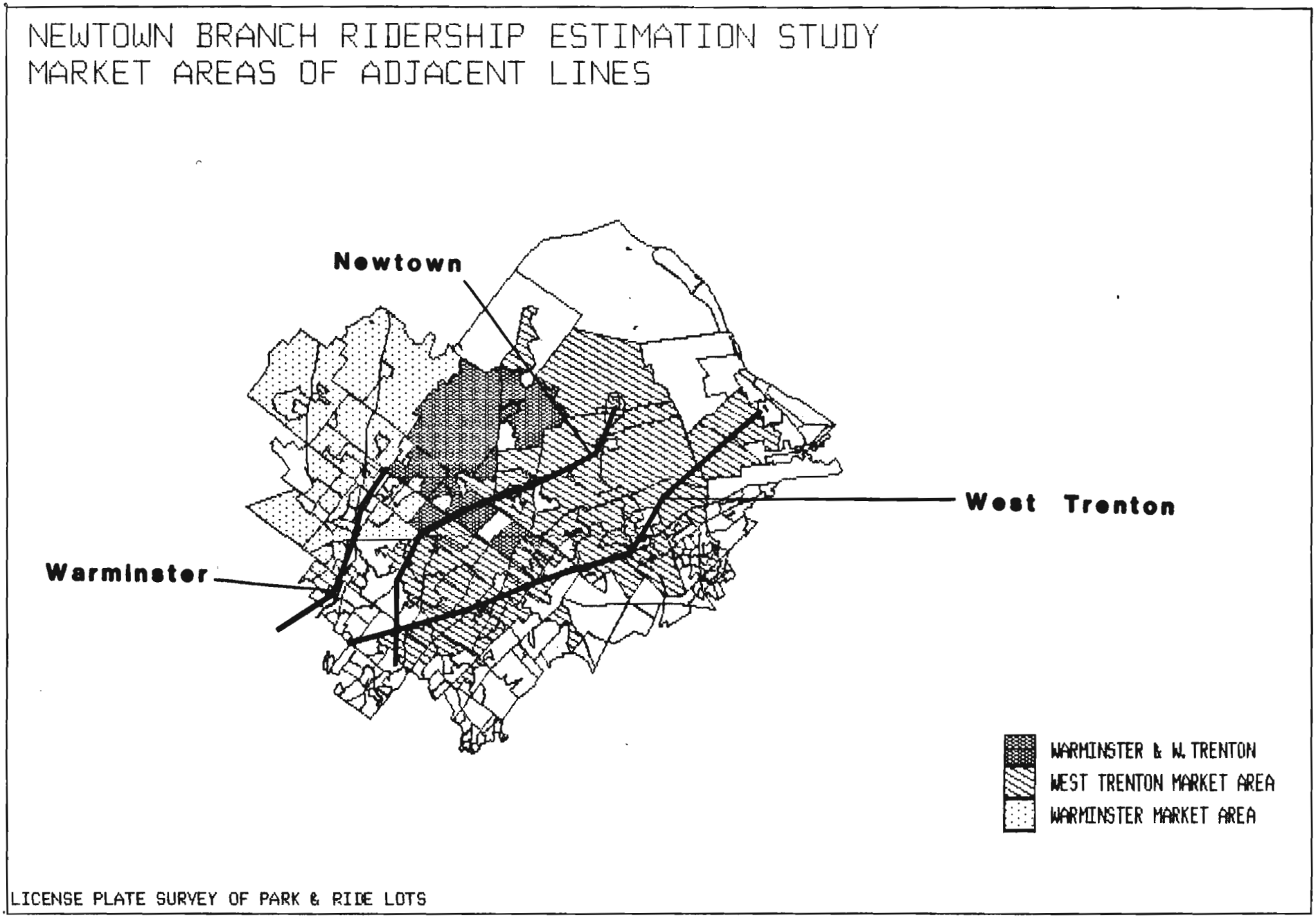
Market Competition

Competition for rail ridership in the Newtown area is significant. Both the Warminster and the West Trenton lines are within three miles of the Newtown Branch. The West Trenton is a multi-track electrified line. Consideration must be given to this competition when attempting to estimate the Newtown Branch's potential ridership.

To understand the extent of competition between the lines, DVRPC conducted a survey of park and ride patrons using the Warminster and West Trenton Lines during February 1985. At that time, no service was provided on the Newtown Branch. License numbers of every car parked in the lots of ten stations on the two operating lines were recorded, processed through the state motor vehicle registration files, and address matched for geographic location by DVRPC. The stations included three on the Warminster Line: Warminster, Hatboro, and Willow Grove; and seven on the West Trenton Line: Langhorne, Neshaminy Falls, Trevose, Somerton, Forest Hills, Philmont, and Bethayres. These 10 stations provide a total of 1800 off-street parking spaces. Nearly 1100 license plate numbers were recorded and 93% were able to be geographically located to the Census block group.

