

PEDESTRIAN ATTITUDES AND BEHAVIOR IN SUBURBAN ENVIRONMENTS

Volume II

of

Development of Guidelines for Accommodating Safe and Desirable
Pedestrian Activity Within the Highway Environment

by

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ABSTRACT

Pedestrianism in suburban areas was examined from the point of view of the walking and non-walking public. Nine case studies were conducted to determine the role of walking as an exclusive mode of travel. The sites examined comprised the three major types of pedestrian facilities--overpasses, tunnels, and at-grade crossings--plus locations where new pedestrian facilities are anticipated. In each case, linkages between land uses were established to define reasons for local travel. The data were then analyzed to show how pedestrian facilities act to sustain the linkages. Various pedestrian characteristics were found to be related to walking activity. For example, age has a direct bearing on walking behavior, as children constitute the largest walking group. Acceptable walking distances up to about one-quarter mile (.4 km) were given for adults, while distances up to one mile (1.6 km) offer little impedence to children. Along with distance, fear of attack is a primary impedence to the potential adult walker, especially the female. Overpasses were cited as the most desirable pedestrian accommodation to bypass traffic, while the public showed little enthusiasm for tunnels due to the mischief they attract. People have also shown that, if the reason exists, they will cross heavy traffic to travel by foot. The results of this study are ultimately interpreted to provide the Department with general principles for successful pedestrian planning in suburban areas. Finally, the survey findings support the idea of combined pedestrian and bicycle ways.

SUMMARY OF FINDINGS

A study of pedestrian attitudes and behavior in suburban areas of Virginia revealed certain dominant factors which influence the interrelationship between pedestrians and the facilities within their walking system. The following findings are presented to assist the Virginia Department of Highways and Transportation in the planning of future pedestrian accommodations in suburban areas.

General Pedestrian Attitudes and Behavior

1. The majority of walkers in suburban areas are between eight and sixteen years of age. Most of the others are under 30.
2. Trip lengths for the elderly pedestrian rarely exceed one-quarter mile (0.4km). While approximately 50% of the population exhibit a maximum walking distance of one-half mile (0.8km), very few are willing to walk over one mile (1.6km).
3. Walking frequency increases as the number of accessible activities increases.
4. The household to school and shopping linkages provide the highest potential for walking travel; the household to household linkage is secondary.
5. The suburban pedestrian, for the most part, is a daytime traveler.
6. Fear of attack is a major deterrent to pedestrian travel in suburbia.
7. As age increases, the effect of weather on walking activity becomes more significant.

Attitudes and Behavior Relative to Specific Facilities

1. Roughly one-fourth of all suburbanites feel that pedestrian accommodations are inadequate.
2. Proper maintenance of pedestrian facilities, particularly with respect to lighting and cleanliness, will enhance pedestrian activity.
3. Most tunnels exhibited inadequate design for drainage, which inhibits usage.

4. Security is a serious problem in tunnel facilities.
5. In general, overpasses are preferred to underpasses.
6. If the attraction is great enough, pedestrian travel will not be deterred by the necessity to cross roads with heavy traffic and no provisions (with the possible exception of a median) for pedestrian travel.
7. Construction of overpasses will encourage travel to recreational areas.
8. It appears that bicyclists and pedestrians are able to successfully share facilities.

CONCLUSIONS

Walking should be considered as a viable travel mode in comprehensive transportation planning and its importance to a community can be associated with the proportion of total travel demand that it accommodates. In suburban areas, potential walking demand can be related to the number of activity linkages. Once desire lines for local travel are established, the results of this research can be interpreted to provide general principles for developing pedestrian facilities. These principles relate to a procedural method for diagnosing individual attitudes and behavior concerning pedestrian travel, and to definitions of those characteristics of pedestrian systems which are requisite to their acceptance by the public.

The experience of the study team suggests that the most efficient method for obtaining citizen input regarding the preliminary planning of a pedestrian facility in a suburban area is through a hand delivered questionnaire to a random sample living within a certain radius of the proposed facility. Also, before and after studies employing a similar survey strategy should be conducted as new projects become implemented. The comprehensive information on pedestrian attitudes and behavior so gained provides the potential for estimating the usage of proposed facilities. In this respect, evaluations can be made concerning the relationship between what people say they will do and what they actually do with regard to pedestrian activity.

Pedestrian facilities should exhibit features which make them attractive to the community. Important pedestrian system criteria have been diagnosed relative to functional aspects, design and planning considerations, and operational and maintenance requirements. The constituent elements in each of these categories include:

Functional

- Connect clearly defined linkages
- Joint usage (bicycles and pedestrians)

Design and Planning

- Interconnected components of major accommodations and adjoining walkways
- Direct travel paths
- Protection from the weather
- Adequate drainage
- High illumination
- Pleasing aesthetics
- Overpass (if possible)

Operational and Maintenance

Provision of security
Prohibition of loitering
Cleanliness

RECOMMENDATIONS

1. Since night walking is very infrequent in most suburban areas, careful consideration should be given before installing extensive lighting on and around pedestrian overpasses.
2. Caged overpasses are unsightly and alternative designs should be considered.
3. If there is a potential for extensive adult usage of an overpass, consideration should be given to overhead shelter since inclement weather appears to discourage adult walkers.
4. Construction of tunnels should be avoided, unless there is no alternative.
5. If tunnels are built they should have adequate drainage and vandal-proof lighting, and be wider than the typical 6 feet (1.8m) so as to allow daylight illumination.
6. All facilities should include ramp access to accommodate bicyclists and the handicapped.
7. Angles and curves should be eliminated in tunnels to provide a line of sight from one end to the other.
8. Future planning for pedestrian accommodations should consider bike travel as well as walking. The concept of the pedabik structure which accommodates both bicyclists and pedestrians should be thoroughly investigated.
9. The most efficient method utilized in this study for assessing opinions regarding a pedestrian site is through a hand delivered questionnaire to a random sample living within a certain radius of the proposed facility. It is recommended that this procedure be followed in subsequent pedestrian site studies.

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INTRODUCTION

This research report considers the pedestrian travel problem in suburban areas by surveying walking activity between pairs of generator/attractor nodes where the route connecting them included a major pedestrian accommodation or barrier. For example, instead of looking at the total number of pedestrians attracted to a suburban shopping center, the existing and latent demands for walking from a given residential area to that shopping center were considered. Consequently the expected number of pedestrian trips between an origin-destination pair can be related to the characteristics of the walking trip. For example, an overpass over a congested roadway can be expected to create more walking activity than if it were not built. Thus, if a potential walking demand between the generator/attractor pairs (i.e., residential-school, residential-shopping, residential-recreation, work-shopping, etc.) is established, an expected number of walking trips for a specific case can ultimately be related to the components of the physical walking system and the capabilities and attitudes of individuals.

This report is the second of two volumes which document the study entitled Development of Guidelines for Accommodating Safe and Desirable Pedestrian Activity Within the Highway Environment. Volume I, Pedestrian Planning in Suburban Areas--A State of the Art Review, reported on the state of the art regarding guidelines for planning, designing and evaluating pedestrian facilities in suburban areas. This report documents the findings of a series of case studies on pedestrianism in selected suburban areas in Virginia and supplements the findings stated in Volume I. Several methodologies are recommended to the Department to assist in the planning and locating of pedestrian facilities. Also guidelines pertaining to the design of pedestrian facilities are suggested. Finally, consideration is given to the potential for combining bicycle and pedestrian systems in suburban areas.

OBJECTIVES AND SCOPE

The research reported here had two primary objectives: (1) to relate pedestrian attitudes and behavior to the dimensions of the physical walking system, and (2) to recommend to the Department a set of guidelines and procedures for pedestrian systems planning and design. Pedestrian attitudes and overt behavior were related to ascertain general guidelines. By examining the data obtained through various means, the study determined those environmental features which are deterrents to walking and suggested means by which such deterrents can be removed or minimized. In addition, those features which improve the walking environment were identified. It is hoped that this report will aid the Department in developing walking systems that will enhance pedestrian activity and encourage walking as a viable, efficient, expedient, and safe mode of transportation.

METHODOLOGY

The case study method was employed to meet the research objectives. Selected sites in suburban areas of the state were chosen which featured the three major types of pedestrian facilities: overpasses, tunnels and at-grade crossings. Three of these sites contained no pedestrian accommodations during the study but in each case the installation of one was anticipated in the near future.

Two methods were used to obtain direct data on the pedestrian movement associated with these sites. First, hour-by-hour observation and volume counting were performed to determine usage patterns, frequency of usage, and user characteristics. Second, attitudinal surveys were administered to random samples of the residents within the vicinity of each pedestrian facility under study. The survey approach was varied among the case studies in order to determine the best strategy for obtaining data. The methods employed included home interviews, on site interviews and observations, and distributed questionnaires.

Because pedestrian movements derive generally from activity participation, land use at trip origin and destination points was specified to define the predominant trip purposes, which will be referred to here as "linkages" associated with pedestrian travel within a study area. The pedestrian facilities were examined to demonstrate how they act to sustain such linkages.

CASE STUDY FINDINGS

Each of the study sites used in this research was individually examined. The study methodology employed at each site and a general description of the area are documented in Appendix I. In the following discussions the individual findings are synthesized into specific facts and principles basic to pedestrian planning. In this respect, the initial section deals with a description of typical pedestrian characteristics, while subsequent discussion relates pedestrian activity to the principal physical pedestrian accommodations.

Pedestrian Behavior in Suburban Virginia

The data derived from the case studies provided insight into the habits, desires and attitudes of the suburban pedestrian and consequently much about the characteristics of pedestrian accommodations which will best serve him. It is important to note that the generalizations made here are based on behavior exhibited by suburban pedestrians as well as perceptions expounded by them. Thus an accurate picture of the relationship between the suburban walker and the suburban walking environment is presented.

