

# Short-Term Impacts of a Suburban Rail Rapid Transit Station: Study Results for Silver Spring, Maryland

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Results of a before-and-after study for the Silver Spring station of the Washington, D.C., Metro rail rapid transit system are presented. The study focused on the short-term impacts on the Silver Spring business district of the initiation of rail service and coordinated changes in collector and community transit services. Findings are reported for several impact categories, including transit use, changes in travel habits, traffic and parking impacts, and the community's perceptions of Metro. There were significant initial increases in transit use in the station service area: about 100 percent for regional service and about 200 percent for local services. The percentage of transit work trips to Silver Spring increased from 10 to 13 percent. Approximately 40 percent of midday non-work trips made by Silver Spring employees into the District of Columbia were made by Metro. Surveys at the station show that a significant proportion—approximately 60 percent—of Metro riders in the morning peak period get to the station by bus and another 16 percent walk. Parking became the most serious negative impact of the station; 1500 daily parkers were added to the parking supply in Silver Spring, which increased the peak-hour occupancy for long-term spaces from 80 to 92 percent. However, this was partly offset by increased use of transit to Silver Spring. Special attitudinal surveys of Silver Spring businesses and residents indicated that, in spite of short-term problems, the overall impact of the station was positive.

The first extension of the Metrorail rapid transit system into the Washington, D.C., suburbs has provided improved accessibility for people from that portion of the metropolitan area to downtown Washington. Just as importantly, it has enhanced transit access to the major regional activity center at its interim terminal, the business district of Silver Spring, Maryland. The main intent of this paper is to disseminate the results of an impact study conducted by the Montgomery County Planning Department of the Maryland-National Capital Park and Planning Commission as a subelement of the overall Metro before and after studies of the Metropolitan Washington Council of Governments (1).

## STUDY FRAMEWORK

### Geographic and Transportation Setting

The Silver Spring, Maryland, central business district (CBD) is located just beyond the "north corner" of the square that forms the boundary of the District of Columbia and about 1 mile south of the Capital Beltway (see Figure 1). The Silver Spring CBD is a major regional office and retail center that serves Montgomery County and parts of the neighboring District of Columbia and Prince Georges County. The CBD contains nearly 3.0 million ft<sup>2</sup> of office space, 1.7 million ft<sup>2</sup> of commercial space, and approximately 3600 residential units and has about 17 000 employees. It is served by three major arterial highways, commuter rail service on the Baltimore and Ohio Railroad, many Metrobus routes, and the Montgomery County Department of Transportation (DOT) innovative Ride-On minibus service.

In February 1978, the Metro "Red Line" was extended to the station at Silver Spring. It will serve as the terminal station until the line is extended to Glenmont, which is now scheduled to take place in mid-1986. The station itself is located alongside the railroad right-of-way and about 1200 ft away from the retail core. Bus feeder services were coordinated with the station opening (2). This involved the relocation of the previous bus terminal to the station area, the turnback of downtown-

oriented routes, and expansion of Metrobus and Ride-On services. Other changes were made in transportation facilities, including several roadway improvements, increases in parking rates several months after the station opening, and conversion of the time duration for many parking meters.

### Study Focus

The focus of this study has been on the impacts on the Silver Spring CBD associated with these initial changes in transit service, both those of the regional rail service and those of the collector and community transit service. Although the study was not directly concerned with regional travel from the Silver Spring area into the District of Columbia, secondary data of that type were available from the Washington Metropolitan Area Transit Authority (WMATA) and other sources and were analyzed in the study. The study framework was set up to examine not just the localized, as opposed to regional, impacts but also to concentrate on the short-term impacts. The intent was to provide a "snapshot" just before and just after these changes in transit service. This effort has been aimed partly at setting the stage for the monitoring of longer-term impacts of the Metro station and the overall Metro system in order to better relate to local comprehensive and land use planning efforts.

### Data Sources and Survey Methods

Measuring the types of impacts that were of concern to Silver Spring required an extensive amount of new data collection as well as reliance on several sources of secondary data. Seven basic types of surveys were conducted for the study, five of which were conducted both before and after the station opening:

1. Establishment survey and employment census (before period only),
2. Travel surveys of people employed in Silver Spring,
3. Person-trip-generation studies,
4. Cordon traffic surveys,
5. Traffic counts at key intersections,
6. Parking studies, and
7. Perception and attitudinal studies (after period only).

