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Introduction

In recent years there has been a surge of interest on the part of local jurisdictions and their citizens in halting the progressive erosion of residential environmental quality caused by ever-increasing street traffic. This interest has resulted in some major as well as many smaller experiments in diverting and slowing the pace of traffic in residential areas in the United States and elsewhere. Lessons from these experiments abound, although they tend to be scattered, not widely known or documented, and not comprehensively evaluated. As interest continues to grow with more and more communities seeking ways of resolving the opposing goals of providing mobility while enhancing residential livability, effective planning guidance is needed. This study, **Improving The Residential Street Environment**, seeks to provide that guidance.

Neighborhood traffic management — a definition

The title of this research study "Improving the Residential Street Environment" is an extremely broad one, but the study's actual subject matter is more closely focused. The study and this report concern themselves only with existing residential environments, not new developments; and they address only one aspect of that environment, the ways traffic and traffic related characteristics of streets affect the quality of the residential environment. More importantly, the research centers on changing and improving the residential environment through measures which relate directly to traffic.

One category of such measures is called **residential protection.** Protection measures shield residents from the adverse impacts of traffic without attempting to affect traffic itself. Noise buffers, double glazed windows and view screens are examples of protection measures. Normally, such measures are employed where, unfortunately, residences are located on streets intended to carry substantial volumes of traffic, usually at moderate to fairly high speeds. Another category of measures, **amelioration,** compensates residents for tolerating the undesirable impacts of street traffic by providing other amenities or services. As with residential protection, nothing is done to affect traffic itself. The compensation may attempt to overcome adverse traffic impacts directly (e.g., providing parks along a street on which it is unsafe for children to play because of traffic). Or it may simply offset the adverse traffic impact by providing a higher quality of some other totally unrelated facility or service. Amelioration is normally attempted on streets which, though residential uses are present, have a strong traffic circulation role and on which residential protection measures are infeasible. Or amelioration may supplement residential protection measures. Both of these types of measures, while acknowledged herein, are not researched in depth in this study. The primary focus of the study is on a third type of traffic related measure, **neighborhood traffic management.*** Unlike protection and amelioration, neighborhood traffic management attempts to improve the residential environment by directly affecting traffic thereby cutting off undesired impacts at the source. It does this by limiting the amount of traffic on the residential streets usually by restricting accessibility and continuity or by affecting the behavior of drivers. Behavior patterns induced are ones such that those continuing to use the "managed" streets will not generate the adverse effects they might were the streets uncontrolled, and drivers whose driving styles are not amenable to the demands of a residential environment will choose to use other streets. The predominant behavioral control attempted relates to traffic speed.

Neighborhood traffic management devices are normally employed on local residential streets — streets which are predominantly residential in character and which have the sole intended traffic function of providing accessibility to limited numbers of immediately tributary properties. The rationale for neighborhood traffic management lies in the recognition of the breadth and the limitations of a local residential street's functions. Local residential streets are meant to provide accessibility to limited areas directly dependent upon them; not to all travelers who find it convenient to use them. And serving traffic, even the local traffic which "belongs" there, is only a part, not the whole of their purpose. The neighborhood street is a place where children play, where neighbors meet, an extension of the front yard, a feature which affects the appearance of homes along it and the quality of life within them. Neighborhood traffic management is an attempt to control streets so as to meet real accessibility needs yet keep the traffic service function of these streets in perspective with the other considerations noted above.

Historical perspective

The evolution of techniques for managing traffic in residential neighborhoods has followed two separate but related paths. The first involves the design of street systems for newly developing areas; the second, and the main focus of this report, involves the techniques needed to compensate for defects in earlier designs.

By the 1920's adverse impacts of automobiles on the urban grid pattern street system first became noticeable. Although little was done to remedy problems on the grid streets themselves at that time, the typical suburban street pattern, with a network of high capacity arterials surrounding a set of discontinuous, curvilinear streets, evolved in reaction to the impacts of auto intrusion on grid street neighborhoods.

