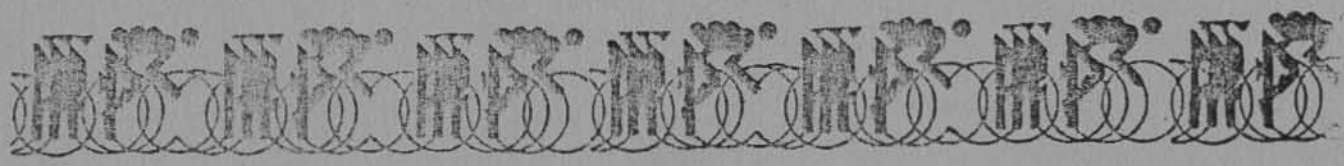
NIAGARA FRONTIER
BICYCLE MASTER PLAN



MARCH 1981

NFTC

NIAGARA FRONTIER TRANSPORTATION COMMITTEE

ENGINEERING
PLANNING
ENVIRONMENTAL
SERVICES

EDWARDS AND KELCEY

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March 27, 1981

Mr. Edward H. Small, Jr., P.E.
Staff Director
Niagara Frontier Transportation Committee
181 Ellicott Street
P.O. Box 5008
Buffalo, New York 14205

Subject: Niagara Frontier
Bicycle Master Plan

Dear Mr. Small:

Pursuant to the terms of our agreement for the subject project, we are pleased to submit herewith our report entitled, "Niagara Frontier Bicycle Master Plan". The Plan was developed to establish a comprehensive bicycle transportation system in Erie and Niagara and to provide a skeletal system that can tie together local bicycle facilities with major new development and transportation projects.

We thank you for the cooperation and help given by the Niagara Frontier Transportation Committee staff and for the opportunity to be of service to the Niagara Frontier Transportation Committee.

Very truly yours,

EDWARDS AND KELCEY

Walter H. Kraft

Walter H. Kraft, D.Eng.Sc.,P.E.
Executive Associate

THE NIAGARA FRONTIER BICYCLE MASTER PLAN

Prepared for the

NIAGARA FRONTIER TRANSPORTATION COMMITTEE

March, 1981

by

EDWARDS AND KELCEY

In Association With

EUGENE S. RICHARDS

ABSTRACT

The Niagara Frontier Bicycle Master Plan was developed to establish a comprehensive bicycle transportation system in Erie and Niagara Counties. Potential bicycle trip generators and bicycle demand corridors were identified along with major new developments, bicycle restricted roadways and abandoned railroad rights-of-way. Potential routes were evaluated based on selected criteria and assessed during actual field reconnaissance by bicycle. The selected routes were based on these evaluations in conjunction with other existing and committed bikeway projects and coordinated with major new development and transportation projects to produce a prioritized plan and implementation schedule. The Plan provides a skeletal system that can tie together local bicycle facilities. In addition, ancillary facilities, which include bicycle parking facilities, dual-mode facilities and other support facilities, were described as well as a bicycle program that discusses the physical, marketing, educational, and enforcement elements of a comprehensive program. Federal, state and local funding sources for bikeway facilities were also identified. Recommended policies are set forth regarding bicycle usage, future bikeway expansion, updating, and coordination of the Plan.

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I. INTRODUCTION

During the late 1960's and continuing through the 1970's, the people of the United States reacquainted themselves with the bicycle. Formerly considered a toy for children, or a means of transportation for eccentrics, the bicycle has emerged as a viable alternate mode of transportation. Bicycle sales have realized an increase of approximately 250 percent in the past 20 years and have outsold automobiles every year since 1972. Of greater significance is the increased portion of adult size bicycles being sold. In 1968, adult bicycles accounted for 26 percent of all sales, however, by 1977 adult bicycle sales accounted for 58 percent of all bicycle sales.

What makes the bicycle so desirable as an alternate mode of transportation? The most desirable characteristic of the bicycle is probably that, unlike the car, it is propelled by human power instead of gasoline and thereby reduces our consumption of fuel. Consequently, an added benefit is derived, that is, it does not pollute the air with carbon monoxide, hydrocarbons or oxides of nitrogen.

In a report[1] it was noted that 110 British Thermal Units (BTU's) are required to ride a bicycle for one mile as compared to 500 BTU's per mile required for walking. Approximately 6,250 BTU's per mile are required for an automobile with a fuel use of 20 miles per gallon. In other words, on an equivalent amount of energy it is possible to travel five times further by bicycling than by walking and 50 times further by bicycling than by auto.

The bicycle, because of its energy saving characteristics, has been recognized as a viable alternative mode of transportation especially for trips of five miles or less. In fact, in a recently published report[2] by the U.S. Department of Transportation, the Secretary of Transportation stated:

> "Implementation of the Comprehensive Bicycle Transportation Program will not only result in substantial benefits in terms of energy conservation from increased use of bicycles for transportation, but also increased transportation system efficiency, air quality improvements, and enhanced individual health and fitness."

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[1] Edwards and Kelcey, Bikeway Planning and Policy Guidelines for New York City, U.S. Department of Transportation, Urban Mass Transportation Administration, July, 1978.

[2] U.S. Department of Transportation, Office of the Secretary, Bicycle Transportation for Energy Conservation, Washington, D.C., April, 1980.