Other secondary sources of data complemented the above data collection efforts. These included (a) a May 1978 WMATA rail survey, (b) other WMATA and Montgomery County DOT transit data, and (c) other county DOT traffic and parking data.

### FINDINGS

The findings of the Silver Spring Metro before and after studies are presented in five categories: transit use, travel habits, traffic, parking, and perceptions of Metro.

### Transit Use

As Figure 2 shows, the growth in average weekday transit use in the corridor from Silver Spring into the District of Columbia has been steady and dramatic. Within the first 10 months after the opening of the Silver Spring station, ridership approximately doubled over the previous bus-only riders. During the month of May 1978, when the after surveys were conducted, there were about 9500 average daily alightings at the Silver Spring station. By May 1979, ridership had increased to more than 15 000 alightings/day. It has since peaked (in the summer of 1979, during the gasoline shortage in the Washington area) and then declined slightly.

When rail rapid transit service was extended to Silver Spring, there was also a major expansion in the county-operated Ride-On system. The initial response was a tripling of ridership, from somewhat

less than 4000 daily riders to 12 000 at the time of the after surveys. This represents travel not only to the Silver Spring CBD but also to other locations in the vicinity of Silver Spring and to the Takoma Park Metro station. It is estimated that about half of the initial Ride-On ridership was related to Metro access. Figure 3 compares the growth in Ride-On system ridership with the alightings at Silver Spring and shows a general correlation between the two transit services.

### Travel Habits

The opening of the Silver Spring Metro station, accompanied by improvements in bus services, has brought about a number of major changes in the travel habits of persons going to and from the Silver Spring CBD. Accordingly, persons traveling to and from Silver Spring have been faced with new

Figure 1. Location of Silver Spring Metro station.

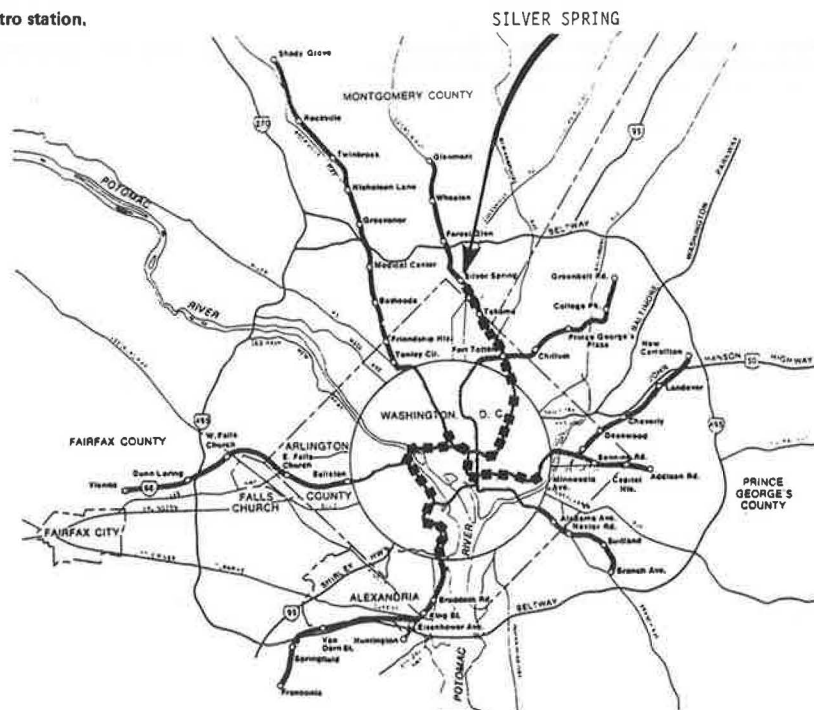
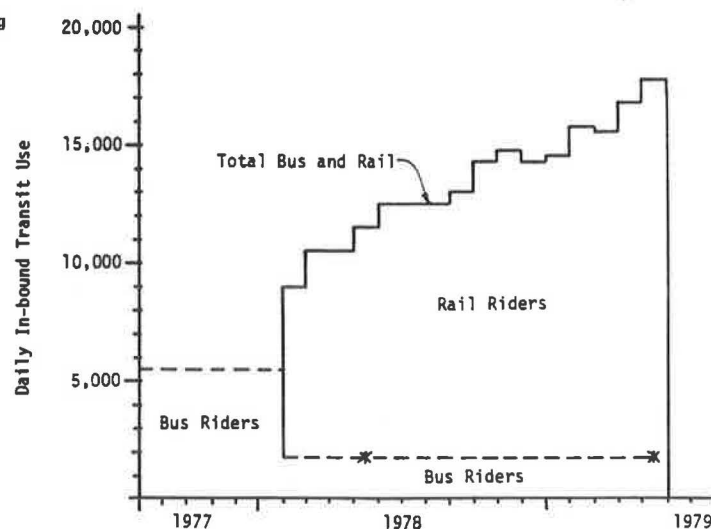