Several general questions should be addressed when dealing with pedestrian planning. First, certain characteristics about pedestrians must be taken into account. In short, Who are the pedestrians to be accommodated and what is their lifestyle? In the suburban areas represented in this study the majority of the walkers fell into two age groups. One group consisted of 20-to-30 year olds, the majority of whom were females who use walking primarily to get to shopping destinations. The second, and larger, age group consisted of individuals between 8 and 16 years of age. The younger group depends upon walking as a primary means of transportation, especially to school and friends' homes. Whereas this group is not at all particular about the type of pedestrian facility that is to be used, the older age group prefers to walk where they never have to be enclosed from view. Neither group's walking activity appears to be related to family size, length of residency in the area, or the type of dwelling they live in. With increasing family automobile ownership, walking declines in importance as a travel mode more in the younger group than in the older group.

The roles of walking, the auto, and bus transportation in accessing particular activities in a representative suburban area are indicated in Table 1. Comparison of such data from a number of sites revealed that mode usage was related to the accessibility provided. For example, if the school was over a mile (1.6km) away, few potential walking trips would be reported, but if the activity site were within one-half mile (0.8km) of the residences, a higher propensity to walk was evident. In this respect 90% of the people

who reported low walking frequencies reported that destinations were too far, while 19% to 30% cited inadequate accommodations as the reason for infrequent walking travel, depending on the study site.

Table 1

Activities Normally Accessed by a Specific Mode

(N = 157)

Activity	Modes		
	Walk	Bus	Automobile
School (children)	36%	10%	86%
Work	5%	33%	85%
Church	8%	0%	60%
Shopping	33%	5%	96%
Recreational	36%	4%	77%
Visit friends	53%	3%	80%
Never utilize	16%	59%	1%

Note: Totals are greater than 100% because respondents were allowable to indicate one or more activities per mode.

Impedances to walking derive both from the physical pedestrian system and from the characteristics of the pedestrians. The former are discussed later; only the impedances which derive from individuals themselves are considered here. For example, age has a direct bearing on walking frequency. Very few instances of large numbers of older folks using walking as a primary travel mode in suburban areas were reported or observed. A few of them make short trips, but distances rarely exceed one-quarter mile (0.4km).

This underrepresentation of the elderly is partially attributed to the fact that the majority of people in this group live in areas other than those examined in this study. Children, on the other hand, travel up to 1 mile (1.6km) on foot and bike even farther.

Typical perceptions of reasonable walking distances are shown in Table 2 to indicate that approximately half of the people are unwilling to walk over one-half mile (0.8km). There appears to be very little difference between what adults consider to be a reasonable walking distance and what they feel is reasonable for their children. A chi square test on the data in Table 3 showed that a significant difference exists between the male and female reasonable walking distance distributions. Men are willing to walk farther, however, the 1 mile (1.6km) limit on most walking holds true for both sexes. Furthermore, a chi square test of the data in Table 4 revealed that a significant difference exists between the reasonable walking distance distribution for those families with high walking frequency and those with low walking frequency. As expected, the high frequency walkers are willing to walk farther. The majority of the high frequency walkers are willing to walk at least three-quarters of a mile (1.2km) to some activities.

Table 2

Reasonable Walking Distances for Home Based Trips

(N = 157)

Distance	Adults	Children
1 block (.16km)	4%	4%
1/4 mile (0.4km)	11%	17%
1/2 mile (0.8km)	37%	26%
3/4 mile (1.2km)	18%	25%
1 mile (1.6km)	22%	18%
more than 1 mile(1.6km)	7%	11%

Table 3

Reasonable Adult Walking Distance by Sex

(N = 157)

Distance	Male	Female
1 block (.16km)	4%	5%
1/4 mile (0.4km)	5%	21%
1/2 mile (0.8km)	38%	35%
3/4 mile (1.2km)	19%	14%
1 mile (1.6km)	26%	19%
more than 1 mile (1.6km)	8%	6%
Total	100%	100%

$$\chi^2 = 8.26$$

$\chi^2_{.95} = 7.81$ for 3 degrees of freedom

Table 4

Reasonable Adult Walking Distance by the Frequency Families Use Walking for Transportation

(N = 157)

Distance	Frequency	
	Low	High
1 block (.16km)	5%	2%
1/4 mile (0.4km)	11%	12%
1/2 mile (0.8km)	44%	23%
3/4 mile (1.2km)	19%	15%
1 mile (1.6km)	16%	36%
more than 1 mile (1.6km)	5%	12%
Total	100%	100%

$$\chi^2 = 12.28$$

$\chi^2_{.95} = 7.81$ for 3 degrees of freedom

Along with distance, fear of attack acts as a primary impedance to the potential adult walker, especially the female. The criminality existent in our society has forced many potential walkers to resort to the automobile, even for short trips. Roughly 20% of the 80% of the respondents who reported that they never or seldom walked stated that they did not because of fear of attack. It is interesting to note that the case study areas in Northern Virginia exhibited the greatest incidence of fear of attack as a deterrent to walking.

A few additional impedances to walking were reported by those surveyed. As would be expected, active pedestrians related that they do not walk at night because lighting is often inadequate. When asked what effect lighting improvement would have on their propensity to walk at night, however, most of this group stated that they would not walk unless it was the only mode choice they had. It then appears that night walking, even with adequate lighting provided, will not occur often in suburban areas. Of course, this phenomenon will depend upon trip purpose. For example, if the linkage is household to school, a lighted facility is probably necessary and desirable since many activities associated with school occur at night. On the other hand, if the linkage is merely among households, the installation of expensive lighting may not be justified. Perhaps the best overall statement that can be made about the suburban pedestrian concerning this impedance is that on the whole he is a daytime walker.

Naturally, weather conditions affect pedestrian activity in almost any setting and the suburban setting is no exception. Roughly 81% of the adults surveyed stated that weather altered their walking behavior. A differentiation is made here between adults and children because, interestingly enough, the children surveyed reported that weather conditions had absolutely no effect upon their walking habits. This finding indicates that shelter from the elements is possibly an unnecessary consideration for facilities that will be utilized primarily by children.

Several other impedances to walking, such as health reasons, fear of traffic, and inconvenience, were occasionally mentioned by the respondents. However, the incidence of these responses was so widely distributed throughout the cases surveyed that no conclusions can be derived from them. Suffice it to say that these are impedances which occur occasionally but ones with which pedestrian planners should not be overly concerned. One important impedance which often appeared throughout the surveys, and one to which consideration is given next, is that of inadequacy of pedestrian facilities.

Pedestrian Facilities

Pedestrian Tunnels

Three pedestrian tunnels were examined during the course of this study and several methods were utilized to gather data reflecting the opinions and activities of individuals concerning these tunnels. Volume counts were made at each site on two successive days from daylight until dusk. Individuals traversing the tunnels were interviewed to determine their attitudes as users. In addition, at one site interviews were conducted in nearby apartment buildings with a random sample of individuals so that opinions from nonusers as well as users of the tunnel would be collected.

There are several generalizations which can be made concerning the public's opinion of both tunnel facilities and the walking environment. It was apparent to the research team that pedestrian tunnels are not very pretty sights. All were damp (with water standing in some) and poorly illuminated (see Figure 1). When asked what improvements could be made to enhance these tunnels for increased pedestrian activity, every respondent cited maintenance improvements in the form of better lighting and drainage as being of primary importance. About two-thirds of those interviewed related that they never used tunnels at night--most of them cited the reason as being fear of attack. Respondents indicated that they felt that tunnels provide a prime location for muggers and vandals. Several instances of such incidents had been recorded but the number and frequency were by no means overwhelming.



Figure 1. Typical pedestrian tunnel in a suburban location.

It is interesting to note, however, that at one tunnel site a military guard is stationed at one entrance. This tunnel had the highest nighttime volume and a very low incidence of pedestrians choosing to cross the highway at street level in lieu of using the tunnel. Nevertheless about half of those interviewed displayed an interest in an alternative pedestrian facility in place of the tunnel. The most frequently mentioned facility was a pedestrian overpass. The main reasons cited for picking this particular type of facility as an alternative are its better visibility, which makes it safer with respect to crime potential, and better drainage. It is also interesting to note that a few respondents preferred a tunnel (if certain improvements were made) over a pedestrian overpass because it provides shelter from the weather and is less of an eyesore than an overpass. For the most part, all respondents agreed that improvements to these tunnels would certainly enhance walking as a travel mode in these areas.

Several items concerning one of the tunnels studied, which is located near a junior high school, are worthy of note. The students surveyed indicated that their reasons for not using the tunnel were slightly different than the reasons adults gave in the case of the other two tunnels. Only 14% of the students surveyed used the tunnel daily; 44% said they would avoid using it if at all possible. Of the latter group, 47% cited safety as their reason in that the tunnel was often occupied by ruffians and was the site of much mischief and congregation of undesirables. In fact, 51% of the students related that they would just as soon take their chances crossing the highway (arterial) than traverse the tunnel, while about 25% preferred a pedestrian overpass. It was noted during the course of one day that 135 crossings were made at street level directly atop the tunnel. This observation seems to indicate that many individuals choose to take their chances with the traffic rather than use the tunnel to reach the same destination. The principal and vice principal of the school also voiced this opinion in that they have received several reports of pot smoking, fighting, setting of fires and general loitering in the tunnel. Both felt that a pedestrian overpass would be a great deal more desirable than the tunnel. It would therefore appear that planning for pedestrian facilities near schools should not include tunnels as a consideration.

In summary, it appears that there is a consensus as to improvements to Virginia's pedestrian tunnels which would enhance the degree of pedestrian activity in and around them. Better maintenance in the form of drainage improvements, better lighting and overall cleanliness were the most frequently mentioned improvements. Pedestrian tunnels also should not be a haven for would-be attackers. This use could be prevented by eliminating hidden areas within tunnels (Figure 2) and by constructing more open approaches to them such as those in Figure 3. The tunnels should be as wide as possible so as to allow a maximum of sunlight for illumination. Another consideration which should be made concerning tunnel construction is the elimination of the step entrance where possible. It is virtually impossible for individuals on bicycles to utilize tunnels such as those in Figure 4. Ramped entrances would allow use by both bicyclists and handicapped persons.