Figure 9 shows the extent of the park and ride market for the Warminster and West Trenton Lines. The plot represents the 90 percentile of park and ride patrons for each line. It is extremely interesting to note that the West Trenton market area penetrates not only across the Newtown Branch, but well into the market area of the Warminster line. This plot very graphically shows that the Newtown Branch would not only be in competition with both the Warminster and West Trenton Lines, but in fact the Newtown Branch lies virtually inside the other lines' market areas. This would account for the historically very poor ridership levels on the Newtown Branch. With levels of service well below that of competing lines and parking facilities nearly non-existent, those rail riders with a choice have taken the other lines, and not the Newtown.

Figure 9.


NEWTOWN BRANCH RIDERSHIP ESTIMATION STUDY
MARKET AREAS OF ADJACENT LINES
Newtown
West Trenton
Warminster
WARMINSTER & W. TRENTON
WEST TRENTON MARKET AREA
WARMINSTER MARKET AREA
LICENSE PLATE SURVEY OF PARK & RIDE LOTS

Demographic Trends

In order to estimate the future year ridership on the Newtown Branch, trends in pertinent demographic characteristics must be established. Figure 10 shows Minor Civil Division (MCD), County, and Region population data from the 1970 and 1980 Census, estimates for 1985 and projections for the year 2000. These projections are based on the recent work of DVRPC through its regional planning effort. DVRPC and its member governments use a cooperative forecasting methodology to forecast regional, county and municipal population and employment. This involves the projection and adoption of regional and county control totals by DVRPC and the preparation and adoption of MCD forecasts by each county. The commission reviewed the MCD numbers to assure consistency with the control totals and regional development policies, thereby establishing an official set of consistent municipal forecasts for the region.

The DVRPC Transportation Division uses these MCD forecasts as control totals in the prediction of tract level demographic data used for travel simulation. For this study, the tract level data for 1980 and 2000 were used to factor the 1980 Census block group data to represent 1985 and the year 2000.

The 11 MCD's included in the study area constitute just over 5% of the regional population in 1980, up from 4.5% in 1970. By 2000 the area is expected to house nearly 5.5% of the region's population. The most significant growth in population is expected in Northampton Township (11,125), followed by Middletown (6387) and Newtown Township (5042). By way of comparison, Northampton will have 3/4 the population density that Middletown had in 1980 (1634 vs. 2155 persons per square mile) while Newtown Township will be nearly as densely populated as Northampton was in 1980 (942 vs. 1060). The study area population will increase by over 12% between 1980 and the year 2000 if regional projections come to pass.

Figure 10. REGIONAL POPULATION TRENDS

Study Area	1970 Census Population	1970 % of Region	1980 Census Population	1980 % of Region	1985 Estimated Population	1985 % of Region	2000 Forecasted Population	2000 % of Region	Percent Growth 1970-1980	Percent Growth 1980-200
Abington	62,899	1.22	59,084	1.18	58,388	1.15	56,300	1.08	-6.1	-4.7
Lower Makefield Twp.	14,804	0.29	17,351	0.35	18,526	0.37	22,050	0.42	17.2	27.1
Lower Moreland Twp.	11,746	0.23	12,472	0.25	12,366	0.24	12,050	0.23	6.2	-3.4
Lower Southampton Twp.	17,578	0.34	18,305	0.36	18,030	0.36	17,205	0.33	4.1	-5.8
Middletown Twp.	30,512	0.60	34,246	0.68	36,372	0.72	42,750	0.82	12.2	24.8
Newtown Boro.	2,216	0.04	2,519	0.05	2,546	0.05	2,625	0.05	13.7	4.2
Newtown Twp.	2,002	0.04	4,527	0.09	6,208	0.12	11,250	0.22	126.1	148.5
Northampton Twp.	15,807	0.31	27,392	0.55	31,100	0.61	42,225	0.81	73.3	54.2
Upper Moreland Twp.	24,866	0.49	25,874	0.52	25,893	0.51	25,950	0.50	4.1	0.0
Upper Southampton Twp.	13,936	0.27	15,806	0.32	15,986	0.32	16,525	0.32	13.4	4.5
Warminster Twp.	34,900	0.68	35,543	0.70	35,576	0.70	35,675	0.69	1.8	0.4
Study Area	231,266	4.51	253,119	5.04	260,991	5.15	284,605	5.47	9.4	12.4
Bucks Co.	415,019	8.10	479,211	9.54	505,908	9.98	586,000	11.27	15.5	22.3
Montgomery Co.	623,799	12.17	643,621	12.81	651,466	12.85	675,000	12.98	3.2	4.9
City of Phialdelphia	1,947,494	40.00	1,688,210	33.6	1,641,158	32.40	1,500,000	28.85	-13.3	-11.1
Region	5,125,142	100.00	5,025,000	100.00	5,068,750	100.00	5,200,000	100.00	-2.0	3.5

Employment Trends

It is also necessary to estimate employment trends in the region to accurately predict Newtown rail ridership. Figure 11 shows regional employment levels for 1970 and 1980 as well as estimates for 1985 and projections for the year 2000.