As bicycle usage increases so do bicycle accidents. Bicycle accident statistics for Erie and Niagara Counties are depicted in Figure 1 for 1977 and 1978. The 14 bicycle fatalities in 1978 for both counties accounted for nearly 24 percent of the 59 bicycle fatalities in the state. A distribution of bicycle accidents by age group for 1978 is presented in Figure 2. The figure indicates that the majority of accidents occur in the 10-14 and 15-19 age groups for both counties. As a result, the State Safety Education Unit has been directed to intensify efforts to train teachers in administering bicycle safety education within the school systems in the two counties.

Another factor often cited during discussions of bicycle usage involves area weather conditions. Because cyclists vary in enthusiasm and tolerance with temperature fluctuations, there are no set criteria for estimating when a cyclist will or will not ride. Some local data[3] may be useful though, in helping one determine just what is a reasonable bicycling season in Buffalo.

Precipitation is fairly evenly divided throughout the year, averaging approximately 3 inches per month. Due to the stabilizing effects of Lake Erie, thunderstorms are relatively infrequent. Snowfall for the month of April averages 3.3 inches, for May 0.1 inch, and for October 0.3 inch. The area is usually frost-free until mid-October. From April to October, the average daily high temperature is above 50^{o} F. The average daily low is below 32^{o} F only for the months spanning December to March. This seems to suggest that April to October is a reasonable period for bicycling, which coincides with the bicycle user survey results performed during the course of this study and available under separate cover.

In response to increased bicycle use, numerous bicycle studies, programs and demonstration projects have resulted in the realization of bicycle networks throughout this country. This includes existing bikeway systems in areas with climate conditions similar to the Niagara Frontier: the Boston Bikeway Network in Massachusetts; the Madison Bikeway in Wisconsin; and the Mercier Network in Montreal, Canada. These networks or systems may be categorized into the following three types:

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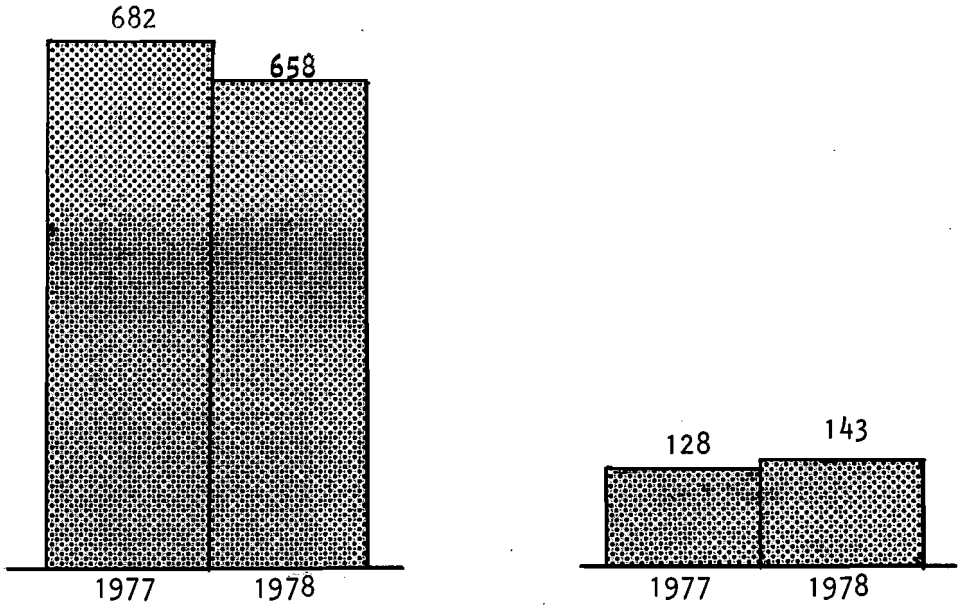
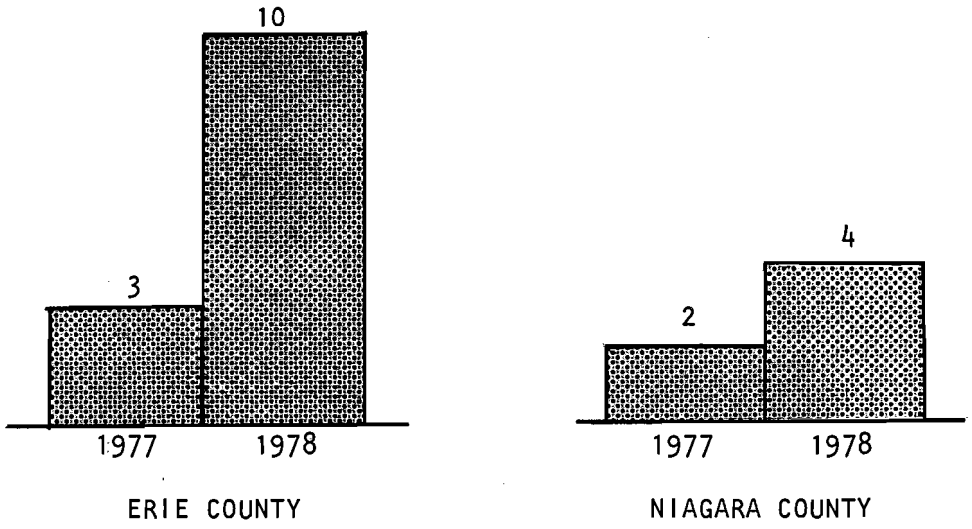
[3] Local Climatological Data-Buffalo, New York; Annual Summary, National Oceanic and Atmospheric Administration, Environmental Data and Information Service, 1979.