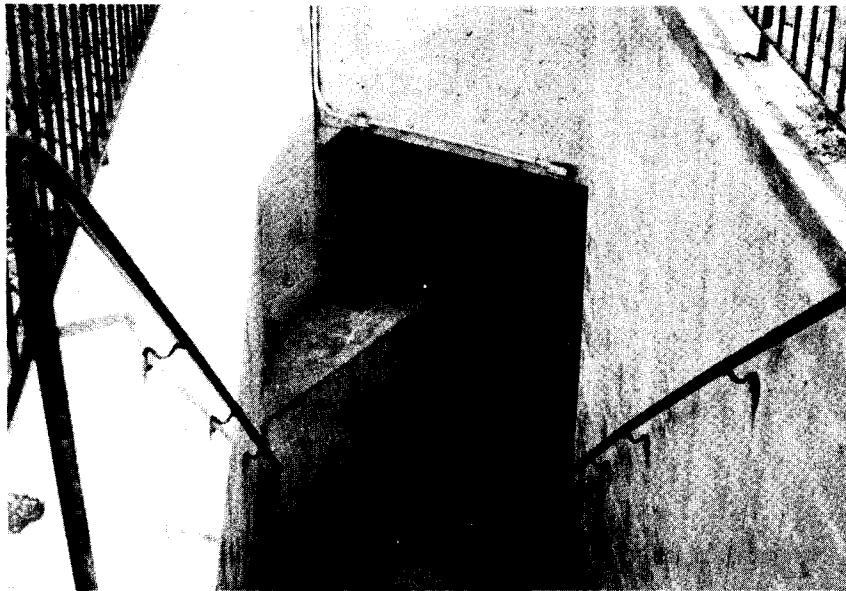


Figure 2. Hidden areas in tunnels provide concealment for would-be assailants.

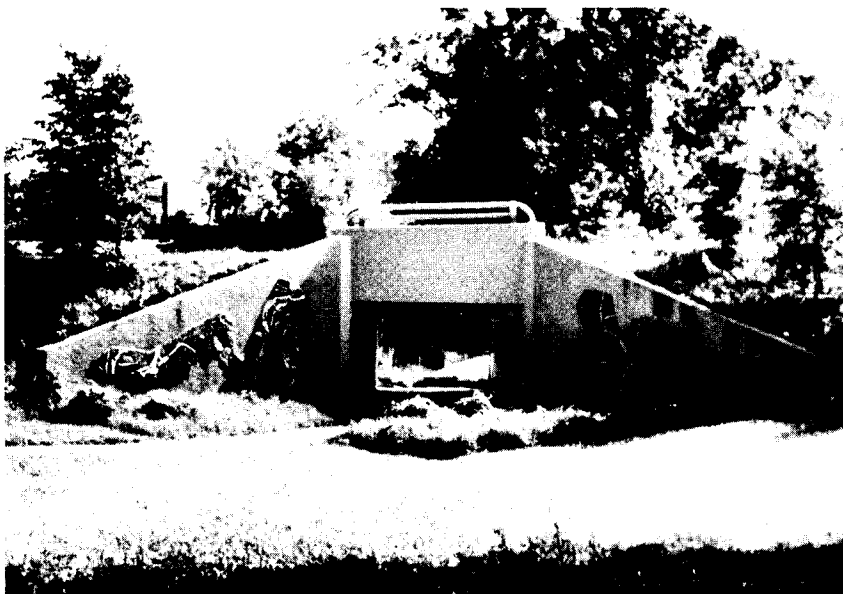


Figure 3. Open approaches decrease such possibilities.

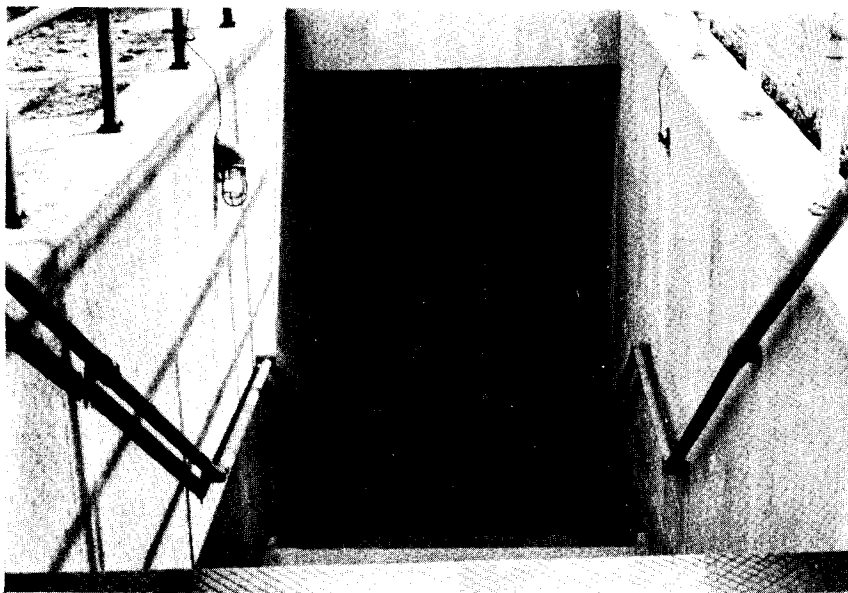


Figure 4. Steep stairs can provide an impedance to bicyclists, the elderly, and the handicapped.

Pedestrian Overpasses

The physical condition, environment, and usage of three pedestrian overpasses in the state were analyzed in this study. On site observations, volume counts, and either pedestrian or household interviews provided data for each case. The primary linkage served by each of the overpasses was residence to school travel. Secondary purposes included residence to shopping and residence to residence.

In general, the overpasses were considered to be adequate by the individuals surveyed. People used them if they had reason to; however only very specialized trips such as school and shopping made up the majority of the reported travel. Less than half of the people contacted felt that an overpass compensated for the barrier created by recent highway construction, but stated that the local overpass was an amenity to their community, even if they themselves did not have frequent occasion to use it. Since all of the pedestrian overpasses were open to view, the security problem, which was critical to tunnels, was not a serious constraint to overpass travel. In one instance, however, larger children were reported to harass smaller children along the overpass. Thus overpasses can in fact isolate travelers and provide for potential security problems. Examples are shown in Figures 5 and 6. Children were also reported to cut the wire fencing enclosure (Figure 5) in order to drop objects over the side. In addition, children were observed running across the top of the wire enclosure despite the presence of barbed wire at both ends (Figure 7).

Complex ramps at the ends of the overpass can considerably increase walking distances (Figure 8) but the alternative of steep stairs is also deficient (Figure 9). In addition, closed corner sections were found to collect debris (Figure 10).

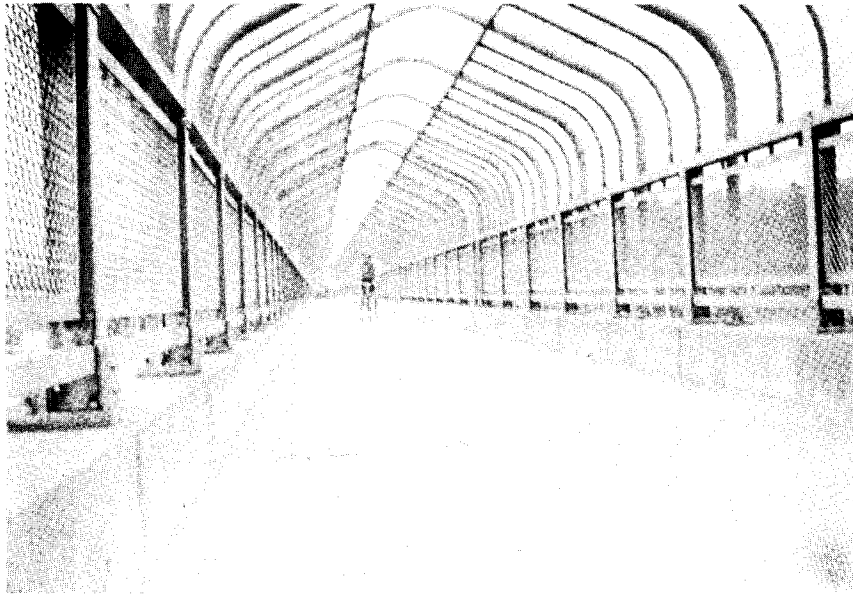


Figure 5. Enclosed pedestrian overpasses often exhibit tunnel-like appearances.



Figure 6. Another example of an enclosed overpass.

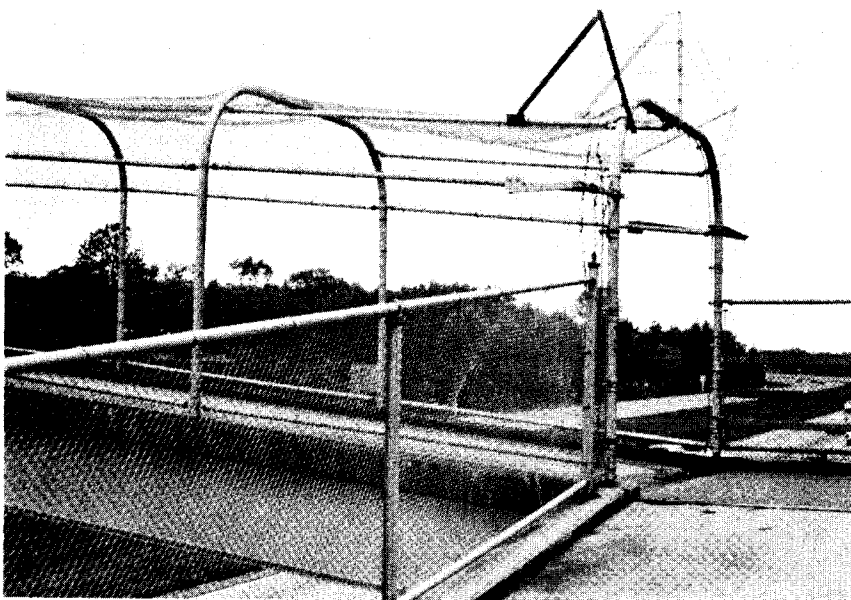


Figure 7. Barbed wire preventive measure provides "ladder-like" structure for access to top of screen enclosures .