Figure 2. Daily in-bound transit users crossing District line from Silver Spring.



opportunities to change their habits of travel. These changes in travel habits were examined in the following categories of trips:

Type of Trip	Source of Data
Work trips to Silver Spring	Silver Spring employee surveys
Morning-peak-period trips from Silver Spring by Metro	WMATA rail survey
Nonwork trips by employees in Silver Spring	Employee surveys
Off-peak-period trips to and from Silver Spring via Metro	Rail surveys

#### Work Trips to Silver Spring

Work trips to Silver Spring include trips made by persons employed within the Silver Spring CBD boundary for the purpose of reporting to work. The table below gives data on the percentage of work trips by travel mode for employees in Silver Spring for both before and after periods (N = 2905 and 2436 for before and after, respectively):

Travel Mode	Before (%)	After (%)
Automobile		
Driver	74.9	71.2
Passenger	7.8	8.3
Dropped off	2.6	2.8
Metrobus	6.6	4.6
Ride-On	2.3	4.9
Commuter rail	1.4	1.5
Metro	0	2.0
Walk or bicycle	3.9	4.6
Taxi	0.3	0.1

For the after period, percentages for automobile driver, Ride-On, and Metro are significant at the 95 percent confidence level.

The number of employees who drove their cars to work decreased by almost 4 percent after Metro opened. Some of this reduction can be attributed to automobile trips diverted to Metro, but the major factor is more likely the improvement in Ride-On service. This shift indicates a reduction of approximately 600 spaces in parking demand by employees. Total transit ridership for work trips to Silver Spring increased from 10.3 percent in the before period to 13.0 percent in the after period. Metrobus ridership declined by 2 percent. It is evident from data discussed below in relation to jurisdiction of residence that this reduction was caused both by persons in the District diverting to Metro and by residents in the Silver Spring vicinity diverting to Ride-On. Ride-On is now serving 5 percent of the employee work trips. Trips by Metro riders constituted 2 percent of work trips to Silver Spring in the after period. This is equivalent to approximately 700 one-way work trips on Metro each day by Silver Spring employees.

#### Mode of Travel by Jurisdiction of Residence

Table 1 gives work-trip travel modes by jurisdiction of residence. Several items are of interest in this table. First, the percentages of automobile drivers are substantially lower for Silver Spring and District of Columbia residents. Of Silver Spring residents within the Capital Beltway (within 2-3 miles of the Silver Spring CBD), more than 20 percent preferred walking to work, which points up the value of mixed office and residential land development in what is normally considered a suburban setting. In

addition, Ride-On service is readily available to these residents and was used to get to work by 14 percent of the employees in this category, an increase of 5 percent over the period prior to Metro route expansion.

The other very noticeable change is the Metro ridership among residents of the District of Columbia who work in Silver Spring, almost 15 percent of whom were found to take Metro once it opened. From Table 1, it would appear that most of these subway riders previously rode Metrobus. Subway ridership for Virginia residents working in Silver Spring was more than 9 percent, but the mode shift for this group appears to be primarily from the automobile.