Between 1970 and 1980, while the region showed only a modest gain in employment, a tremendous shift in the location of jobs was occuring. The core of the region, most notably Phialdelphia, has been loosing employment at the same time that the suburban counties have been gaining. This process is by no means unique to this region. Suburbanization of employment is a trend that has been going on since the advent of the automobile age and will likely continue as technology allows greater decentralization of industry. The Philadelphia CBD is only projected to reach its 1970 level of employment by the year 2000. These jobs will be filled by workers whose residences are increasingly more dispersed throughout the region. The combined result of a suburbanization of both population and employment is a decreasing concentration of trips to the regions core.

Figure 11. EMPLOYMENT TRENDS

Study Area	1970 Census Employment	1970 % of Region	1980 Census Employment	1980 % of Region	1985 Estimated Employment	1985 % of Region	2000 Forecasted Employment	2000 % of Region	Percent Growth 1970-1980	Percent Growth 1980-2000
Bucks Co.	138,136	6.0	183,082	8.1	200,269	8.5	251,830	9.7	32.5	37.6
Montgomery Co.	305,710	14.2	360,399	15.9	383,552	16.3	453,011	17.5	17.9	25.7
Phialdelphia	1,007,378	46.9	835,812	36.8	839,126	35.7	849,066	32.9	-17.0	1.6
Phila. CBD	271,454	12.6	264,000	11.6	265,500	11.3	270,000	10.4	-2.7	2.3
Region	2,150,163	100.0	2,269,000	100.0	2,347,750	100.0	2,584,000	100.0	5.5	13.9