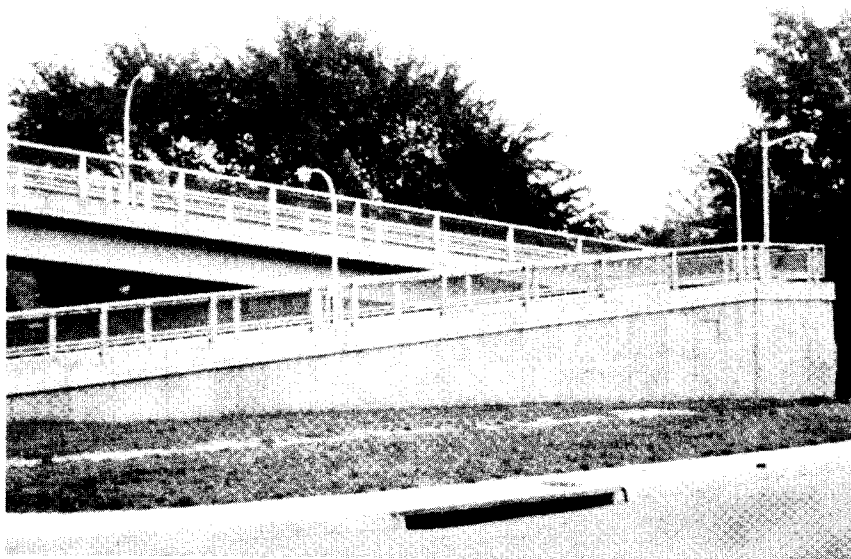


Figure 8. Ramps sometimes may triple walking distance but are more accessible and desirable than stairs.



Figure 9. Steps decrease walking distance when compared to ramps but other problems prove them to be less efficient than ramps.

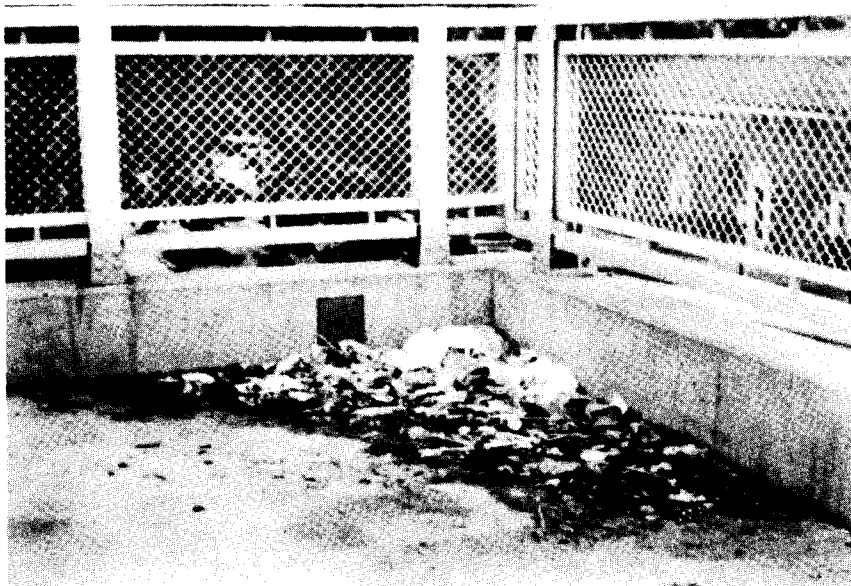


Figure 10. Accumulations of debris create unpleasant walking experiences.

The observed problems with overpasses were thus minor as compared to those associated with the tunnels. The majority of the criticisms related to the mischief of children which can potentially be eliminated by discipline. The wire mesh enclosures (Figures 5, 6, and 7) are not aesthetically pleasing and alternatives should be considered in future designs. Various types of creative structures should be investigated in order to match the local environment as much as possible. For example, wooden structures appear to be compatible with wooded recreational areas. The use of such structures would be in keeping with Virginia's tradition of scenic highways. Also, routine maintenance should be conducted to remove debris, ensure adequate lighting, and let people know that someone cares about the facility. This study confirms the observations made in Volume I of the study which recommends that an overpass is preferred to a tunnel whenever a feasible design is possible.

Pedestrian Facilities: Anticipated or Nonexistent

The case studies next considered concern situations where no pedestrian accommodations exist but where there is an acknowledged physical barrier to walking travel. These observations derive from the analysis on the following pedestrian scenarios:

1. Travel from an office building to a shopping center which is impeded by a 4-lane arterial highway.
2. Travel to new high school which is separated from a middle income residential area by a 4-lane, limited access bypass.
3. Travel between a park and a residential area which are separated by a 6-lane interstate highway.

In the first instance, data used to analyze pedestrian activity in the vicinity of their workplace consisted of questionnaires completed by 270 persons as well as on site observations. These data showed that, in general, if good reason exists, people are not deterred from walking by having to cross a traffic stream between intersections, particularly if there is a safety median. Desired improvements most often cited were an overpass, a traffic signal with a pedestrian phase, a crosswalk, a police guard, and lower traffic speeds, in that order. Alternatively, some respondents stated that no improvements should be made, while 38% stated that improved walking conditions would generate more walking trips. Useful accommodations were perceived as those which provided a direct route between origin and destination.

In the case relating the highway barrier to travel to a high school, a survey was administered to those households in the residential area on the side of the highway opposite the high school occupied by children who currently attend the high school or plan to do so within the next five years. A large majority of the households surveyed stated that the proposed overpass was needed or desirable. If the facility were built, 89% would use it during the day and 52% at night. These responses indicated that an overpass would generate 22% and 34% more walking trips per day and nighttime travel, respectively, to the new high school. Good lighting and accommodations for bicycles were cited as necessary dimensions for an acceptable facility.

In the situation where an overpass will be constructed between a residential area and a park, 157 households were surveyed. Site investigation revealed that the majority of the potential walking trips to the park via the overpass would be well over a mile (1.6km), which is somewhat beyond a reasonable walking distance. Presently, 25% of the families surveyed visit the park, while 92% stated that they will use the park after more recreational facilities are available. Ninety-six percent said an overpass was needed. Since distance is an apparent constraint on the potential walking trips generated by an overpass, two questions were asked which deal with the problem of multimode facilities. Respondents were first asked to indicate whether they approved of bicycles and pedestrians on the same facilities and to indicate whether this response was based on a pedestrian's or a bicyclist's point of view. Sixty-six percent of the bikers approved while only 48% of the pedestrians agreed with the concept. The second question concerning shared facilities asked whether bikes and autos should operate on the same facilities. Forty-four percent of the bicyclists approved while only 20% of the drivers accepted the idea. Based on these findings it would appear that bicycle-pedestrian systems rather than bicycle-auto facilities should be developed. However, caution must be taken in the interpretation of these findings because the respondents were speaking from experience in denouncing auto-bike facilities, and probably from frustration from the lack of accommodations and experience concerning joint pedestrian and bicycle systems.

THE PEDABIK CONCEPT

Local travel in suburban areas as previously examined in this report showed relatively low volumes as compared with that witnessed in areas of concentrated activity such as the central business district. However, the need for accommodating pedestrian activity between very specific origin-destination pairs was evident. Accordingly, this section addresses the problem of getting the maximum benefit from non-vehicular travel structures in suburban areas, wherein the significance of the non-mechanized modes to the community is related to the availability of activity sites and to the facilities provided for safe and convenient access.

To this extent, bicycle systems and pedestrian systems exhibit common needs. The earlier case study analysis revealed that combined pedestrian-bicycle facilities were preferred to combined bike-auto facilities. Since there is no consensus as to exactly what pedestrian and bicycle systems are, this discussion considers only major accommodations such as tunnels and overpasses which are usually impossible to justify solely with benefit-cost measures.

Table 2 indicated that very few people perceived a walking range beyond 1 mile (1.6km) and that half of them considered one-half mile (0.8km) to be their limit. Thus the maximum potential walking market for an attractor to be contained within a given

radius can be viewed as shown in Figure 11. The physical market area for the 1 mile (1.6km) and one-half mile (0.8km) limits will actually be much smaller due to measured travel distances and impedances as indicated by the dashed area.