#### Prior Travel Mode of Transit Users

In the after-period survey of Silver Spring employees, persons who took public transit to work were asked how they made the trip before the Silver Spring station opened. Table 2 gives the responses to this question. Almost two-thirds of those who rode Metrobus to work in Silver Spring also used Metrobus before the Metro station opened. More than 20 percent of Metrobus riders had diverted from the automobile. Approximately one-third of the employees who took Ride-On also took Ride-On before Metro. Among those using the Ride-On service, about 25 percent were diverted from automobiles and 25 percent from Metrobus. Almost half of the respondents who used Metrorail had previously used the automobile.

#### Morning-Peak-Period Trips from Silver Spring by Metro

Substantial information on commuter trips by Metro from Silver Spring into the District was obtained from the WMATA survey of Metro passengers. These include trips largely made by persons residing around and north of the Silver Spring Metro station. The Takoma Park station, which is located about 1 mile south of Silver Spring, serves residents to the south.

Four aspects of these trips are described in the WMATA survey: (a) mode of access, (b) alternate mode of travel, (c) effect on automobile travel, and (d) work trips by Silver Spring residents.

#### Mode of Access

The table below indicates how those commuting from Silver Spring into the District got to the Silver Spring Metro station in the morning peak period (N = 1000):

Access Mode	Percentage
Metrobus	31.2
Ride-On	24.8
Automobile	
Driver	14.5
Passenger	12.0
Walk	16.2
Other	1.3

Fifty-six percent of the riders came by bus, and there were approximately as many people walking to the station as there were driving.

A comparison of mode-of-access statistics at somewhat comparable suburban rail rapid transit stations on the Toronto, San Francisco, and Philadelphia systems shows interesting results. The Silver Spring station is operating more like the terminal stations in Toronto, where there is heavy

Figure 3. Comparison of Ride-On and Metro ridership at Silver Spring station.

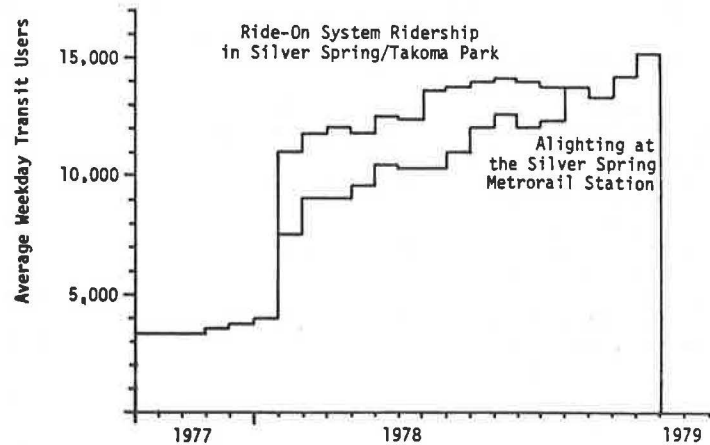


Table 1. Work-trip travel mode by jurisdiction of residence.

Category	Silver Spring Within Beltway (%)		Elsewhere in Montgomery County (%)		Prince George's County (%)		Elsewhere in Maryland (%)		District of Columbia (%)		Virginia (%)	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
Automobile												
Driver	52.9	48.7	81.1	75.5	84.2	84.2	78.9	76.2	57.4	56.5	87.4	76.6
Passenger	7.7	7.0	6.5	8.4	7.2	6.6	11.1	14.3	8.1	3.3	7.8	9.6
Dropped off	2.4	4.5	2.7	1.4	2.7	2.7	2.3	3.7	3.4	6.6	0.4	0.9
Metrobus	6.0	2.6	5.1	5.8	4.2	3.1	2.9	1.6	27.0	15.2	3.8	1.9
Ride-On	9.0	13.8	0.8	4.4	1.1	2.1	0.6	0.3	0.4	1.9	0	0
Commuter rail	0.1	0	2.5	2.9	0.3	0	3.1	1.5	0	0.4	0	0.5
Metro	0	0.2	0	0.2	0	0.8	0	0.8	0	14.9	0	9.3
Walk or bicycle	20.2	21.7	0.4	1.3	0	0.3	0	0	0.6	0.2	0	0
Taxi	1.2	0.8	0.2	0	0	0	0	0	0.4	0	0	0
Other	0.5	0.7	0.6	0.1	0.4	0.3	1.1	0.3	2.1	0.9	0.7	1.1
Proportion of all work trips	18.4	18.4	37.6	38.6	18.9	18.6	10.2	10.6	8.2	6.9	6.7	6.9

Table 2. Prior travel mode for transit work trips to Silver Spring.