A. ACCIDENTS

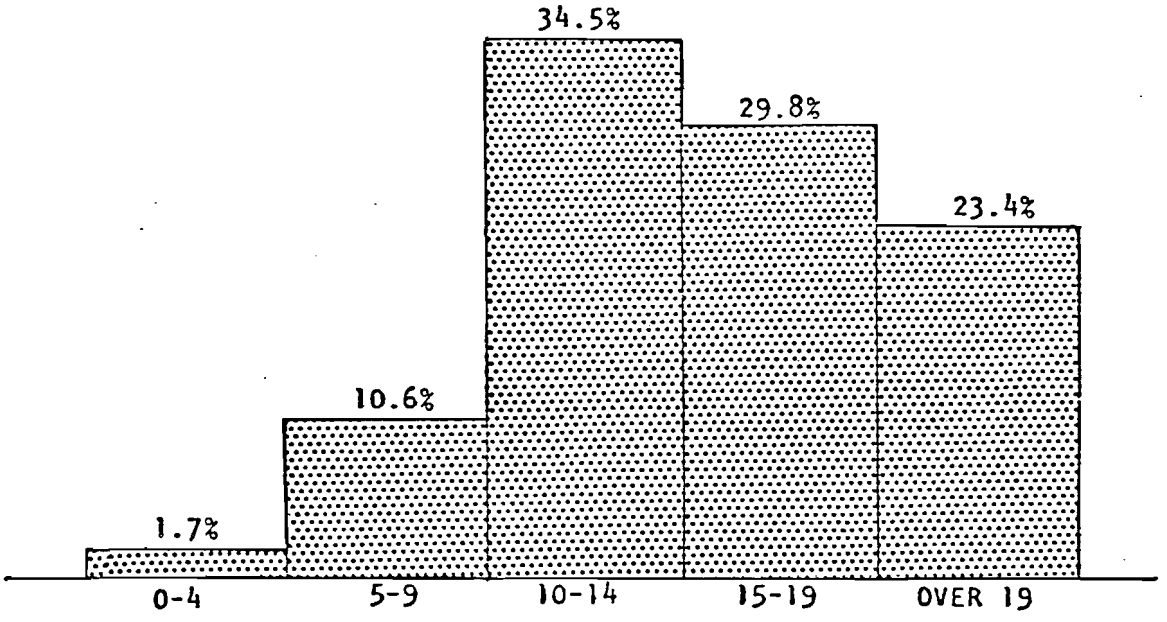


B. FATALITIES

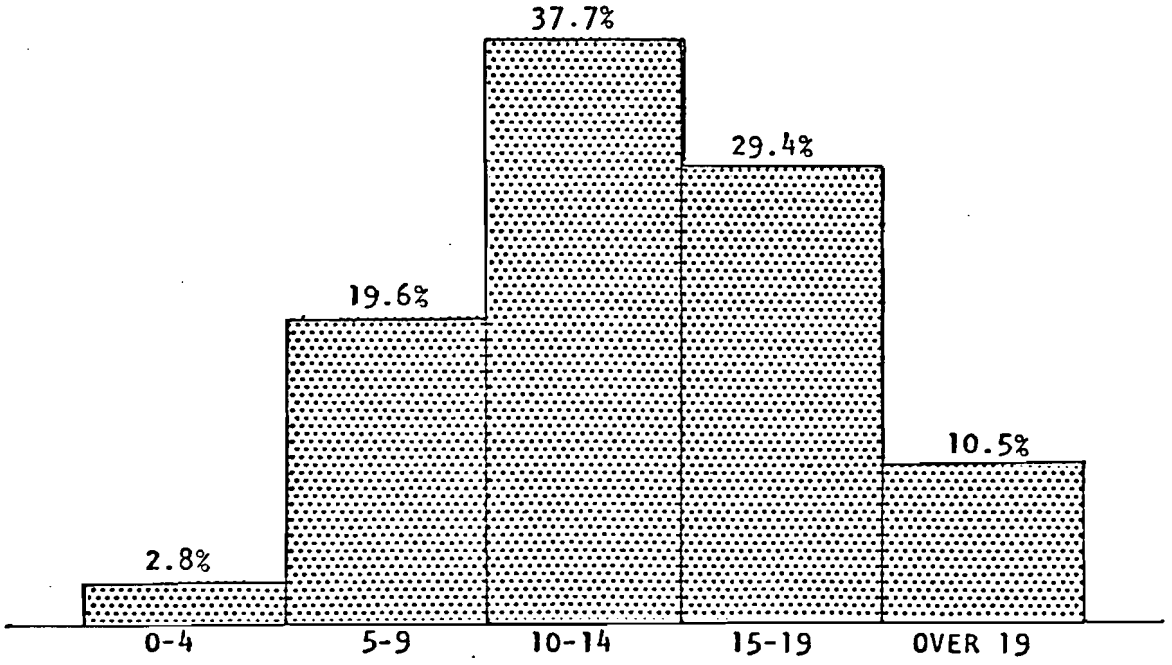


SOURCE: State of New York Department of Motor Vehicles
Summary of Motor Vehicle/Bicycle Accidents,MV-144A

1977 and 1978 BICYCLE ACCIDENTS/FATALITIES



A. ERIE COUNTY



B. NIAGARA COUNTY

SOURCE: State of New York Department of Motor Vehicles Summary of Motor Vehicle Accidents MV - 144 A (01/79).

1978 BICYCLE ACCIDENTS BY AGE GROUP

- **Utilitarian Systems** are used mainly for work, school and shopping trips. These types are characterized by directness and efficiency with respect to time and energy.