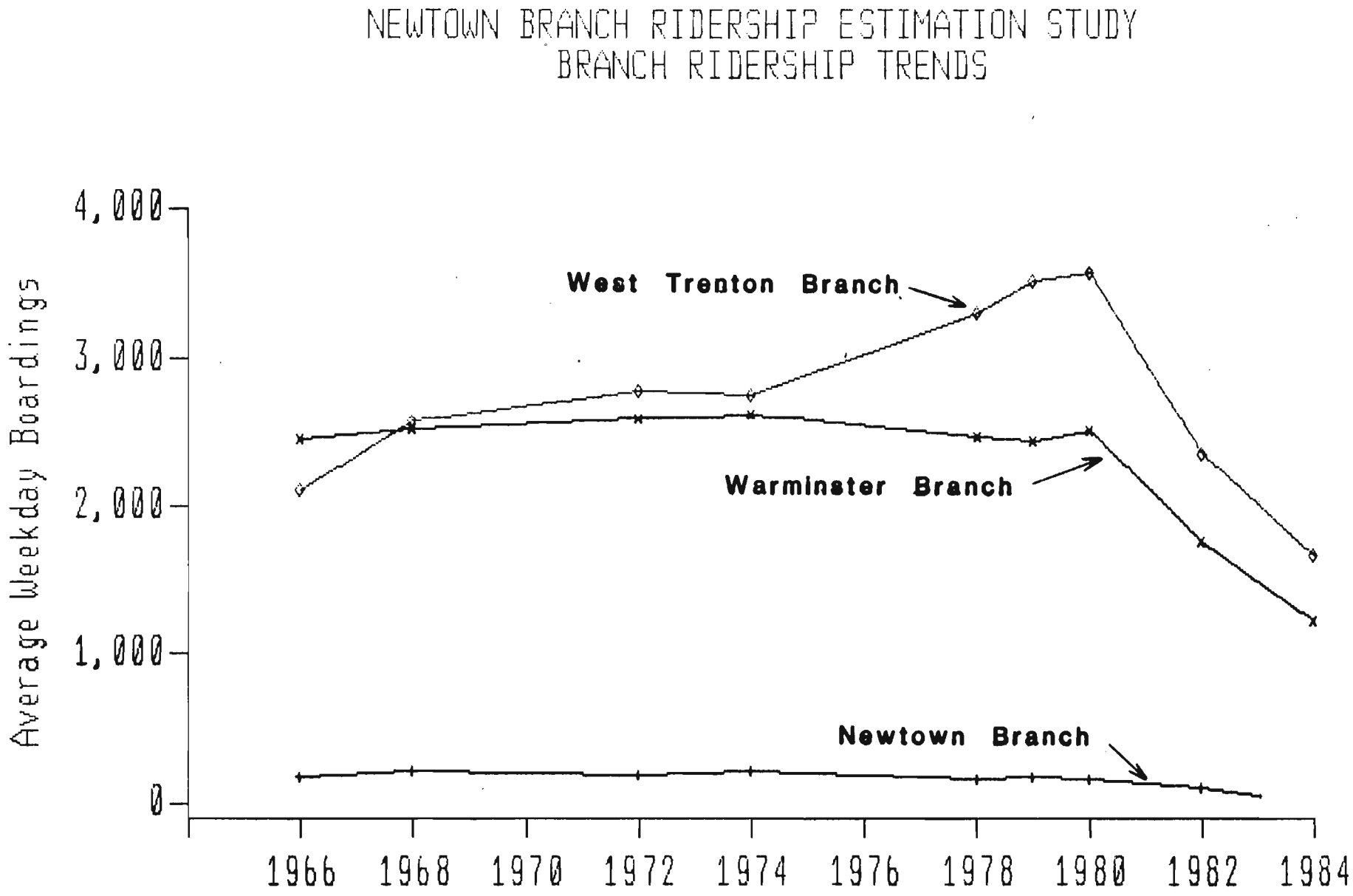
V. RIDERSHIP ESTIMATES

Ridership Trends

Ridership estimates must be made in the context of current experience and past trends of rail patronage. Ridership has been extremely unstable in the last few years as the result of the SEPTA takeover from Conrail, the restructuring of lines for operation through the Center City Commuter Connection tunnel (CCCC), strikes, and labor and equiptment shortages. However, during the previous decade ridership on the regional rail system had fallen over 10%. That loss may have been the result of Conrail's disinterest in promoting passenger rail service, coupled with the population and employment trends noted in the last chapter. With SEPTA control of the system, the added efficiency and convenience provided by the CCCC and at least stable CBD employment the regional rail system should be able to return to the overall trends of the latter 70's.

When estimating the potential ridership on the Newtown Branch, the patronage trends of the rail lines in that area should be considered. Figure 12 shows the ridership trends on the Newtown, West Trenton, and Warminster Lines for the period 1966 to 1984. Newtown ridership consistently remained in the 100-300 boardings per day range over the period. Ridership on the other two lines remained above the 2000 boardings per day level, with the West Trenton Line exceeding the 3000 boardings mark during the latter half of the 70's. All three lines sustained serious losses of ridership after 1980 and, of course, service was discontinued on the Newtown Branch in January of 1983.

Figure 12.



Source: DVRPC Commuter Rail Statistics

Alternative Scenarios

Estimates have been prepared for a "Base Case" and three alternative scenarios. Each of these scenarios have certain assumptions which affect the rates used in the estimation process and, ultimately, final ridership estimates. The scenarios are presented below.

The "Base Case" Scenario

This scenario estimates ridership in the study area under the assumption that no change will be made to the existing rail system, including no resumption of service on the Newtown Branch.

The rate of "Work Trips per Household" was held constant to the 1980 level of 1.353 over the forecast period. The rates for "CBD Egress", "Peak", and "Percent Work" were also held constant with values of 90.3%, 70.0%, and 89.0%, respectively. The rate of "Percent CBD" was derived by factoring the 1980 value for each market area by the growth factor for CBD employment (percent of region). These factors result in a decrease in CBD orientation. The 1985 and 2000 growth factors were 0.97 and 0.90, respectively. The rate of "Percent Rail" for each market area was held constant at the observed 1980 value.

The "Electrification" Scenario

This scenario estimates ridership in the study area under the assumption that the Newtown Branch will be electrified from Newtown to Fox Chase, that sidings and signalling will be installed to permit half-hourly service during peak periods and hourly service during the off-peak service hours, that the through service operated will be equal to that offered on the competing lines, and that station conditions will be upgraded for passenger comfort and safety and parking increased to the system average of roughly 75 spaces per station.

Rates used in this scenario for the competing lines were identical to those used in the "Base Case". Rates used for the Newtown market area followed the same prescription as described under the "Base Case", except that the "Percent Rail" was increased to the high end of the observed range (from 53% to 60%) as discussed in Chapter III.

The "Electrification Plus Park & Ride" Scenario

This scenario makes all the same assumptions as the "Electrification" scenario, except that the market area of the Newtown Branch is expanded by assuming that very large regional Park & Ride lots will be constructed along the line with excellent access from area arterial highways.

All rates were the same as under the "Electrification" scenario.

The "Electrification Plus CBD Development" Scenario

This scenario makes all the same assumptions as the "Electrification" scenario, except that the Philadelphia CBD is assumed to have a greater concentration of the regional employment than that embodied in the most recent regional forecasts.

All rates were therefore the same as in the "Electrification" scenario, except that the rate of "Percent CBD" was growth factored so as to return the CBD to its 1970 percent of the region's employment by the year 2000. The factors for 1985 and 2000 were 1.02 and 1.09, respectively.