Prior Mode	Current Mode (%)		
	Metrobus <sup>a</sup>	Ride-On <sup>b</sup>	Metro <sup>c</sup>
Automobile	21.6	24.5	47.3
Metrobus	65.7	24.2	31.0
Ride-On	0.8	36.8	2.5
Commuter rail	0.7	1.5	0
Walk or bicycle	0	1.6	0
Taxi	0	2.2	0
Other	0.7	1.4	0
Did not work in Silver Spring before	10.4	7.7	19.1

<sup>a</sup>N = 106.

<sup>b</sup>N = 113.

<sup>c</sup>N = 46.

reliance on bus as a mode of access, than like comparable stations on the Bay Area Rapid Transit (BART) System, where commuters rely on both bus and automobile, or stations on the Lindenwood Line, where commuters rely primarily on the automobile.

#### Alternate Mode of Travel

The Metro surveys conducted by WMATA asked respondents to state what mode of travel they would have used for their trip had there been no subway. The following table gives alternate mode of travel for persons making morning-peak-period Metrorail trips from Silver Spring (N = 1000):

Alternate Mode	Percentage
Metrobus	53.7
Automobile	
Driver	32.0
Passenger	5.6
Taxi	0.9
Walk	0
Other	6.3
No trip	1.5

More than 53 percent would have taken Metrobus, and almost 38 percent would have driven or ridden in a car.

#### Effect on Automobile Travel

The percentage of respondents designating "automobile driver" as their alternate mode in the table above indicates 1900 fewer automobiles in the corridor south of the station in the morning peak period. Between 7:00 and 8:00 a.m., a decrease of approximately 900 automobiles is indicated. Given these results, it would be expected that traffic volumes would be noticeably reduced on some of these roadways south of the Metro station. A comparison between these results and traffic data is made later in this paper.

#### Work Trips by Metro for Silver Spring Residents

Several other interesting findings were available from a telephone survey of 200 residents who live in

or immediately outside the Silver Spring CBD. Ten percent of the persons interviewed used Metro to get to work five days a week. Approximately 18 percent had used Metro at least once to get to work. Of the 200 residents interviewed, 23 percent reported that their place of work was within walking distance of a downtown Metro station. Approximately half of these were consistently using Metro to get to work.

#### Nonwork Trips by Silver Spring Employees

The effect of Metro on the midday travel habits of people employed in Silver Spring is discussed below. Of particular interest is the influence of accessibility improvements on mode choice.

#### Mode of Travel

Table 3 gives data on the mode of travel for midday, nonwork trips by Silver Spring employees, categorized by one of three destination groups: (a) the Silver Spring CBD, (b) the District of Columbia, and (c) other destinations, including Montgomery County outside the CBD, Prince Georges County, Northern Virginia, and regions outside the metropolitan area. Clearly, trips within the Silver Spring CBD are dominated by the walk mode. The larger number of walk trips in the period after the opening of the Metro station is attributable to the seasonal difference in the before and after periods. Trips to destinations other than the CBD and the District are heavily automobile oriented. The subway trips to other destinations indicated in Table 3 are primarily trips to Northern Virginia.

The impact of Metro is identified primarily in those data in Table 3 that show travel modes to destinations within the District. The after data indicate that approximately 40 percent of midday, nonwork trips made by Silver Spring employees into the District are now being made by Metro.