- **Recreational Systems** are used for pleasure trips and are characterized by attractiveness and scenic routes; time is not usually a factor.

- **Combination Systems** are used for both utilitarian and recreational trips.

The Niagara Frontier Transportation Committee (NFTC) was formed to permanently establish a regional, decision-making forum for transportation planning and development to meet changing needs. As the Metropolitan Planning Organization (MPO) for the study area, it shares responsibility with the State to cooperatively develop transportation plans and programs that ensure an adequate, coordinated transportation system to serve the Niagara Frontier. The NFTC recognizes the lack of bicycle facilities and the need for a comprehensive bicycle plan/program. In order to address those needs, the NFTC decided to produce this bicycle master plan.

The plan was developed by a consulting firm with expertise in the bicycling field under the direction of the NFTC's staff. Local participation was evident throughout the development of the plan via the active involvement of a bicycle subcommittee consisting primarily of local bicycle users. Local officials/planners also provided input to the plan.

The objective of the Niagara Frontier Bicycle Master Plan is to develop a planning, design, and implementation framework for establishing a comprehensive bicycle transportation system in Erie and Niagara Counties which would:

1. Foster greater safety using current design and locational criteria.
2. Integrate the bicycle with other modes of transportation to afford greater versatility and usage of the bicycle.

3. Identify funding sources on the federal, state and local levels.

4. Develop and prioritize an implementation plan for bicycle facilities.

The Niagara Frontier Transportation Committee's bicycle goals and objectives considered in the development of the plan are:

1. **Increase the Safety of Cyclists**

   a. Identify high accident potential areas or situations.
   b. Improve bicycle facility and equipment standards.
   c. Improve intersection safety for bicyclists.
   d. Improve street maintenance for Class II and III facilities and perform diligent upkeep of Class I routings. Encouraging restrictions on "no-deposit" bottles would be helpful.
   e. Improve signing and marking of all bikeways.
   f. Educate bicyclists and motorists as to rules and rights of the road.
   g. Encourage effective enforcement of laws on both bicycle and motor vehicle operation.
   h. Improve accident reporting to illuminate contributing factors.
   i. Modify or replace unsafe parallel bar sewer grates.

2. **Provide Services that Advance Bicycling as a Realistic Transportation Alternative**

   a. Identify major generators and corridors, and areas of potential use.
   b. Increase accessibility to activity centers.
   c. Provide for an integrated and continuous regional system.
   d. Coordinate with other transportation modes.
   e. Include bikeways in all future planning projects.

3. **Provide a Focal Point for Coordinated Bicycle Planning Activities**

   a. Assess local areas as to bikeway development potential including utility rights-of-way, railroad abandonments with preferential rights and natural corridors.
   b. Provide guidelines to decision makers at all levels for planning, designing, implementing and evaluating bicycle facilities.
   c. Identify possible funding sources.
   d. Provide guidelines for developers, including subdivision requirements/recommendations.

4. **Increase Security**

   a. Reduce the likelihood of theft/improve the chances of recovery of stolen bicycles, possibly through better identification techniques and police enforcement.

b. Increase and improve the number of parking facilities.
c. Include storage facilities in all future planning projects.
d. Cite locations of transfer points and activity centers for storage facility allocation.
e. Provide a two-county computerized registration program.

II. IDENTIFICATION OF DEMANDS AND OPPORTUNITIES

Major factors considered in the overall planning process for the bicycle master plan included areas of demand for bicycle travel, bicycle system opportunities and constraints, and possible facility types. Review of the above factors in addition to input from local bicycle users led to the development of the potential routes.

II.1 DEMANDS

The identification of existing and potential bicycle trip patterns and desires was accomplished by mapping locations of bicycling activity. Potential travel demands were identified by reviewing travel data from the continuous transportation planning technical processes and determining those locations that generate bicycling activity.