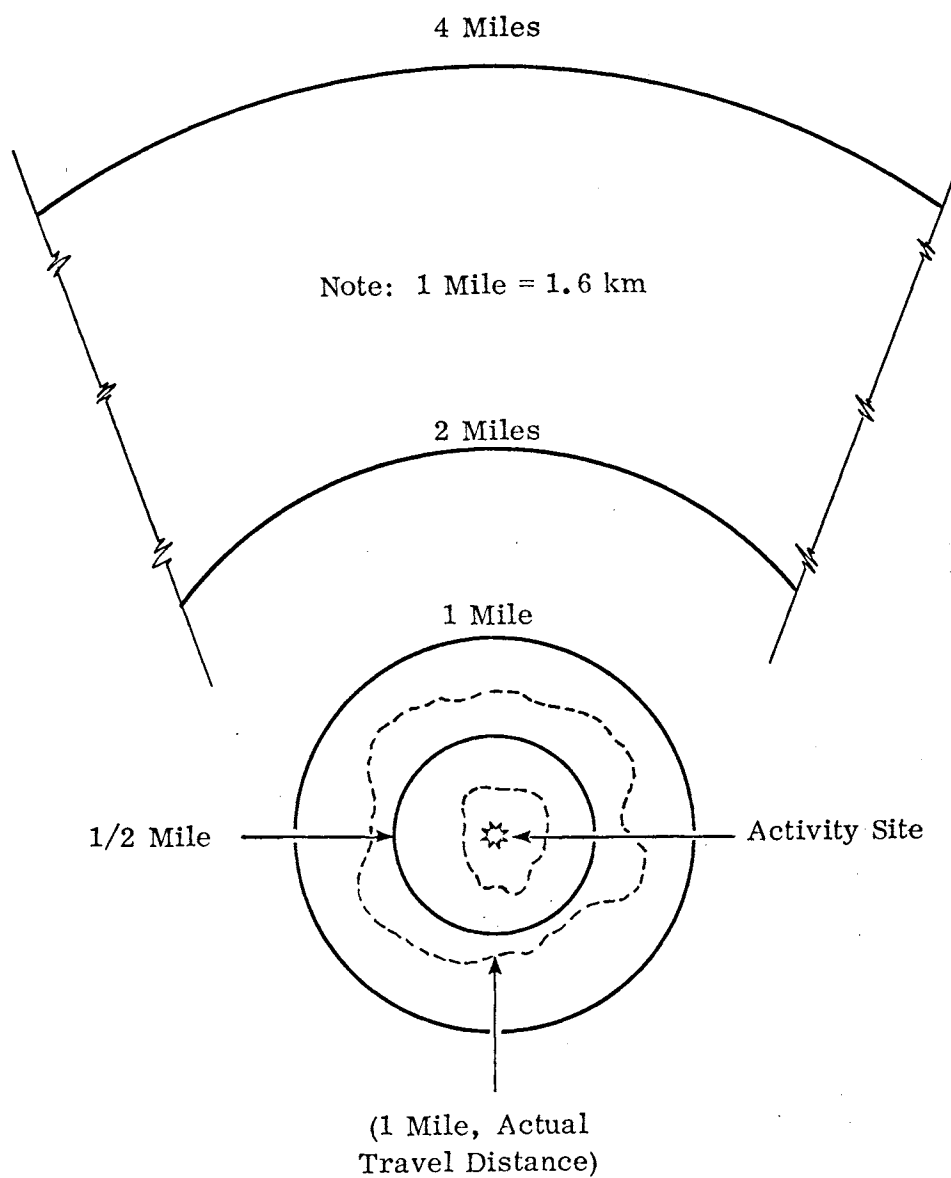


Figure 11. Walking vs bicycle travel range.

On the other hand, if the bicycle market were established, it would extend the market for non-vehicular travel to a site and, hence, create more usage for a given accommodation. Typical reasonable biking distances have been stated by Barton-Aschman Associates, Inc. in a study of the Atlanta Metropolitan Region based on 10-minute travel time increments.⁽¹⁾ For each one-half mile (0.8km) walking distance, the bicycle provides for 2 miles (3.2km) of travel for the same time period as shown in Table 5. Thus, the area served is increased by a factor of 16 for both short-and long-range local travel as shown in Figure 11.

It appears that the survey strategy previously described could be implemented to establish the bike and walking travel potential together for a given area and then the feasibility of joint major facilities could be examined. For the purposes of this discussion, the access facilities to a major accommodation for the respective modes are not considered since there usually are sufficient secondary roads, sidewalks, and footpaths in suburban areas to accommodate such needs.

This report and Volume I of this study document the requirements for pedestrian accommodations, many of which also apply to bike facilities. For example, safety, security, directness, adequate entrances and ramps and lighting, are probably as important to the bicyclist as they have been diagnosed to be to the pedestrian. However, in order that the problem be properly documented similar case studies and literature reviews on bicycle travel should be conducted. Once sufficient information is obtained for both modes, the findings should be synthesized to establish guidelines for joint pedestrian-bicycle (pedabik) facilities.

Table 5

Travel Distance per time Consumed for
Pedestrian and Bicycle Travel

(Basic Conversion Units: 1 mi. = 1.6km; 1 sq. mi. = 2.36 km)

Mode	Operating Time Tolerance	Travel Distance (Capture Radius)	Capture Area
Walking	10 min.	1/2 mile	0.8 sq. mi.
	20 min.	1 mile	3.1 sq. mi.
Bicycling	10 min.	2 miles	12.6 sq. mi.
	20 min.	4 miles	50.3 sq. mi.

Additional important issues which must be resolved with respect to the pedabik concept include the evaluation of ramp access designs for accommodating both modes and alternative model integration or separation strategies for movements on the facility. Also, any legal restrictions which prohibit pedestrian and bicycle integration must be resolved. For example Va. Code ANN. Sec. 46.1-229 provides that "any person riding or driving a bike or motorbike on the sidewalks of any city or town or county except for Arlington and Henrico Counties is guilty of a misdemeanor with a fine of not less than five dollars and not more than twenty-five dollars." The Code further provides that Virginia Beach, Fairfax County and the town of Vienna may let a person of any age ride bicycles in certain designated areas. In this context it is unclear whether a pedestrian overpass or underpass is considered to be a sidewalk. If such facilities are, in fact, specified as sidewalks, then the law may need to be modified if joint use facilities are to become feasible. In its Guide for Bicycle Routes, AASHTO states that "It may be prudent, if not essential, to modify some existing laws and ordinances to assure safe and efficient operation where a system of bicycle routes is to be introduced within the rights of way of public highways and streets."⁽²⁾ The AASHTO statements are directed primarily toward joint street usage of bicycles and other vehicles, but should, from a systems viewpoint, also relate to interactions between bicycles and pedestrians.

The Uniform Vehicle Code (UVC) contains a specimen set of vehicle ordinances for a municipality entitled the "Model Traffic Ordinance" (MTO). The MTO is consistent with the recommended state law embodied in the UVC and the following portion pertains to riding bicycles on pedestrian sidewalks.

Section 12-14: Riding on Sidewalks

- "(a) No person shall ride a bicycle upon a sidewalk within a business district.
- "(b) The (chief of police) is authorized to erect signs on any sidewalk or roadway prohibiting the riding of bicycles thereon by any person and when such signs are in place no person shall disobey the same.
- "(c) Whenever any person is riding a bicycle upon a sidewalk such person shall yield the right of way to any pedestrian and shall give audible signal before overtaking and passing such pedestrian."

An analysis of pedestrian travel in suburban areas supports the need to investigate the feasibility of joint use of major accommodations (structures) by bicyclists and pedestrians. Various legal, operational, and design considerations are suggested in order to make the concept feasible. The ultimate objective is to optimize the usage of major non-vehicular travel facilities in suburban areas.

FUTURE PLANNING PROCEDURES

It is of utmost importance that the pedestrian be allowed input into the planning for pedestrian facilities if feasible. The experience of this research team indicates that the most efficient method of gaining this input is through a hand delivered questionnaire to a random sample of the population living within a certain radius of the proposed facility. An example of a very successful questionnaire utilized by this research team can be found in Appendix II of this report. The questionnaire should be accompanied by a self-addressed, stamped envelope to facilitate return. This technique was tried by the research team and the return rate was over 50% from 300 questionnaires. This technique combined with an observation of existing pedestrian travel patterns at the proposed site, a study of the existing and projected land use for the area adjacent to the proposed site, and an observation of current trip length averages as applied to the future pedestrian facility being considered should provide the Department with valuable information concerning the feasibility of a pedestrian accommodation of the site being studied. If this systematic approach is utilized a sufficient number of times it would appear that the Department would eventually become quite efficient at projecting the usage of a proposed pedestrian facility. Moreover, such a program would also be in keeping with the Department's continuing efforts in eliciting citizen input into the highway planning process.

The survey procedure for estimating the pedestrian travel on proposed facilities could not be fully validated during this study since no site provided the opportunity for before and after data. The procedure that was recommended in the preceding paragraph and implementation of the survey questionnaire given in Appendix II supply sufficient cross-sectional data. However, since only a before study was conducted with the methodology, complete confidence in the questionnaire methodology is not yet assured.

The only way that the questionnaire can be completely validated is by conducting an after study at the same location as the before study. Once this is completed, responses on the before study can be compared to those on the after study and the adequacy of the questionnaire as an efficient research tool can be tested. For this reason it is recommended that an after study be conducted some reasonable period following the completion of the proposed pedestrian overpass that was the site of the before study. Indeed before a consensus can be reached as to the exact procedure to be utilized, many before and after studies may have to be conducted.

REFERENCES

1. The Bicycle - A plan and program for its use as a mode of transportation and recreation - Atlanta Metropolitan Region, Barton-Ashman Associates, St. Paul, Minnesota, July 1973.
2. Guide for Bicycle Routes, American Association of State Highway and Transportation Officials, Washington D. C., 1974.

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APPENDIX I

DESCRIPTION OF CASE STUDIES

Pedestrian Tunnels

Study Site 1

The first study examined a facility which accommodates pedestrian travel beneath Interstate 95 near Glebe Road in Northern Virginia. This tunnel is approximately 200 feet (61 m) long, 8 feet (2.44 m) high, and 6 feet (1.83 m) wide and vandal-proof lighting was recently installed. The drainage is poor and thus the interior of the tunnel is quite damp and muddy. The major land use adjacent to one entrance is residential, consisting primarily of a high-rise apartment building containing approximately 400 units and a convenience store. This entrance is below street level and must be reached by steps. At the other end is a bus stop and an entrance to a specialized hospital. Approximately one-half mile (0.8 km) from this end are junior high school and playground areas, and about one-fourth mile (0.4 km) further there is a small shopping center. Volume counts were made at this site between the hours of 6:30 a. m. and 11:30 p. m. on two clear days in the early spring. They showed that 72% of all pedestrian trips took place during the two-hour periods, which correspond closely to the two commutation periods of the day (between 7 and 9 a. m. and 4 and 6 p. m.). It therefore appears that the tunnel is used primarily by commuters who either work at the hospital or catch a bus to other parts of the metropolitan area.