Figure 13 shows the market area of the Newtown Branch used in the analysis of the "Electrification" and "Plus CBD Development" scenarios. Figure 14 shows the market area used in the "Plus Park & Ride" scenario.

Figure 13.

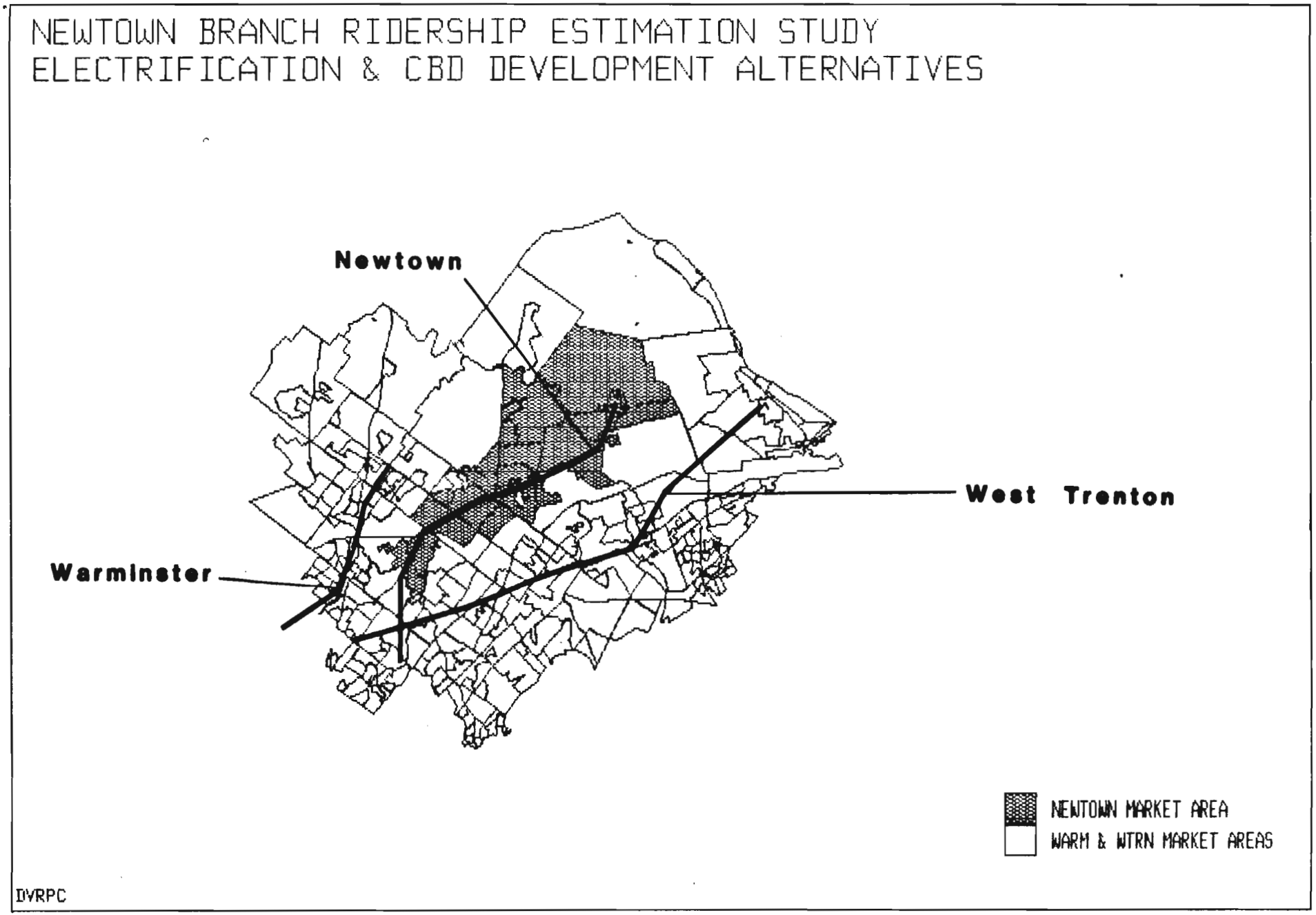
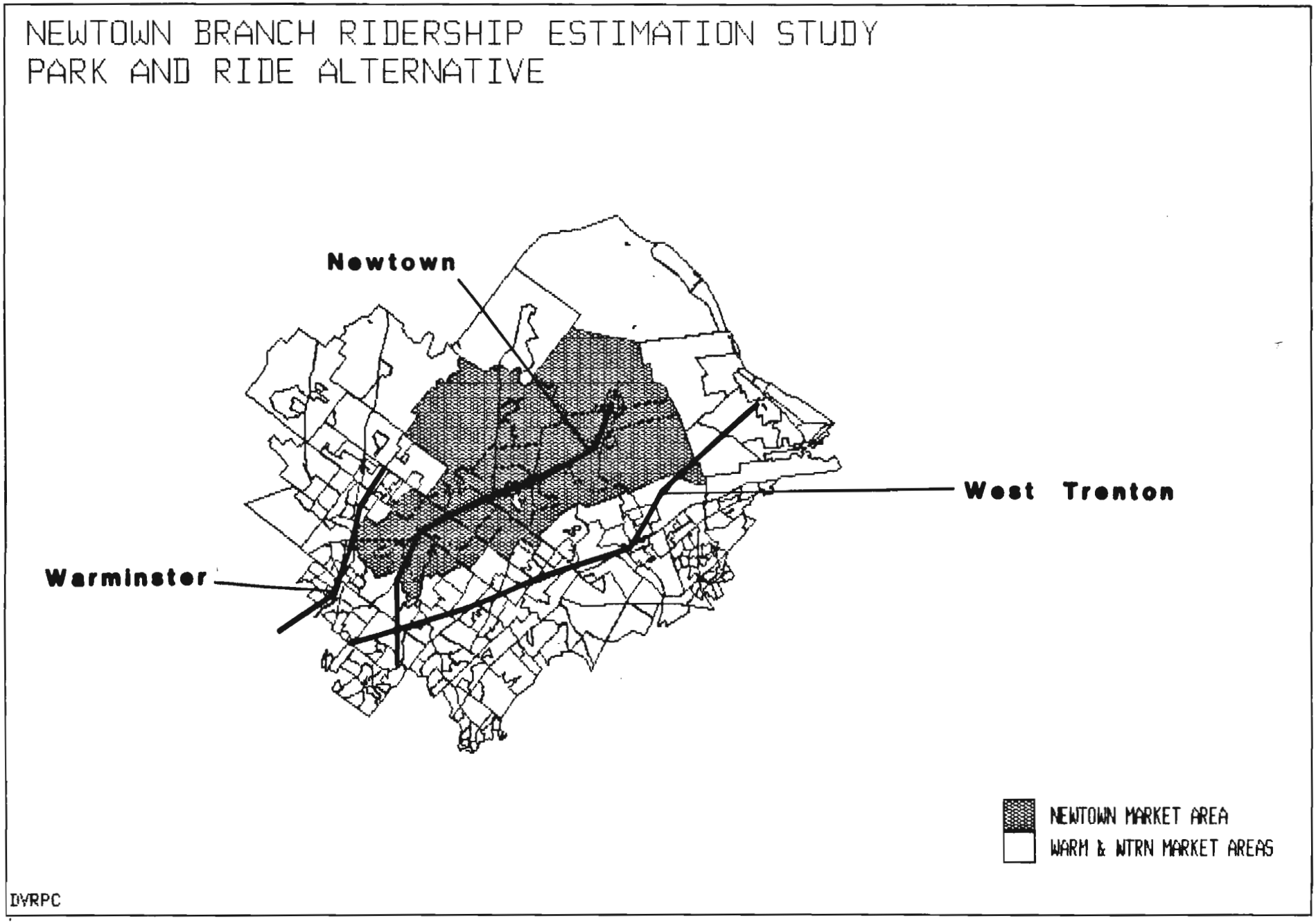