II.1.1 Existing Generators

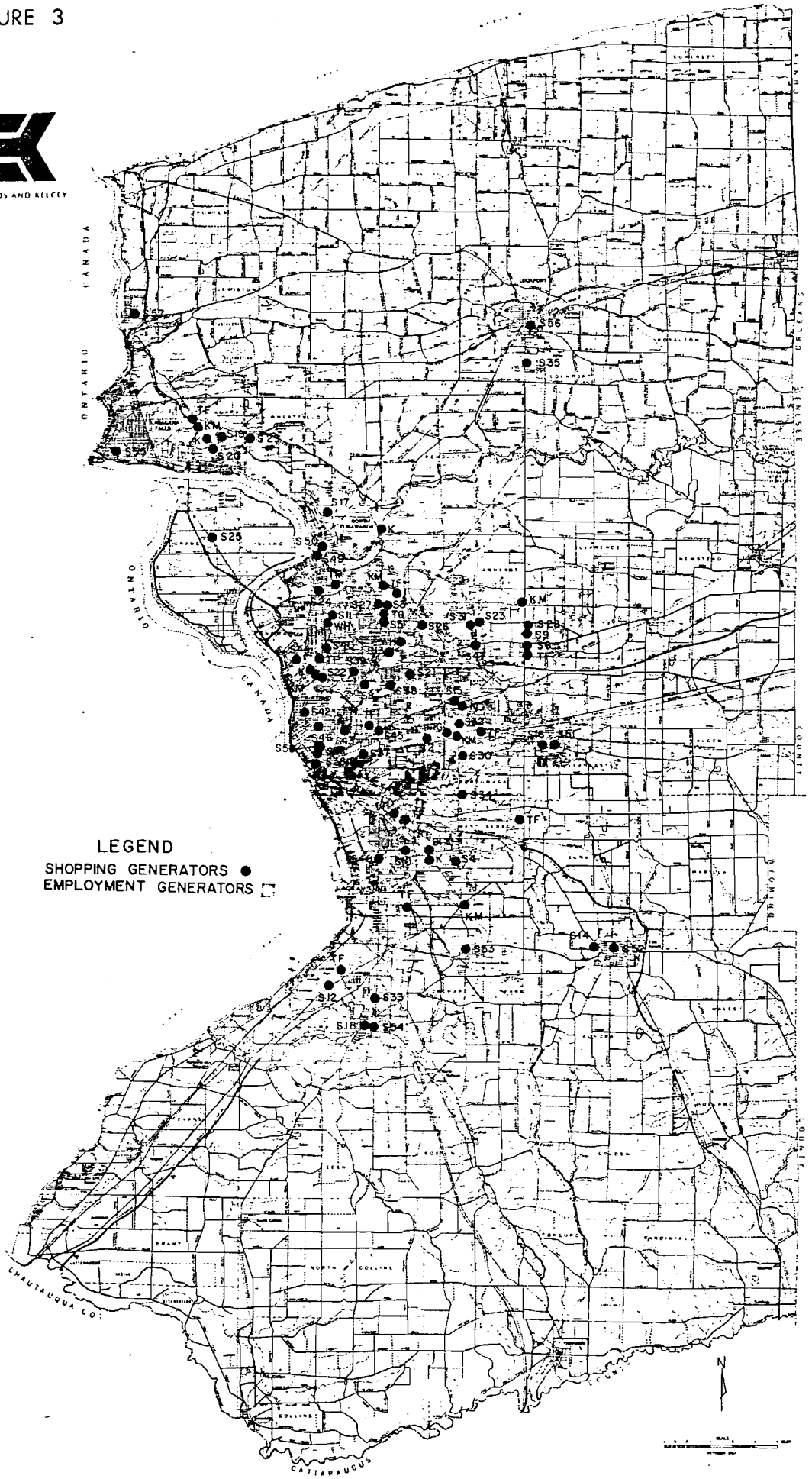
The types of existing bicycle travel generators considered were:

- Shopping centers such as major shopping plazas and malls, conventional shopping areas (which, in some cases, correspond to central business districts), and large free standing stores; and major employment areas that include transportation analysis zones with 1000 or more employment trips based on post-2000 projections. These generators are identified in Figure 3 and listed in Table 1.
- College/University campuses and recreational areas that include state, county, and municipal parks as depicted in Figure 4 and listed in Table 2.

II.1.2 Future Generators

Major new developments that were considered as future bicycle trip generators, and/or areas where the demand for bicycle facilities are thus likely to increase, include:

FIGURE 3



SHOPPING AND EMPLOYMENT GENERATORS

TABLE 1

LEGEND FOR SHOPPING GENERATORS

Major Plazas and Malls

*S1	Seneca Mall	*S19	Mil-Pine Plaza
*S2	Thruway Mall	S20	Pine Plaza
*S3	Boulevard Mall	S21	Cleve Hill Plaza
*S4	Southgate Plaza	S22	Delaware Park Plaza
*S5	Northtown Plaza	S23	Georgetown Square Plaza
*S6	Transit Town Plaza	S24	Del Ton Plaza
*S7	Main Place Mall	S25	Grand Island Plaza
S8	Central Park Plaza	S26	Sheridan-Harlen Plaza
*S9	Clarence Mall	S27	Marvin Gardens Plaza
S10	Abbott Road Plaza	*S28	Eastern Hills Mall
S11	Sheridan Plaza	*S29	Summit Park Mall
S12	Southshore Plaza	*S30	Como Mall
*S13	University Plaza	S31	Evanstown Plaza
S14	Aurora Village Plaza	S32	George Urban & Union Plaza
S15	Airport Plaza	S33	Town Hall Plaza
S16	D & L Plaza	S34	Garden Village Plaza
S17	Mid-City Plaza	*S35	Lockport Mall
S18	Hamburg Shopping Center		