Two methods were used to examine pedestrian behavior in and around this tunnel structure. First, on one morning 19 pedestrians, 7 male and 12 female, were interviewed as they traversed the tunnel. All but 1 stated that they use the tunnel every day and for all but 2 the primary destination was the bus stop. Twelve of those interviewed said that they never use the tunnel at night and all but 1 of these said the reason was fear of attack. Seventeen of the pedestrians felt that the tunnel was a necessary facility, but all but 1 said it did need improvements, the most frequently mentioned being better lighting and better drainage. All 19 were asked if they would prefer an alternative to the tunnel. Eight replied yes, 5 no, and 6 didn't care either way. It is interesting to note that all those answering yes to this question favored the construction of a footbridge. These 8 individuals stated that they felt a footbridge would provide better visibility than the tunnel, and consequently would be safer to use, particularly at night. They also felt it would be easier to maintain than a tunnel, especially with regard to the accumulation of debris and drainage problems. It was also noted that whereas a tunnel might have artificial lighting 24 hours a day, an open footbridge would necessitate the use of lighting only during nighttime hours. On the other hand, those preferring the tunnel noted that it provided shelter from the weather and was less of an eyesore than an overpass.

The second phase of the examination of pedestrian behavior in the area of this pedestrian tunnel consisted of selecting 40 households in the adjacent high-rise apartment building for interviews. Thirty-nine usable interviews were obtained consisting of responses to questions concerning these residents' uses of and attitudes towards the tunnel and towards pedestrianism in general. Sixty-two percent of those interviewed said that they use the tunnel regularly and a majority of them use it primarily to get to the bus stop. Only slightly more males than females use the tunnel at night and, as would be expected, the most common reasons given for inhibited nighttime use of the tunnel was fear of attack and merely the fact that they had no reason to do so. When asked to express a general attitude towards the tunnel, 80% felt that it was indeed necessary. The remaining 20% viewed it as either unnecessary or a nuisance because it created a potential for crime and mischief; 95% of these persons felt that it needed better lighting and drainage and 50% that it should be clean. Only about half of the respondents interviewed during this phase preferred an alternative to the tunnel. When questioned about their general walking behavior 62% stated that they seldom or never walked anywhere. The main reasons given for this behavior was fear of attack and inadequate walking facilities; 80% stated that most destinations were too far and 70% said that they would just rather drive. Ninety-two percent of the respondents indicated that weather extremes impeded walking and, on the average, the respondents reported that one-half mile (0.8 km) was a reasonable distance to travel on foot. Eighty-five percent of the respondents stated that improvements to the walking environment such as sidewalks and better lighting would increase the possibility of them walking more. While about half of the respondents own bicycles, only about half of these rode them frequently. All bike riders indicated that the most important mode of transportation to their family was the automobile. Only 1 person cited the bike as being of utmost importance, and no one interviewed viewed walking as being of any importance. Furthermore automobile owners (94% of the respondents) reported that walking was less important to them than did respondents who owned no automobile. No relationship was detected however between the number of cars owned by a particular family and that family's walking behavior.

Study Site 2

The second pedestrian tunnel examined accommodates pedestrian travel beneath the Lee Highway in Northern Virginia. It is approximately 90 feet (27.45 m) long, 8 feet (2.44 m) high, and 8 feet (2.44 m) wide. It, too, is damp, littered with debris and mud, contains no lighting, and the walls are covered with graffiti. A junior high school accommodating approximately 800 students is located adjacent to one entrance. The other entrance meets the parking lot of the large high-rise apartment building. The tunnel is below ground level and thus must be reached by steps. The major purpose of the tunnel appears to be to provide students of the junior high school safe accessibility to the other side of the highway. Volume counts made between the hours of 7 a.m. and 4 p.m. on two days in good weather showed that the tunnel receives very little use not

associated with the school, and that the majority of the trips through the tunnel take place immediately before and after normal school hours. In spite of the availability of the tunnel, the researchers noticed 135 daily street level crossings of the highway at this location. This seems to indicate that many of the school children choose to take their chances with the traffic rather than use the tunnel to reach the same destination. Reasons for this behavior became evident upon further study.

The principal and vice principal of the high school were both interviewed in order that an administrative point of view could be included in the analysis. Both agreed that the tunnel was an undesirable facility and that it provided a place for students to congregate and on occasion to carry on certain types of mischief (e.g., pot smoking, fighting, loitering). They further stated that they felt that a pedestrian overpass would be far more desirable than a tunnel and that the tunnel was indeed obsolete as the result of a change in the demographic character of the community.

To examine the attitudes and opinions of the users of the tunnels, 91 questionnaires were administered to 3 randomly selected homerooms at the junior high school. Of this sample, 82% lived within a 20-minute walk of the school, and 47% of the total sample stated that they normally walk to school. A higher percentage of the males than the females walk to school, while significantly more females ride the bus. Ninety percent of those responding were aware of the tunnel, but only 14% said they used it for traveling to and from school. Ten percent said they use the tunnel for reasons other than traveling to and from school, thus supporting the allegations of the school principal and vice principal. The students were fairly evenly divided with respect to their feeling about walking through the tunnel, with 44% indicating that they would avoid using the tunnel if at all possible. Of those 44%, 47% cited safety as their reason. Ninety percent of the students felt that the tunnel was badly in need of maintenance, and the installation of lights was the most frequently mentioned desired improvement (ironically, lighting has been installed on several occasions only to be destroyed by vandals). When given a hypothetical choice of a footbridge, no facility, or the existing tunnel, 51% opted for walking across the highway, 25% favored the footbridge, and 24% favored the tunnel. In terms of their general walking behavior, the most common destinations to which the students walk are friends' homes (78%), stores (60%), and the school (47%). Seventeen percent of the students indicated that they never or seldom walk anywhere either because pedestrian facilities are inadequate or they would simply rather be driven. About half of those students interviewed stated that walking was their most important mode of travel and the rest fell somewhere in between. When age was considered, the data indicated that as age increases, walking as a mode tends to be of lesser importance.

Study Site 3

The third pedestrian tunnel site examined was located beneath Route 50 in Northern Virginia. This tunnel site was examined strictly with respect to its surrounding land use and physical condition. At one entrance lies an extensive apartment complex and at the other a bus stop and military facility. The tunnel is quite damp, is not well illuminated, and serves to link pedestrians from the apartment buildings to the military facility and the bus stop. Pedestrian activity was observed between the hours of 7:00 a.m. and 4:00 p.m. on two sunny days during the spring. Special attention was given to the number of pedestrians who crossed the highway at street level where no pedestrian accommodation existed compared to the number that used the tunnel. The average number of daily crossings of the highway either through the tunnel or at street level was 117. It is worthy of note that an average of only 7 of these were made at street level. The implication here is that there is very little hesitancy to use this tunnel especially compared with the aversion exhibited toward the tunnel at Study Site 2. The behavior exhibited at the Study Site 3 tunnel is possibly due to the fact that a military guard is stationed near the entrance that lies adjacent to the military facility.

Pedestrian OverpassesStudy Site 4

The first overpass examined accommodates pedestrian travel over Interstate 264 in Eastern Virginia. It is approximately 800 feet (244 m) long, 8 feet (2.44 m) high, and 10 feet (3.05 m) wide. The total walking distance is approximately 900 feet (275 m) from one end to the other. It is well lighted and the portions over the roadway are caged. The land use adjacent to the southern entrance is residential, consisting mostly of single family dwellings, with a large suburban shopping center located approximately one-half mile (0.8 km) away. Adjacent to the northern entrance the land use is also single family dwellings, with an elementary school located about three-fourths of a mile (1.2 km) away. The major purposes of the overpass are to provide for pedestrian travel between households and the local shopping center. Volume counts taken between the hours of 7:00 a.m. and 5:30 p.m. on two clear days seemed to indicate typical usage. On one of the days school was in session and on the other it was not. The data indicated that most of the trips on the overpass can be attributed to the school, since on the day the school was open 58% of all the trips occurred during those periods when children are going to and returning from school. On the day school was closed the proportion dropped to 36% for these periods. Ninety percent of the persons observed using the overpass on both days were school age children. Fifty-one percent of those children were male and 41% of the total were on bicycles.

To gain insight into pedestrian behavior, interviews were conducted with 16 people who were either using the facility or walking nearby. In responding to general questions about the overpass, 13 reported that they used it. The remaining 3 indicated they very seldom had occasion to use it. All but 2 of these respondents felt that the overpass was necessary, and while 5 reported that the construction of the highway altered normal travel to desired destinations, only 1 felt that the overpass compensated for this alteration. The most frequently mentioned reasons for using the overpass were to visit friends and to shop. Since all but 4 of those interviewed were adults, school trips were not mentioned as a primary usage. While several of the respondents indicated that they or their friends frequently used the overpass on weekends to get to and from the shopping center, most agreed that the major use of the overpass was to travel to and from the school. Although the size of the sample was relatively small it represents roughly 10% of the households adjacent to the overpass and thus is probably representative of local attitudes concerning the overpass.

Study Site 5

The second pedestrian overpass accommodates pedestrian travel over Interstate 64 in Eastern Virginia. It is approximately 160 feet (48.8 m) long [walking distance is 560 feet (170.69 m)], 8 feet (2.44 m) high, and 10 feet (3.05 m) wide. It is not lighted and the entire facility is caged. The land use adjacent to both entrances is residential, consisting of single and multifamily dwellings. These two areas contain approximately 270 households. The overpass was built in part to provide pedestrian accessibility between the two subcommunities created by construction of Interstate 64. Approximately one-half mile (0.8 km) from the west entrance is a grade school, junior high school, and high school. A small shopping center is located about three-fourths of a mile (1.2 km) from the east entrance. The primary purpose of the overpass appears to be to link the households to the schools, with the secondary purposes being to link households to households, and households to the shopping center. Volume counts were taken at this site on two days, one when school was in session and one when it was not. The counting was done between the hours of 7:30 a. m. and 6:30 p. m. and the weather was good. The data imply that the overpass serves a highly specialized purpose during the school year and its usage is relatively uniform and infrequent. Ninety-five percent of the persons using the overpass were school age children, and during the day when school was in session 75% of the trips across the overpass were to and from school, 30% of which were made on bicycles.