NEWTOWN BRANCH RIDERSHIP ESTIMATION STUDY
ELECTRIFICATION & CBD DEVELOPMENT ALTERNATIVES
Newtown
West Trenton
Warminster
NEWTOWN MARKET AREA
WARM & WTRN MARKET AREAS
DVRPC

Figure 14.


NEWTOWN BRANCH RIDERSHIP ESTIMATION STUDY
PARK AND RIDE ALTERNATIVE
Newtown
West Trenton
Warminster
NEWTOWN MARKET AREA
WARM & WTRN MARKET AREAS
DVRPC

Estimation Results

Ridership estimates for the Newtown Branch were developed for the years 1985 and 2000 using the trip rates and the market area demographic characteristics established in the previous tasks. The estimation process involves projecting the 1980 block group demographic data to the estimation year and applying the trip rates to estimate the number of total daily work trips generated by the block group population. These work trips are further refined to estimate the work trips destined for the CBD and the number of those CBD bound trips that can be expected to take a rail line. Finally, additional factors are applied to the estimated rail trips to account for non-work, non-CBD travel and to estimate peak and off-peak demands.

Figure 14 shows the results of this estimation process for the "Base Case" and the three alternative scenarios. The table shows ridership on each of the 3 rail lines in the study area, as well as the study area total rail patronage. All ridership numbers are in terms of passenger boardings within the branch segments. The 1980 ridership numbers are the calibrated output of the estimation process assuming the operation of the Newtown Branch as a limited service shuttle line and are provided for comparison purposes.