#### Alternate Mode of Travel

In the employee travel survey, Silver Spring employees who used Metro for at least one midday trip were asked what means of travel they would have used and/or what location they would have gone to had Metro not been available. The responses are summarized below:

Alternative	Trips	
	Number	Percent
Would go to same place		
But use car	510	73.5
But use bus	101	14.6
But use taxi	13	1.9
Would go to Silver Spring CBD instead	35	5.0
Would not go at all	35	5.0

Of those employees who made midday trips by Metro, the majority would have used a car to make the trip had Metro not been available. Some trips would have been diverted to bus, and a few would have been made by taxi. A relatively small number of Metro trips (35 trips/day) would have been diverted to the Silver Spring CBD had Metro not been available. This is a strong indication that Metro is not siphoning off from the District business generated by Silver Spring employees. The times and costs associated with trips from Silver Spring to downtown are apparently too great to make these trips very attractive when other destinations are available. However, other data also indicate that Metro is not attracting business-generating trips to Silver Spring.

#### Off-Peak-Period Trips by Metro to and from Silver Spring

Data on off-peak trips by Metro to and from Silver Spring are available from the WMATA Metro surveys. The majority of these trips are nonwork trips, but some work trips are included.

The following table gives modes of access to the Silver Spring Metro station for the off-peak period (9:00 a.m. to 3:00 p.m.) (N = approximately 400):

Access Mode	Percentage
Metrobus	16.4
Ride-On	14.7
Automobile	
Driver	22.4
Passenger	16.6
Walk	27.4
Other	2.4

In comparison with modes of access during the morning peak period (almost all work trips), off-peak-period modes of access are much more walk oriented and much less transit oriented.

The table below gives the alternate modes of travel that would have been taken for Metro trips from Silver Spring in the off-peak period had there been no subway:

Travel Mode	Percentage
Metrobus	34.8
Automobile	
Driver	43.0
Passenger	6.2
Taxi	3.0
Walk	0.1
Other	2.3
No trip	10.6

Almost 80 percent of the trips would have been made by either automobile or Metrobus (slightly more than half by automobile). A comparison with previously cited data on morning-peak-period trips from Silver Spring indicates a higher percentage for the automobile as the alternate mode for the off-peak period and a lower percentage for Metrobus.

#### Traffic Impacts

Extensive studies were conducted on the impact of Metro on traffic volumes in Silver Spring and the District of Columbia to the south. Of the impacts examined, traffic was the most difficult about which to draw conclusions because of substantial day-to-day variability in volumes.

#### District of Columbia Traffic Volumes

Data on traffic volumes in the District indicate slight decreases in volume on Georgia Avenue but increases on 16th Street. One possible explanation for the increase on 16th Street is that many of the buses terminate their runs at the Metro station rather than continuing into the District and thus provide additional roadway capacity for automobiles. However, it is difficult to judge the effect of Metro on traffic congestion from traffic-volume data alone. This result is similar to that obtained in the BART impact study, which was unable to detect any changes in traffic volume fostered by the BART System except for a slight, temporary decrease on the Oakland Bay Bridge (3).

It is significant to note here that the District of Columbia recently converted 13th Street, which



**Table 3. Travel mode for midday nonwork trips by Silver Spring employees to selected destinations.**

Travel Mode	Trips to Silver Spring CBD		Trips to District of Columbia		Trips to Other Destinations	
	Before <sup>a</sup>	After <sup>b</sup>	Before <sup>c</sup>	After <sup>d</sup>	Before <sup>e</sup>	After <sup>f</sup>
Walk	7500	10 100	100	130	190	510
Automobile						
Driver	2500	2 100	910	650	5230	4850
Passenger	380	270	100	70	520	570
Metrobus	140	70	130	70	70	140
Ride-On	50	100	10	50	70	140
Taxi	40	40	10	10	50	50
Free shuttle	10	0	20	0	170	0
Metro	0	0	0	570	0	150
Other	40	50	30	10	50	100

<sup>a</sup>Population = 10 660; N = 1840.<sup>b</sup>Population = 12 770; N = 1850.<sup>c</sup>Population = 1350; N = 230.<sup>d</sup>Population = 1560; N = 230.<sup>e</sup>Population = 6340; N = 1100.<sup>f</sup>Population = 6510; N = 940.**Table 4. Summary of parking data for county-operated facilities.**