* Identified as Higher Priority Facility by the Bicycle Subcommittee

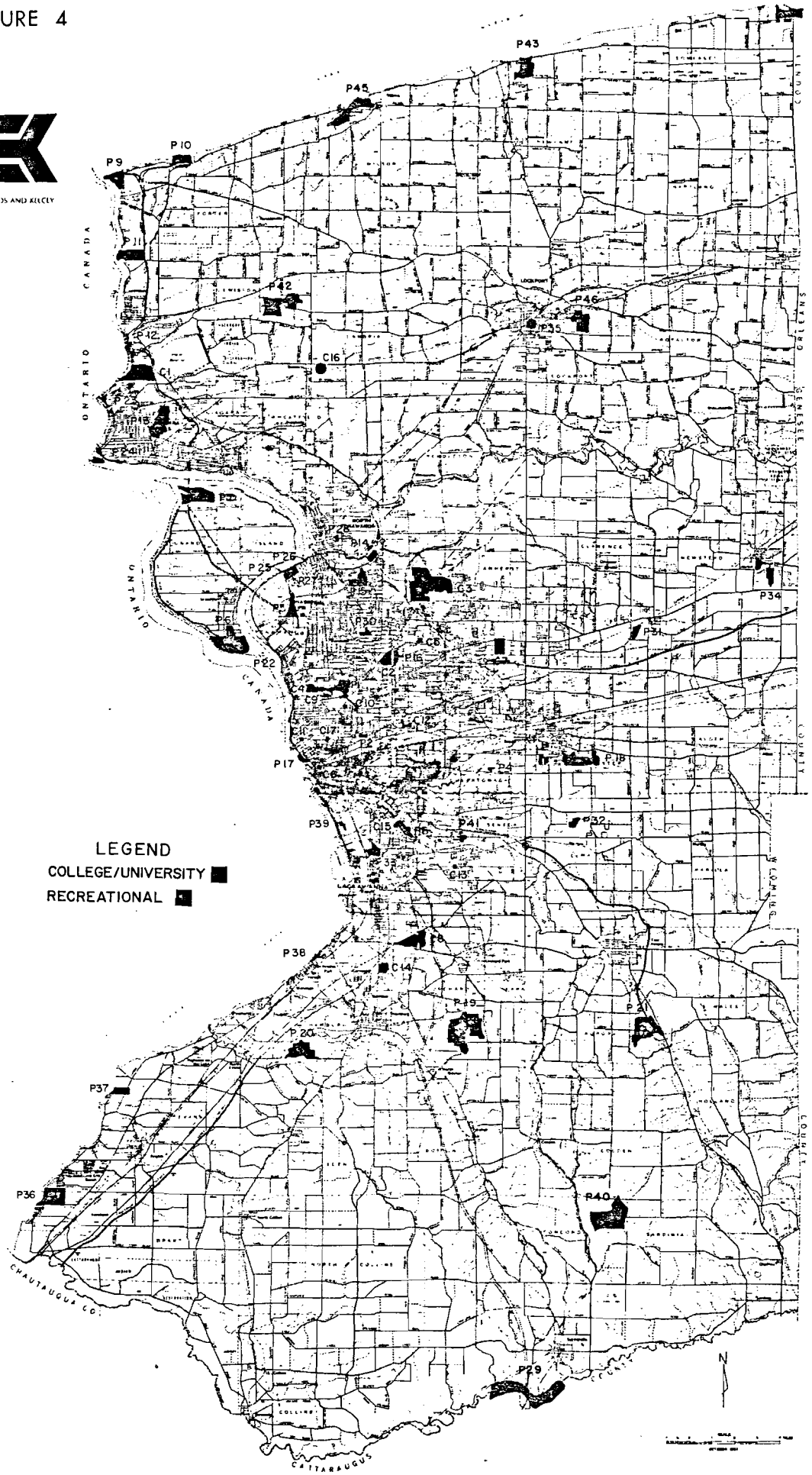
Conventional Shopping Areas

S36	Downtown Buffalo	S47	Main Street in Williamsville
S37	Broadway-Fillmore	S48	Ridge Road in Lackawanna
S38	Bailey-Kensington	S49	Tonawanda City
S39	Hertel-Parkside	S50	North Tonawanda City
S40	Delaware Avenue in Kenmore	S51	Lancaster Village
S41	Seneca-Cazenovia	S52	East Aurora Village
S42	Grant-Ferry	S53	Orchard Park Village
S43	Jefferson-Utica	S54	Hamburg Village
S44	Tonawanda-Ontario	S55	Downtown Niagara Falls
S45	Genesee-Moselle	S56	Downtown Lockport
S46	Elmwood-Utica	S57	Lewiston Village
		S58	Allentown

Free Standing Stores

TF - Twin Fair
WH - Wm. Hengerer Co.
K - Kings
KM - K-Mart
TG - Two Guys

FIGURE 4



COLLEGE/UNIVERSITY
AND RECREATIONAL GENERATORS

TABLE 2

LEGEND FOR COLLEGES/UNIVERSITIES

*C1	Niagara University
*C2	SUNY (Main Campus)
*C3	SUNY (Amherst Campus)
*C4	Buffalo State College
C5	Daeman College
C6	Erie Community College - City Campus
C7	ECC - North Campus
C8	ECC - South Campus
C9	Medaille College
C10	Canisius College
C11	D'Youville College
C12	Villa Maria College
C13	Houghton College
C14	Hilbert College
C15	Trocaire College
C16	Niagara County Community College
C17	Bryant and Stratton Institute

LEGEND FOR RECREATIONAL AREAS

*P1	Delaware Park
*P2	Humbolt Park
*P3	Schiller Park
*P4	Cheektowaga Town Park
*P5	Sheridan Park
*P6	Beaver Island State Park
*P7	Buckhorn Island State Park
*P8	Cazenovia Park
*P9	Fort Niagara State Park
*P10	Four Mile Creek State Park
*P11	Joseph Davis State Park
*P12	Lewiston State Park (Art Park)
*P13	Hyde Park
*P14	Ellicott Creek Park
*P15	Brighton Park
*P16	Grover Cleveland Park
*P17	LaSalle Park
*P18	Como Lake Park
*P19	Chestnut Ridge Park
*P20	Elghteen Mile Creek Park
*P21	Emery Park
P22	Riverside Park
P23	Whirlpool State Park
*P24	Niagara Reservation[1]
P25	Isle View Park
P26	Nia-Wanda Park
P27	Veterans Memorial Park
P28	Sweeney Park
P29	Zoar Valley
P30	Lincoln Park
P31	Clarence Town Park
P32	Elma Town Park
P33	South Park
P34	Akron Falls Park
P35	Kenan Center
P36	Evangola State Park
P37	Wendt Park
P38	Hamburg Park
P39	Tifft Farm
P40	Sprague Brook
P41	Centennial Park
P42	Bonds Lake
P43	Krull Park
P44	Golden Hill State Park
P45	Wilson-Tuscarora State Park
P46	Niagara County Park and Golf Course

*Identified as Higher Priority Facility by the Bicycle Subcommittee

[1]Includes Goat Island, Niagara Falls, and Prospect Parks

- The developing Audubon New Community in the town of Amherst.