The "Base Case" indicates the growth expected in rail ridership from the study area from 1980 to 2000. Without significant change to the existing physical rail system, a 15% increase in rail ridership can be expected over that time. This increase is the result of population growth projected for the area. Ridership growth will be twice as great on the Warminster Line as on the West Trenton Line.

The termination of service on the Newtown Branch had very little impact on either of the competing rail lines. In 1980, the Newtown Branch carried less than 4% of the study area rail trips. Under both the "Electrification" and the "CBD Development" scenarios, Newtown is projected to carry 15 to 20 percent of study area rail trips. This increase in ridership is the result of parity with the competing lines in level of service as assumed in these scenarios. However, under the "Park & Ride" scenario the line is projected to carry nearly 30% of study area rail riders. The expanded market area of the line under this scenario attracts a significant number of riders from the market areas of the competing lines as assumed in the other alternatives.

The ridership estimates for both the "Electrification" and "Plus CBD Development" scenarios do not take into consideration the parking constraint to potential ridership. Rather, the ridership numbers assume that sufficient additional parking can be provided to accommodate the demand. To obtain these levels, 800-950 spaces would need to be added to the stations of the Newtown Branch. If additional spaces are not provided, actual ridership would likely not exceed 400-500, respectively, for the two scenarios.

Figure 16 summarizes the change in study area rail ridership as a result of the influence of each alternative scenario. This table is of most importance in the feasibility analysis of electrifying the Newtown Branch. The table shows the net increase in rail ridership due to each scenario for the years

1985 and 2000. "Electrification" causes a 9% to 10% increase in study area rail ridership over that which could be expected if no significant improvements were implemented. A maximum increase of 13% could be achieved by constructing large regional park & ride lots along the electrified Newtown Line, as assumed in the "Plus Park & Ride" scenario. By contrast, the strengthing of the Philadelphia CBD as a regional employment center and the de-emphasis of suburbanization of employment as assumed in the "Plus CBD Development" scenario, could cause study area rail ridership to increase by 34% by the year 2000.

Figure 15. RIDERSHIP ESTIMATES FOR ALTERNATIVE SCENARIOS

D A I L Y P A S S E N G E R B O A R D I N G S

SCENARIO	LINE	1980 Total	1980 Peak	1980 Off-peak	1985 Total	1985 Peak	1985 Off-Peak	2000 Total	2000 Peak	2000 Off-Peak
BASE CASE	NWTN	229	160	69	-	-	-	-	-	-
	WARM	2369	1658	711	2711	1898	813	3023	2116	907
	WTRN	2884	2019	865	3129	2191	939	3272	2290	982
	STUDY AREA	5482	3837	1645	5840	4089	1752	6295	4406	1889
ELECTRIFICATION ONLY	NWTN	-	-	-	1024	717	307	1311	918	393
	WARM	-	-	-	2442	1709	733	2698	1888	809
	WTRN	-	-	-	2881	2016	864	2940	2058	882
	STUDY AREA	-	-	-	6347	4442	1904	6949	4864	2084
ELECTRIFICATION PLUS PARK & RIDE	NWTN	-	-	-	1737	1216	521	2108	1476	632
	WARM	-	-	-	2084	1459	625	2287	1601	686
	WTRN	-	-	-	2712	1898	814	2721	1905	816
	STUDY AREA	-	-	-	6533	4573	1960	7116	4982	2134
ELECTRIFICATION PLUS CBD DEVELOPMENT	NWTN	-	-	-	1075	752	322	1577	1104	473
	WARM	-	-	-	2566	1796	770	3286	2300	986
	WTRN	-	-	-	3043	2130	913	3542	2479	1063
	STUDY AREA	-	-	-	6684	4678	2005	8405	5883	2532

Figure 16. RIDERSHIP INCREASES DUE TO ALTERNATIVE SCENARIOS

D A I L Y P A S S E N G E R B O A R D I N G S

	1985			Percent	2000			Percent
	Total	Peak	Off-Peak	Increase	Total	Peak	Off-peak	Increase
BASE	5840	4089	1752		6295	4406	1889	
INCREASE DUE TO...								
ELECTRIFICATION	507	353	152	9%	654	458	195	10%
ELECTRIFICATION PLUS PARK & RIDE	693	484	208	12%	821	576	245	13%
ELECTRIFICATION PLUS CBD DEVELOPMENT	844	589	253	14%	2110	1477	643	34%

VI. CONCLUSIONS

Findings

This study has analyzed the ridership potential of the Newtown Branch Rail Line as part of a feasibility study of electifying the line from Fox Chase to Newtown. The analysis compared market areas, trip rates, demographics, and competition between similar suburban rail line segments to determine the market potential of the Newtown Branch. The market base was projected to 1985 and the year 2000 in accordance with recent regional population and employment forecasts. The results of this ridership estimation process are stated below:

1. Ridership on the Newtown Branch, if service were reactivated with direct electrification into the existing Fox Chase Line and made equal to that on competing lines, would reach 1311 average weekday riders (boardings) by the year 2000. However, the net increase in rail ridership in the study area would be only 654 riders or slightly more than 10% greater than that which could be expected if the line were not reactivated.