Item	Long-Term Parking		Short-Term Parking	
	Before	After	Before	After
Capacity	4203	4402	2782	2687
Daily parkers	5343	5894	8970	9122
Turnover (vehicles/space)	1.27	1.34	3.23	3.39
Average duration (h)	5.71	6.21	2.17	2.12
Occupancy (percentage of capacity)				
8:00 a.m.-6:00 p.m.	65	82	64	72
Peak hour	80	92	82	89

**Table 5. Net impact of transportation changes on parking in county facilities.**

Category	Number of Daily Parkers
Parkers added	
Metro	900
Other (shopping, etc.)	100
Silver Spring employees who formerly drove a car downtown in midday, now taking Metro and leaving car in Silver Spring	200
Subtotal	1200
Parkers subtracted (former car drivers)	
Using Metrorail	200
Using Metrobus	100
Using Ride-On	200
Subtotal	500
Total increase	700

parallels the Metro line, back to two-way operation, at least partly in response to the opening of the Silver Spring Metro station.

#### Traffic in the Station Area

In the area around the station itself, only slight increases in congestion appeared to take place. This was essentially verified in the after survey of Silver Spring employees when those driving automobiles to work were asked whether it now took them more time, less time, or about the same time to drive to work. Most employees driving cars to work (76.4 percent) did not perceive any difference in the travel time required before and after Metro. Approximately 16 percent of automobile drivers felt that they now took more time to get to work, and 7 percent felt that they took less time.

#### Parking Impacts

Parking in Silver Spring proved to be the most noticeable of the short-term impacts brought on by the opening of the Silver Spring Metro station. The mode-of-access data indicated that in May 1978 approximately 1450 vehicles parked in Silver Spring daily for the purpose of riding Metro.

Parking supply did not change significantly between the before and after periods. Approximately 6200 off-street county-operated spaces, 850 on-street spaces, 800 commercial spaces, and 5600 other privately owned spaces were available.

#### County-Operated Facilities

Parking accumulation data present the best overall view of the impact of Metro. Table 4, derived from data of the Division of Parking, Montgomery County DOT, gives the approximate number of vehicles using county-operated facilities in the before and after periods. The before data were obtained in the fall of 1977 and the after data in the spring of 1978. The implication of Table 4 is clear--namely, that Metro significantly increased parking occupancies in Silver Spring. The number of daily parkers increased by 550 vehicles (10 percent) for long-term spaces and 150 vehicles (2 percent) for short-term spaces. Peak-hour occupancy, a key indicator of parking availability, increased by 200 vehicles (12 percent) for long-term spaces and 100 vehicles (7 percent) for short-term facilities. The most heavily affected area was the parking sector adjacent to the Metro station, where peak-hour occupancies increased from 50 percent before to 100 percent after the opening of the station. There were acute parking shortages throughout the northern part of the Silver Spring CBD, where employment densities are highest. However, the effect would have been much worse had there not been significant improvements in bus service to Silver Spring.

#### Residential Areas

Since the fringes of Silver Spring contain residential areas that are close to major traffic generators, they are prime candidates for absorbing the pressures of parking shortages and the cost of parking in the CBD. The study indicated that approximately 400 additional vehicles were parking in residential areas after the Metro station opened. Personal interviews with people who were parking in selected residential areas that were most convenient to Metro indicated that approximately 25 percent (or about 100 vehicles) were parking to ride Metro. An additional 50 such vehicles may have parked in residential areas outside the times surveyed, for a daily total of 150 Metro parkers.

Perhaps more significant than Metro riders parking in residential areas is their parking in the CBD, thus displacing parking spaces otherwise available to employees and visitors, who must then park in the residential areas. It is estimated that another 100 vehicles parked in the residential areas are in this category. Thus, the total effect of Metro on residential parking was to create 200-250 new parkers in residential areas. The remaining 200 additional vehicles of the total 400-vehicle increase would probably have parked in the area, because of seasonal factors, even if the Metro station had not been opened.

#### Summary

As a summary of parking impacts, an effort was made to identify where the new Metro parkers were ab-

sorbed into the CBD and the residential area around it. The 1450 daily parkers are estimated to have been absorbed as follows:

Type of Facility	Number of Parkers
County	900
Private pay	50
Private free (legal and illegal) inside CBD	200
Residential on-street parking	150
WMATA kiss-and-ride lot, midday parking	150
Total	1450

An estimate was also made of the factors contributing to changes in parking in the county-operated facilities. Table 5 indicates that parking impacts on county facilities could have been even more severe had the significant shifts from automobile to transit of people destined to Silver Spring not occurred.