To determine how the overpass is perceived by the area's residents as well as the walking behavior in this locale, interviews were held with 51 households. Fifty percent of the interviewees stated that they used the overpass with some frequency. Visiting friends was the most acknowledged use of the facility while shopping and school together comprised only 16% of the total use. Of those who said that they did not use the overpass

61% said they had no reason to use it and 17% believed it was dangerous. Seventy-one percent of the households in this sample contain children and of those 51% reported that their children used the overpass. Of those respondents, 36% said the childrens' usage was for traveling to and from school, 36% for visiting friends, and the remainder did not specify. It appears that the bulk of the adult usage of the overpass is not school related while the bulk of the child travel usage is. The respondents were questioned specifically concerning their most recent use of the overpass. It was found that 61% of the respondents did not use the overpass that week, 22% used it 1 to 5 times, 6% used it 6 to 10 times, and 11% used it more than 10 times. Despite the relatively low use rate, 83% of the sample felt the overpass was necessary. This general opinion is apparently based on the respondents' perceived use of the overpass, since 84% said that they thought many people used it. Fewer than half of those responding said that the building of the interstate had changed their travel habits. Of these less than half felt that construction of the overpass compensated for the loss occasioned by that change.

Study Site 6

A third pedestrian overpass was observed strictly with respect to its surrounding land use and physical characteristics. It is approximately 560 feet (170.69 m) long, 10 feet (3.05 m) high, and 8 feet (2.44 m) wide. The walking distance from one side to another is nearly 1200 feet (355 m). Near one entrance is a shopping center and a high school. The land use near the opposite entrance consists of single and multifamily dwellings. The overpass traverses Interstate 95 in Northern Virginia, is not lighted, and is partially caged. Its major travel purpose appears to be to link households to the shopping center and the high school. Volume counts made at this site between the hours of 7:30 a.m. and 6:00 p.m. on two spring days showed a daily average of 131 trips. Fifty-five percent of the users of the facility were female, which seems to indicate a large number of shopping trips to the adjoining shopping center. Also, since no peak periods were indicated it appears that this facility is not a primary means of access to the high school even though 46% of its users were school age children.

Pedestrian Facilities: Anticipated or Nonexistent

The case studies next described concern situations where no pedestrian accommodations exist but where there is an acknowledged potential for walking travel.

Study Site 7

Study of Site 7 considered pedestrian movements from an office building housing approximately 525 employees to a major shopping center. The path between the two is intersected by a 4-lane highway divided by a 12 foot (3.66 m) raised grass median. There are no crosswalks or traffic signals near the office building for crossing the street. The posted speed limit of the road is 40 mph (64 km/h), and downstream traffic signals cause vehicles to pass in platoons with periodic gaps. Counts of pedestrian and auto traffic were taken during selected periods of typical work days during good weather in June. The data obtained are summarized in Table I-1.

Table I-1. Pedestrian and Vehicle Volumes, Study Site 7

<u>Peak Periods</u>	<u>2-Way Volumes</u>
7:30 a.m. - 8:00 a.m.	Pedestrians - 37; Autos - 862
11:30 a.m. - 1:00 p.m.	Pedestrians - 362; Autos - 2,463
4:15 p.m. - 4:45 p.m.	Pedestrians - 72; Autos - 846
Average number of trips per peak hour	Pedestrians - 242; Autos - 1,642

These data indicate that the walking trips are important to the office employees since a significant number of trips are made each day under difficult circumstances. To determine how the employees perceive the pedestrian situation, 270 completed questionnaires were obtained from the firm personnel. The three most frequent reasons given for walking across the roadway were to shop (83%), to eat (56%), and to go to the bank (50%). The majority of those who cross the roadway (96%) stated that they did so at a point immediately in front of their place of work, which indicates a desire for a direct path. Sixty-seven percent of those responding stated that weather conditions influenced their walking activity. Ninety-three percent expressed a need for better pedestrian accommodations. The desired improvements most often cited in descending order were an overpass, a traffic signal with a pedestrian phase, a crosswalk, a police guard, and lower traffic speeds. Alternatively, some respondents stated that no improvements should be made, and 38% stated that improved walking conditions would indeed generate more walking trips to and from the shopping center.

Study Site 8

The study of Site 8 concerned itself with pedestrian travel to a new high school which is separated from a middle income residential area by the 4-lane Route 250 By-pass in Charlottesville. The average straight-line distance between the new high school and the residential area is approximately 1 mile (1.6 km). The conditions are such that the highway presents a physical barrier for walking between these two points. The nearest existing pedestrian overpass would require travel distances approaching 2 miles (3.2 km) between the two points. On the school side of the highway, there is a public park that also generates considerable pedestrian travel. Soon a swimming pool will be constructed on the side opposite the school which will attract trips from the residences on the school side. Thus a pedestrian facility in this area would cater two trip purposes; home to school and home to recreation trips.

In order to determine the feasibility for a facility here, a survey was administered to those households in the residential area on the side opposite the school occupied by children who will be attending the high school within the next few years. Questions were designed to obtain data on the attitudes of this group toward walking in general as well as their feelings towards the proposal for a pedestrian overpass. Surveys were distributed to 45 single family units and 27 usable questionnaires were returned. Fifty-six percent of the children represented in the surveys currently walk to school, while 48% ride with a friend. Sixty-seven percent of the respondents stated that children in their household would walk during the day, and 18.5% at night. Seventy-seven percent of the households surveyed stated that family members seldom walk and 12% that they never walk. Thus it can be inferred from the data that there is a very low incidence of walking in this area. When asked why they did not walk, 73% said most destinations were too far, while 35% stated that pedestrian facilities were inadequate or roadside walking conditions were unsafe. Questions asked relative to reasonable walking distances revealed the data in Table I-2.

Table I-2. Acceptable Walking Distances, Study Site 8.

<u>Distance</u>	<u>Adult</u>	<u>Children</u>
1/4 mile (0.4 km)	12.0%	7.7%
1/2 mile (0.8 km)	52.0%	38.5%
3/4 mile (1.2 km)	12.0%	15.4%
1 mile (1.6 km)	24.0%	34.6%
> 1 mile (1.6 km)	—	3.8%

These data show that the majority of adults are willing to walk up to one-half mile (0.8 km) while more than 50% of the children will walk even greater distances. Twenty-five respondents stated that a proposed overpass was needed and or desirable, while 2 did not answer the question. If a facility of this type were built, 89% would use it during the day and 52% at night. These responses imply that an overpass would generate 22% and 34% more walking trips for day and nighttime travel, respectively, to the new high school. The comments indicate that the lower incidence of nighttime usage is mostly attributed to fear of attack. Additional comments volunteered on a number of surveys cited the need for good lighting and accommodations for bicycles.

Study Site 9

The final case analysis dealt with a pedestrian overpass proposed for construction in Northern Virginia. The facility will span Route 495 and connect a park with a residential area comprised of approximately 1,500 households representing all dwelling types. On the residential side the planned bridge will be located immediately adjacent to townhouses and must be reached by the majority of the residents via the local street system. The average walking distance for park users from this residential area is estimated to be well over a mile.

Questionnaires were hand delivered to 300 households randomly selected for the purpose of estimating the impact of the new pedestrian facility on walking behavior, especially travel to the new park. The questionnaire packet included a self-addressed stamped envelope with which to return the questionnaire. One follow-up was conducted approximately two weeks after the initial hand delivery. One hundred fifty-seven completed questionnaires (a return rate of 52.3%) were received representing approximately 11% of the households adjacent to the proposed overpass.

Currently walking plays a minor role as a travel mode in this area as 67% of the households replied that members either seldom or never walk. Ninety percent of the respondents cited the reason for this as being that most destinations are too far. Similar questions were asked relative to the next least mechanized mode, the bike, and 81% said they never or seldom used bicycles. Also, as one might suspect, only 2% of the respondents reported their household never or seldom use the automobile to get from one place to another. Moreover, it appears that in general the people living in this area do anticipate an increasing role for walking in their future as 58% stated a desire for better walking facilities, with more sidewalks and better lighting the most frequently mentioned improvements. Accordingly, 69% stated a desire for better bicycle facilities. The 11% difference here is possibly due to the phenomenon of "perceived space" as bicycling provides accessibility at greater distances than walking. In other words, the respondents, as a whole, felt they would be able to reach more points on bikes than they could walking.

Questions asked relative to reasonable walking distances revealed the data in Table I-3.

Table I-3. Acceptable Walking Distances, Study Site 9.

<u>Distance</u>	<u>Adults</u>	<u>Children*</u>
1 block	--	6.7%
1/4 mile (0.4 km)	16%	33.3%
1/2 mile (0.8 km)	44%	26.7%
3/4 mile (1.2 km)	8%	6.7%
1 mile (1.6 km)	24%	20.0%
> 1 mile (1.6 km)	8%	6.7%

*Responses only from families with children

Twenty-nine percent of the respondents felt that a reasonable distance for an adult to walk was 1 mile (1.6 km) or more while 29% thought the same about child walkers. Also, 88% of the respondents felt that 1 mile (1.6 km) or greater was a reasonable distance for an adult to ride a bicycle while 74% stated that the same distance was reasonable for children. The lesser figure for children is attributed to the fact that very young children were considered.

Two questions were asked of respondents which deal with the problem of multi-mode local travel facilities. When asked whether or not bicyclists and pedestrians should be permitted to use the same facility, 66% of those viewing the problem from a biker's perspective responded positively. Of those taking a pedestrian point of view, only 48% agreed. Approximately one-third of the bikers and one-half of the walkers disapproved of mixing these modes. The other multi-mode questions dealt with facilities shared by bikes and automobiles. Here again, the bikers exhibit the most favorable reaction but slightly less than one-half approved of this type of facility (44%). Respondents with a driver's point of view did not like the idea of sharing streets with bicycles, probably due to experience. Only 21% of the drivers agreed to sharing roads with bicycles. The proportions of approval and disapproval to multi-mode facility use warrant some additional discussion. The bikers' favoritism to shared facilities can be easily explained. Facilities have traditionally been built for walking (even "no bike" signs) and driving cars. In terms of safety, bicycles present some danger to pedestrians but not to the extent that cars do to bikes. On the other hand, bikers have no facilities of their own to speak of and prefer the more expedient of the alternative modes--streets. Drivers do not want to share streets with bikers and the conflict potential is high both because speeds are greater than on sidewalks and because cyclists behavior is potentially so unpredictable yet, bikers are willing to accept to a greater degree the sharing of facilities. Bikers are the "have nots" and thus are more willing to share than either walkers or drivers.