- The Waterfront Development in the City of Buffalo which will include a new hotel, office buildings, additional commercial activities and a new residential development.

- The Riverwalk from downtown Buffalo to the Niagara County line along the Niagara River. The portion of the Riverwalk in the City of Buffalo is under construction, whereas the other portion in the Town and City of Tonawanda is in the planning stage.

- The Light Rail Rapid Transit (LRRT) on Buffalo's Main Street from Memorial Auditorium, 6.4 miles northeasterly, to the South Campus of the State University of New York at Buffalo.

- Lockport Expressway (I-990), five miles of new expressway in Amherst, from I-290 to NY263 to serve the new Amherst campus of the State University of New York and the Audubon Community.

- Ransom Oaks - a residential development.

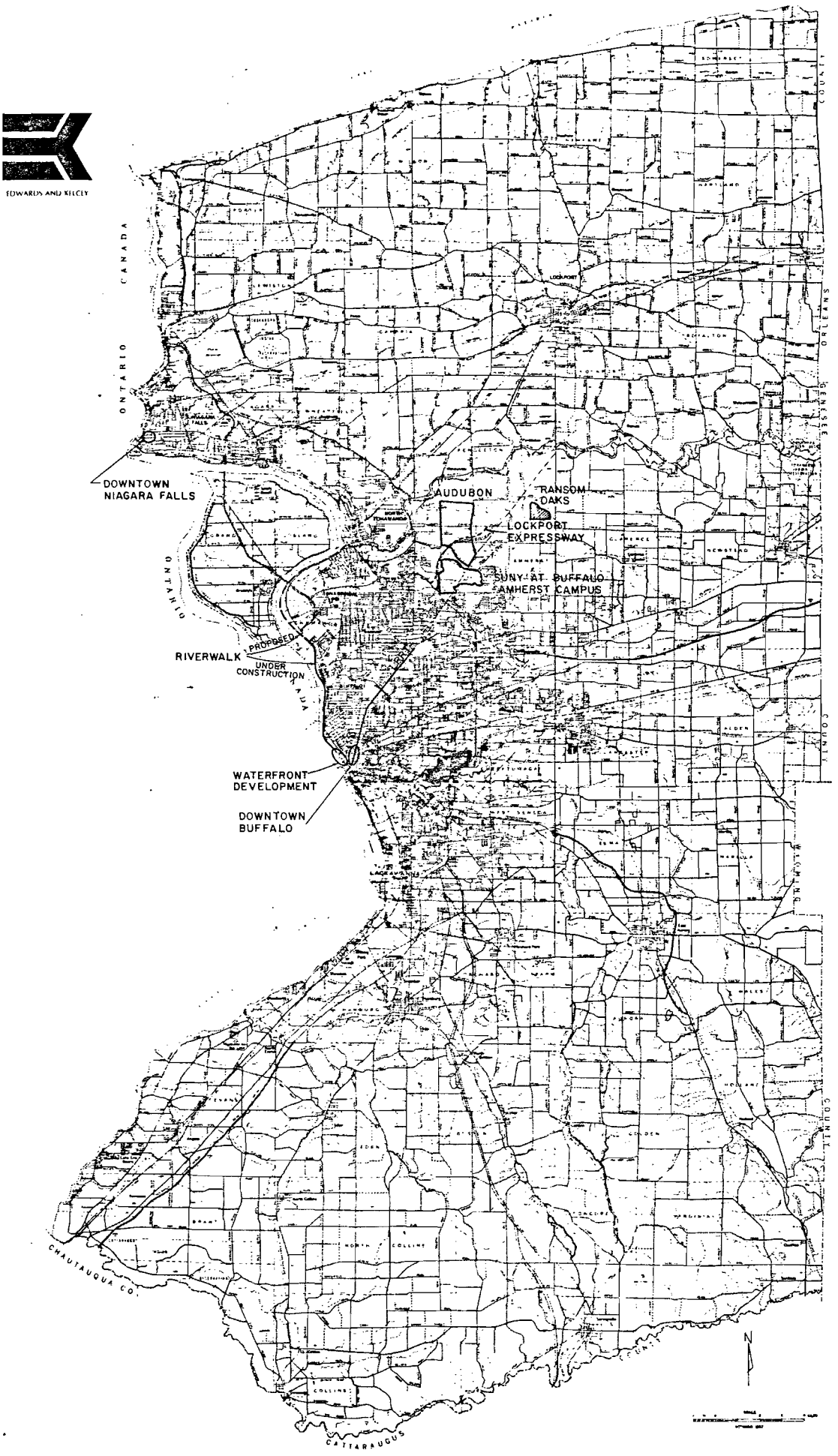
- State University of New York at Buffalo - Amherst Campus.

- Downtown Niagara Falls which includes the Niagara Falls International Transportation Center.

- Downtown Buffalo.