2. If stations were expanded to provide significant Park and Ride lots (400 or more spaces) and electrified service was equal to that provided on the West Trenton and Warminster Lines, ridership could exceed 2108 average weekday riders (boardings). This could mean a 13% increase in study area ridership by the year 2000. This increase should be considered the maximum ridership potential of the Newtown Branch that can be achieved through transportation facility improvements to the line.

3. If the Newtown study area was to become more oriented toward the Philadelphia CBD as the result of a strengthening of the CBD and a lessening of suburbanization of employment, ridership on the electrified Newtown Line with service equal to that on competing lines, could be as high as 1577 average weekday riders (boardings). However, this would mean 2100 new rail riders in the study area by the year 2000, representing nearly a 34% increase over the Base Case. This increase would take time to mature and would depend on mostly non-transportation policies being enforced.

4. If sufficient parking is not provided at the stations along the Newtown Branch in either the "Electrification" (800) or "Plus CBD Development" (950) scenarios, the estimated ridership will not be accommodated. Most of these unaccommodated potential riders will shift to the competing lines, if sufficient capacity exists for them there. However, those not accommodated will either be lost to other modes or, particularly in the latter scenario, the trip will not be made at all. Ridership could then be as low as 400 and 500, respectively.

Observations

In addition to the specific findings of potential rail ridership on the Newtown Branch, the following observations are provided to aid decision makers in promoting rail service and increasing rail ridership in the Newtown study area.

a. The vast majority of rail riders use an automobile to access a rail line in suburban areas. In the Newtown study area, the DVRPC Rail Survey found that 74% of the West Trenton riders approached the line by auto, while 88% of the Warminster riders used the auto approach. Overall, the Bucks County stations averaged 83% auto approach and only 16% walk approach.

    - Adequate off-street parking at suburban rail stations is necessary to attract potential users. Inadequate parking will divert riders to other lines within competitive areas or will result in lost potential ridership. The Newtown branch stations have inadequate off-street parking. Line potential could be increased with the addition of Park and Ride lots.

b. The market area of a rail line can be defined in terms of the distance a potential rider is willing to travel to reach the line. This distance is generally related to the overall distance of the primary trip. It is also specifically related to the ability of the stations along the line to accommodate those longer approach trips that must rely on an automobile. Finally, the market area is affected by the presence of competing lines of the same or a similar mode. If the market areas of these competing lines overlap, than the potential ridership will be shared between them. This sharing tends to be heavily biased toward the line providing a significantly higher level of service or service at a lower price.

    - The market potential of the Newtown branch is shared with the Warminster and West Trenton lines. Since historically both of these lines provided a higher level of service than the Newtown Branch, most of its market potential was given to the competing lines. Parity in level of service would provide a redistribution of the potential market. (Note: West Trenton potential is also being shared with other lines, evidenced by the limited market area southeast of the line in the License Plate survey.)

c. The primary use of the rail network is for work trips (89%) travel to the Philadelphia CBD. Only 3% of the rail trips from suburban area stations are for shopping. With the advent of the suburban shopping mall concept of retailing, many of the stores in the CBD are also located in the suburbs. This is not to imply that the rail system is not important to the vitality of CBD retailing. To the contrary, as the rail system helps to attract the suburban resident to work in the CBD, the worker then becomes a potential CBD shopper. And with a growing and viable retail base in the CBD more shopping trips may be attracted to use the rail system. However, shopping will not account for a significant proportion of rail system trips.

    - The peak period CBD orientation of the Newtown branch will predominate and be largely unaffected by a resurgence of CBD retailing.

d. The Newtown study area has experienced significant population growth in the last decade which should continue during the next two decades, though at a reduced rate. The distribution of this growth is mixed, with some older areas experiencing modest declines in population while new tracts of housing are opening in younger areas. Employment also has been expanding both in the immediate Newtown area, as well as along the Pennsylvania Turnpike, I-95, and US 1 in the adjacent counties of Montgomery and Mercer. These trends will make the Newtown areas less of a Philadelphia bedroom community and more a part of an integrated suburban area with its own employment base. The percent of work trips to Philadelphia has been declining over the years and unless very significant changes occur in employment location, the trend will continue.

    - Potential gains in rail ridership from population growth are somewhat offset by the suburbanization of employment, jobs which can not be served by the Newtown Line.