Seventy-five percent of those interviewed do not use the park facilities and 64% of the sample were unaware of its current expansion. However, 92% of the respondents stated that they would use the park with expanded facilities, with 55% expressing the auto as their means of access to the park, 20% the bicycle, and 19% walking, given the current access facility situation. Assuming the construction of the pedestrian overpass, 76% said this would make the park more accessible, 34% would bike to it and 33% would walk. As can be seen by the data, the respondents exhibit a potential increase in their walking activity as well as biking to the park after the overpass is constructed. Under the proposed circumstances, 58% of the responding families would use the park either frequently or very frequently. Of the 42% who would seldom use the park, 75% noted lifestyle incompatibility as being the reason.

APPENDIX II

WAKEFIELD PARK
AREA PEDESTRIAN SURVEY

1. What activities do you (your family) normally get to by walking? (circle one or more)
- | | |
|----------------------|----------------------------|
| a) School (children) | e) Recreational activities |
| b) Work | f) Visit friends |
| c) Church | g) Never walk |
| d) Shopping | |
- 2a. How many bicycles are owned by you or your spouse? _____
- 2b. How many by your children? _____
- 3a. How many automobiles are owned by the members of your household? _____
- 3b. What activities do you (your family) normally get to by car? (circle one or more)
- | | |
|----------------------|----------------------------|
| a) School (children) | e) Recreational activities |
| b) Work | f) Visit friends |
| c) Church | g) Never drive |
| d) Shopping | |
4. What activities do you (your family) normally get to by bus? (circle one or more)
- | | |
|----------------------|----------------------------|
| a) School (children) | e) Recreational activities |
| b) Work | f) Visit friends |
| c) Church | g) Never ride bus |
| d) Shopping | |
- 5a. On the average, how often do you (your family) normally use walking to travel from your home to another place? (circle one)
- | | |
|-----------|--------------------|
| a) Never | c) Frequently |
| b) Seldom | d) Very frequently |

APPENDIX II (cont'd)

5b. If you answered never or seldom, what are the reasons? (circle one or more)

- | | |
|---|-----------------------|
| a) Most destinations are too far | d) Fear of attack |
| b) Pedestrian facilities are inadequate | e) Would rather drive |
| c) Health reasons | f) Other _____ |

6a. On the average, how often do you (your family) normally use bicycles to get from your home to another place? (circle one)

- | | |
|-----------|--------------------|
| a) Never | c) Frequently |
| b) Seldom | d) Very frequently |

6b. If you answered seldom or never, what are the reasons? (circle one or more)

- | | |
|-----------------------------------|--|
| a) Most destinations are too far | d) Fear of attack |
| b) Bike facilities are inadequate | e) Unsafe--too much conflict with cars |
| c) Health reasons | f) Not appropriate to lifestyle |
| | g) Other _____ |

7a. On the average, how often do you (your family) use the automobile to get from your home to another place? (circle one)

- | | |
|-----------|--------------------|
| a) Never | d) Frequently |
| b) Seldom | e) Very frequently |

7b. If you answered never or seldom, what are the reasons? (circle one or more)

- | | |
|--------------------------|---------------------------|
| a) Roads are inadequate | e) Would rather ride bike |
| b) Health reasons | f) Don't have a car |
| c) Would rather ride bus | g) Other _____ |
| d) Would rather walk | |

8a. On the average, how often do you (your family) normally use the bus to get from your home to another place? (circle one)

- | | |
|-----------|--------------------|
| a) Never | c) Frequently |
| b) Seldom | d) Very frequently |

APPENDIX II (cont'd)

8b. If you answered never or seldom, what are the reasons? (circle one or more)

- | | |
|--------------------------|------------------------------|
| a) Inadequate bus routes | d) Would rather ride bicycle |
| b) Would rather drive | e) Don't like buses |
| c) Would rather walk | f) Too expensive |
| | g) Other _____ |

9a. Do weather conditions affect your walking habits? Yes _____ No _____

9b. If yes, which ones deter you the most? (circle one or more)

- | | |
|---------|---------|
| a) Snow | d) Cold |
| b) Rain | e) Heat |
| c) Wind | |

10a. Are there improvements you would like to see made that would enhance your opportunity for walking? Yes _____ No _____

10b. If yes, what? (circle one or more)

- | | |
|--------------------|------------------------------------|
| a) Sidewalks | c) More traffic signals at corners |
| b) Better lighting | d) Other |

11a. Are there improvements you would like to see made that would enhance your opportunity for bicycling? Yes _____ No _____

11b. If yes, what? (circle one or more)

- | |
|--|
| a) More bike facilities |
| b) Better laws regarding bicycle-pedestrian-driver |
| c) Other _____ |

12a. What is a reasonable distance for walking to some activity from your home? (circle one)

- | | |
|--------------------------|----------------------------|
| a) 1 block | d) 3/4 mile (10-11 blocks) |
| b) 1/4 mile (3-4 blocks) | e) 1 mile (14 blocks) |
| c) 1/2 mile (7 blocks) | f) more than 1 mile |

APPENDIX II (cont'd)

12b. How about your children? (circle one)

- | | |
|--------------------------|----------------------------|
| a) 1 block | d) 3/4 mile (10-11 blocks) |
| b) 1/4 mile (3-4 blocks) | e) 1 mile (14 blocks) |
| c) 1/2 mile (7 blocks) | f) more than 1 mile |

13a. What is a reasonable distance for bicycling to some activity from your home? (circle one)

- | | |
|--------------------------|----------------------------|
| a) 1 block | d) 3/4 mile (10-11 blocks) |
| b) 1/4 mile (3-4 blocks) | e) 1 mile (14 blocks) |
| c) 1/2 mile (7 blocks) | f) more than 1 mile |

13b. What about your children? (circle one)

- | | |
|--------------------------|----------------------------|
| a) 1 block | d) 3/4 mile (10-11 blocks) |
| b) 1/4 mile (3-4 blocks) | e) 1 mile (14 blocks) |
| c) 1/2 mile (7 blocks) | f) more than 1 mile |

14a. Do you think that bicyclists and pedestrians should be allowed to use the same facilities?

Yes _____ No _____

From what point of view are you speaking? bicyclist _____ pedestrian _____

14b. Do you think that bicycles and automobiles should be allowed to use the same facilities?

Yes _____ No _____

From what point of view are you speaking? bicyclist _____ driver _____

15. Do you (your family) currently use the Wakefield Park facilities?

Yes _____ No _____

16. Are you aware that Fairfax County is going to expand the park to include additional facilities?

Yes _____ No _____

APPENDIX II (cont'd)

17. Will you (your family) use it after these improvements have been made?

Yes _____

No _____

18. How will you and your spouse get to the park? (circle one or more)

- a) car
- b) bicycle
- c) walk

18a. How will your children get to the park? (circle one or more)

- a) car
- b) bicycle
- c) walk

19. Are you aware that the Highway Department plans to construct a pedestrian overpass across the Beltway to the park? (see enclosed map)

Yes _____

No _____

20a. Will the overpass make the park more accessible to you and your family?

Yes _____

No _____

20b. - How will you (your family) get to the park? (circle one or more)

- | | |
|-----------------------|------------------------------|
| a) car | d) bike down Braddock or 236 |
| b) walk over overpass | e) won't use park |
| c) bike over overpass | |

21a. How often do you think you will use the park? (circle one)

- | | |
|-----------|--------------------|
| a) Never | c) Frequently |
| b) Seldom | d) Very frequently |

21b. If you answered never or seldom, what are the reasons? (circle one or more)

- | | |
|--------------------------------------|---------------------------------|
| a) Too far to walk or bike to | c) General access is inadequate |
| b) Don't use recreational facilities | d) Other _____ |

APPENDIX II (cont'd)

22a. How often will your children use it? (circle one)

- | | |
|-----------|--------------------|
| a) Never | c) Frequently |
| b) Seldom | d) Very frequently |

22b. If you answered never or seldom, what is the reason? (circle one or more)

- | | |
|--------------------------------------|---------------------------------|
| a) Too far to walk or bike to | c) General access is inadequate |
| b) Don't use recreational facilities | d) Other _____ |

23a. Do you feel the pedestrian overpass is needed?

Yes _____ No _____

23b. If no, what is your reason? _____

24a. Are there any additional facilities that could improve the access to the park?

Yes _____ No _____

24b. If yes, what? _____

25. What is your age? _____

26. What is your sex? _____

27. How many people are in your household? _____

28. What are the ages and sexes of the children in your household? _____

29. What is your occupation? _____

30. What is your spouse's occupation? _____

Please feel free to make any additional comments you would like concerning pedestrian and bicycling activities in your area: _____

APPENDIX II (cont'd)

June 1974

23-7-22

Dear Resident:

The Virginia Highway Research Council is conducting a survey of the use of the existing and planned pedestrian and bicycling facilities located near your home. To obtain a good cross section of opinion, we are surveying a number of households in your area.

It would be greatly appreciated if you would fill out the attached questionnaire. It is brief and concerns the pedestrian and bicycling activities of your family as well as your family's use of Wakefield Park. If any of the questions do not apply to you or your family, you may leave them blank. All information received will be kept confidential.

Your cooperation in this effort will be very much appreciated. It is hoped that we can get some new ideas about what kinds of pedestrian and bicycling facilities are desirable over and around interstate highways and in urban areas. A self-addressed, stamped envelope is provided for you to return the questionnaire.

Thank you very much for your cooperation.

Mike Perfater
Highway Research Analyst

MP/ss