By 1929, Charles Perry had proposed the formation of "neighborhood units" within which schools, local streets and parks would be pro-

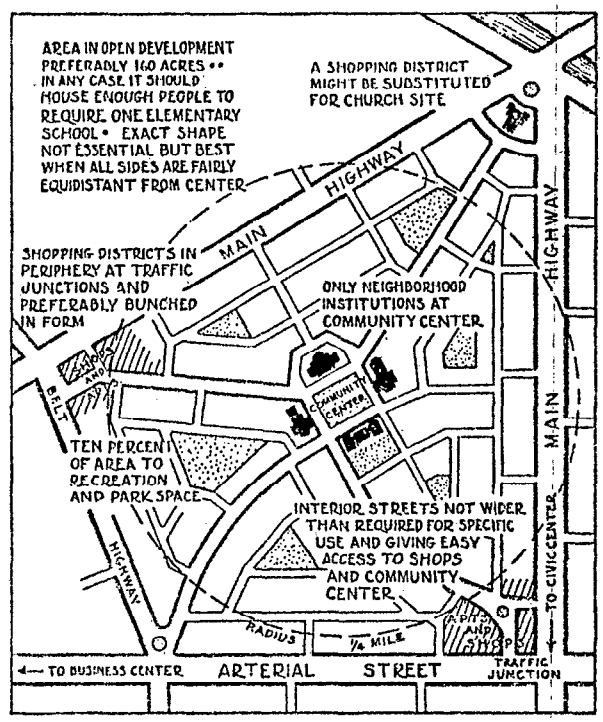
*Synonymous terms in the literature include "residential traffic restraint" and "neighborhood traffic control."

tected from through traffic that was to be confined to the periphery of the unit.[104]* "Children," said Perry, "should never be required to cross a main traffic street on the way to school. If for no other reason, streets of the residential area should rigorously exclude through traffic." Another reason for routing through traffic outside the neighborhood is to set bounds to the district, giving it a "clear identity in people's consciousness."

In the 1930's, subdivisions with long, curving streets were adopted on the grounds of safety, as well as visual relief. Conventional wisdom, expressed most influentially in the **Community Builder's Handbook**, advocated the neighborhood concept with no through traffic and a hierarchy of arterial, collector and minor (access) streets.[105] The minor streets were often cul-de-sacs or loops branching from long, curving collectors which had as few intersections as possible. Cities in general required these streets to be relatively wide, at least 26 feet for minor streets and 36 feet for collectors. Accident research demonstrated that three-way intersections were safer than four-ways and the former were advocated on minor streets.

But despite these concerns for safety, the economic and site constraints, and sometimes the city subdivision regulations did not ensure safety everywhere. The long, wide collectors and arterials encouraged high-speed travel, and as many as half the houses in many subdivisions are to be found on these high speed streets. Their residents have been as vociferous in their complaints about traffic as those in the inner city.

Techniques to deal with traffic problems in already constructed grid systems, as well as the newer subdivisions, have evolved more recently. In the late 1940's and early 1950's, Montclair, New Jersey and Grand Rapids, Michigan installed the first diverters and cul-de-sacs specifically retrofit to protect neighborhoods from through traffic. Other small projects, such as in Richmond, California, followed. At the same time, massive urban renewal projects in cities such as New Haven, Boston, Washington, D.C.



*Superscripts indicate bibliographic references alphabetically ordered and located at the conclusion of this report.

and San Francisco allowed cities to create superblocks with pedestrian cores and limited automobile access.

In 1964, the first significant planning guide to specifically address the traffic problem in residential areas was published. Colin Buchanan's **Traffic in Towns** proposed the creation of "environmental areas" in which the pedestrian would be dominant and through traffic excluded. These residential areas were deemed to have an "environmental capacity" which placed limits on the amount of traffic they could absorb. The Buchanan Report has led to residential area traffic limitation plans in several British, Canadian and Australian cities.

In the past decade, numerous isolated attempts aimed purely at traffic management have been made, some meeting with success and others failing. An early history of some of these efforts in Britain and California can be found in Appleyard's **Liveable Urban Streets.**[3] Current interest in the subject can perhaps best suggested by the over 1000 requests for the publication, "Recycling Streets," by Jack Sidener (1976), which presented graphical illustrations of various techniques for neighborhood traffic management.[75]

Purpose of this study

While the public has experienced accelerating sensitivity to problems caused by traffic intrusion in neighborhoods and has become increasingly conscious that they need not continue to accept it — that **something** can be done — there has been little sound guidance to traffic engineers and planners on specific control measures and how they work. Traffic engineering and planning guides for existing streets have traditionally focused upon techniques to increase capacity, and accessibility while maintaining and improving safety. Authoritative guidance on techniques to maintain and improve safety while **limiting** traffic speed, capacity and accessibility has been lacking. Though a substantial number of experiments have been made by local jurisdictions, there has been little effective communication of techniques and results.