#### Perceived Impact of Metro

A summary of perceptions of the Silver Spring Metro station among business managers and residents in Silver Spring is reported below. Other groups were sampled but are not reported on here.

##### Silver Spring Businesses

A survey of 99 businesses was conducted during the after period of the project. A number of specific questions were asked, but only the overall perception of Metro is reported here.

When asked whether they thought that the effect of Metro was positive or negative for their business, businesses responded as follows:

Effect	Response (%)
Positive	61
Negative	13
Neither	24
Too soon to tell	2

By a ratio of nearly 5:1, businesses felt that, overall, Metro was a positive feature in Silver Spring.

##### Silver Spring Residents

A telephone survey of 200 residents in and around the Silver Spring CBD was also conducted. When asked if the Metro station had had a positive or negative effect on them as individuals, residents replied as follows (again, only the overall perception is cited):

Effect	Response (%)
Positive	47
Negative	12
None	24
Don't know of any	17

Positive responses outnumber negative responses by a 4:1 ratio, which indicates favorable initial impressions of Metro by residents.

#### SUMMARY OF RESULTS

The first extension of the Washington, D.C., Metro system into the suburbs and associated changes in local transit service have been studied with regard to their short-term impacts in the vicinity of the interim terminal at Silver Spring. Some of the more noteworthy of these impacts can be summarized as follows:

1. Transit use in the corridor between Silver Spring and downtown Washington doubled when the Silver Spring station opened and has doubled again since that time. Ridership on local transit service to Silver Spring and its vicinity has also increased significantly.

2. Observation of the travel habits of people employed in Silver Spring showed an increased reliance on transit. The percentage of work trips by transit increased from 10 to 13 percent. Almost half of the workers going to Silver Spring on Metrorail were previously automobile users. Data on non-work trips by people who work in Silver Spring indicate that approximately 40 percent of those traveling into the District of Columbia are now using Metrorail and that about 75 percent of these are being diverted from automobile travel.

3. Approximately 60 percent of Metrorail commuters going from Silver Spring into the District during the morning peak period are getting to the Silver Spring station by bus; the remainder are almost equally divided among automobile drivers, automobile passengers, and walkers. If there had been no Metro, almost 40 percent of these trips would have been made by automobile. Indications are that Metro is capturing almost 50 percent of Silver Spring residents who live within half a mile of the station and have convenient walk access to their place of work from a downtown Metro station.

4. As expected from impact studies of other rail systems, effects on traffic were the most difficult to examine. Although the data indicate an initial peak-period reduction of about 2000 vehicles in the radial corridor between Silver Spring and downtown Washington, that reduction was divided among several arterials. There were slight increases in congestion in the vicinity of the station.

5. Parking in Silver Spring proved to be the most noticeable of the short-term impacts. It was brought about by the addition of about 1500 daily parkers in Silver Spring in the initial months of the station opening. However, the net effect on Silver Spring was about half that number of parkers, primarily because many Silver Spring employees switched to transit, making more spaces available for Metro users.

6. Attitudinal studies of the impacts perceived by businesses and residents of Silver Spring were conducted. By a ratio of almost 5:1, businesses felt that Metro was an overall positive feature in Silver Spring. The benefits appeared to relate primarily to improved access and the primary problem to be parking. For nearby residents, positive responses outnumbered negative responses by a 4:1 ratio.

#### ACKNOWLEDGMENT

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#### REFERENCES

1. JHK & Associates. Silver Spring Metro Before and After Study: Volume 1--Technical Report. Maryland-National Capital Park and Planning Commission, Silver Spring, Jan. 1979.
2. R.M. Winick and C.H. Alter. Providing Coordinated Transit Services by Using a Transit Functional Classification. TRB, Transportation Research Record 719, 1979, pp. 48-53.
3. R.D. Worrall. BART's Initial Impacts on Travel Behavior and Transportation System Performance. Presented at 56th Annual Meeting, TRB, 1977.

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