Recognizing the void, the Federal Highway Administration has commissioned this study entitled **Improving The Residential Street Environment.** The study has these objectives:

- To identify and evaluate existing information on residential traffic management measures to improve the street environment
- To identify and assess community needs and community acceptability of residential area traffic management techniques
- To develop a manual providing guidelines for professionals and the community in the application of neighborhood traffic management techniques

Beyond these technicalities, the report has a philosophic objective. It is to convince traffic engineers that they have a professional role and responsibility relative to residential streets which is broad, not limited. Dealing with residential streets is a challenging task demanding application of very professional techniques and judgment. In the residential street context, traffic engineering means providing for the full range of residential street activities and functions, not just motor vehicles.

About this report

This "State-of-the-Art" report documents the range of neighborhood traffic management techniques currently attempted in the United States and abroad and, insofar as it is possible on the basis of existing information sources, evaluates the effectiveness of those techniques and the processes through which they were planned and implemented.

Two basic resources have been utilized in compiling this report: an international literature search, and contacts with professionals in jurisdictions across North America. Individuals contacted were persons whom the research team, through prior professional relationships or references, had reason to believe were actively undertaking traffic management experiments in their communities. The State-of-the-Art search has not involved a census or statistically

rigorous survey of ongoing traffic management actions in the United States. However, the sheer numbers of individuals contacted, the geographic distribution of jurisdictions in sharing data and experiences, all lend confidence that the information presented herein reasonably represents the current State-of-the-Art. The depth, breadth and consistency of data and experiences reported by these widespread and independent sources support this conclusion.

In this State-of-the-Art document the research team has attempted to go beyond simple presentation of the features of measures which have been tried. Instead, the attempt has been made to analyze successes and failures and the reasons for each, and to postulate elements of good neighborhood traffic management practices and pitfalls to be avoided. However, one of the unfortunate characteristics of the current State-of-the-Art is that communities normally collect very little data before traffic management implementations; and only rarely is data collected afterward. Evaluations of success or failure frequently involve few measurements of effects on traffic. Political decision making — whether the community accepts or rejects the device — is usually the primary criterion. If there are few or no further complaints, the device is judged successful. If there is strong public outcry, the device is often judged a failure and usually removed. In either case it is unusual for the responsible engineers or planners to devote much effort to measuring performance objectively since such data is so little used in the ultimate decision-making process.

As a result of this, though a rich body of experience in neighborhood traffic management has been found, there is a shortage of hard evaluative data upon which to draw firm and generalized conclusions. Fortunately, a small number of communities and organizations have devoted the time and effort to perform detailed evaluative studies which the research team has drawn upon heavily. And though, in many of the other cases, little hard evaluative data is available, parallelism in the results of similar cases and in the insights and experiences related by the professionals involved in them has made further judgments possible. But the reader must be cautioned that except where hard data is presented or referenced, findings and conclusions constitute the current best judgments of the authors based upon the research conducted to date.

What is to follow

This report is an early product of a comprehensive study of neighborhood traffic management. Over the next two years FHWA and the research team will be attempting to fill some of the gaps in knowledge about control of traffic in neighborhoods which have become evident in this State-of-the-Art review. This will be done through a series of case studies across the United States as well as by monitoring neighborhood traffic management activities in other American cities and abroad. The end product of the program will be a comprehensive manual on the planning and design of neighborhood traffic controls primarily intended for professionals but also useful to members of the community. This manual is scheduled to be available by Autumn, 1980.

Organization of the state-of-the-art report

Following this introductory chapter, Chapter 2 presents a discussion of residential street traffic issues and an overview of the current State-of-the-Art in neighborhood traffic management. Chapter 3 treats design details and performance evaluations of neighborhood traffic control devices and systems. Chapter 4 discusses the process through which communities plan for and implement neighborhood traffic management schemes, including the professional's role and the role of community participation. In Chapter 5, some in-depth details of further planning and design considerations are presented. A reference bibliography completes the main document and appendices provide additional details on community participation techniques, assessment measures for planning neighborhood traffic control and for organization of technical data.