Both downtown Niagara Falls and downtown Buffalo were included in this listing of major new developments because of the substantial revitalization in these areas and subsequent increased activity. The major new developments are depicted in Figure 5.

FIGURE 5



MAJOR NEW DEVELOPMENTS

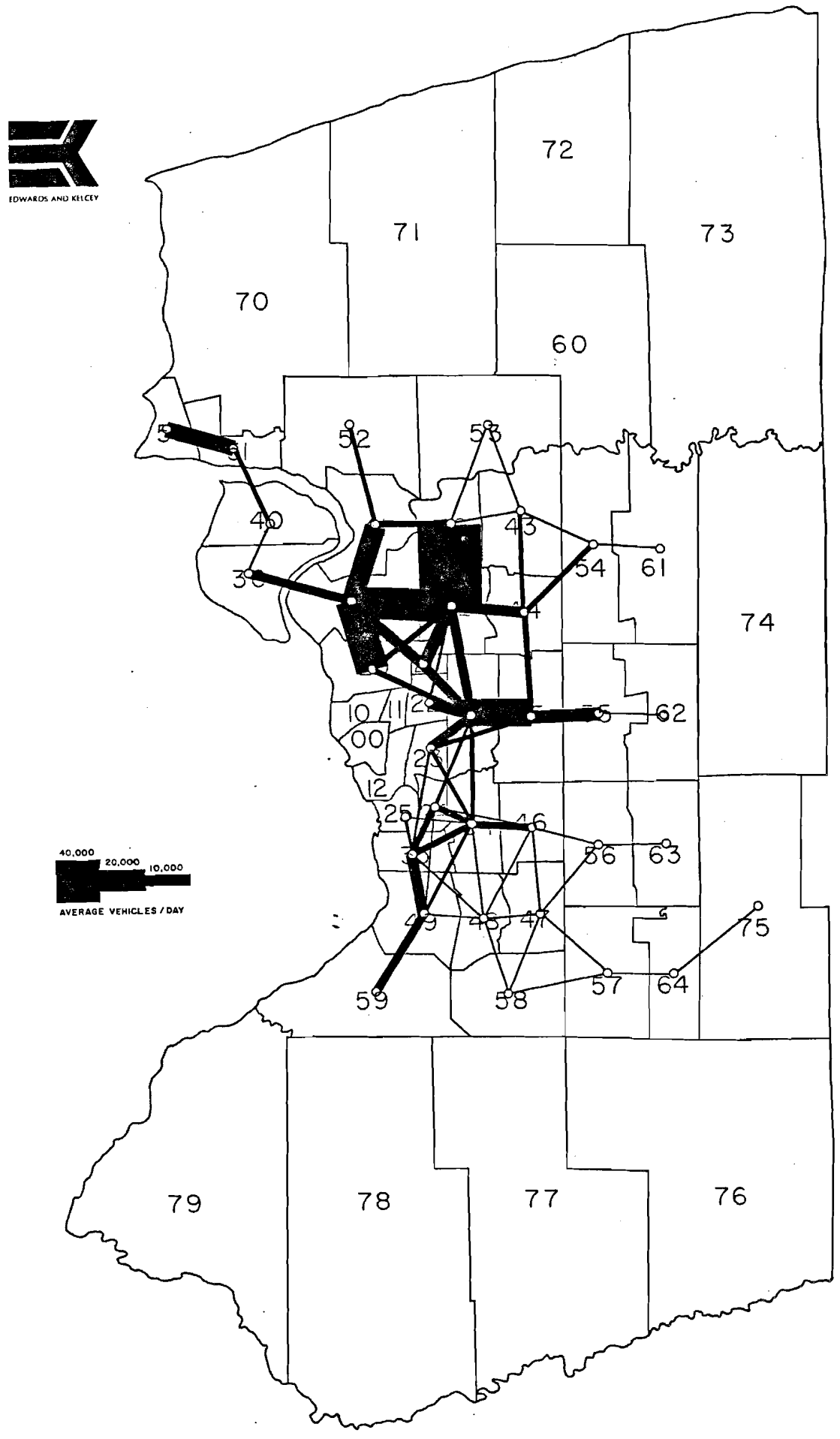
II.1.3 Potential Trip Corridors

The potential corridors of the bikeway system were developed with the intention of providing continuity, linking existing and future generators, and comparing travel demands with corridor opportunities and constraints. These corridors were defined as either utilitarian or recreational primarily because of differences in trip purpose and trip lengths. Utilitarian corridors serve the residential (home) to employment (work) trips, whereas the recreational corridors link recreational and scenic areas. Utilitarian trips were considered to be five miles or less in length; however, recreational trips could be much longer.

An estimate of potential utilitarian trips was made based on the projected number of trips between districts which were within five miles of each other. These estimates were based on data supplied by the New York State Department of Transportation's Traffic Simulation System, a computer modeling system which estimates travel patterns and volumes. Trips of five miles or less were identified by assigning centroids to the districts and then plotting the number of trips between districts whose centroids were within the five mile range as shown in Figure 6. These represent the utilitarian travel demands. Intra-district trips (i.e., those that begin and end in the same district) were not included because the information was not available. However, these trips are generally considered local in nature and would for the most part be very short trips on the local residential streets or would use these local streets to access the same corridors described for longer trips.

Recreational trips are typically longer than utilitarian trips because there is usually no time constraint and the trip itself is for sight seeing or touring. The recreational travel demands were developed based on consideration of scenery and aesthetics, and on a logical connection of longer links to the various state and municipal parks as shown in Figure 7.

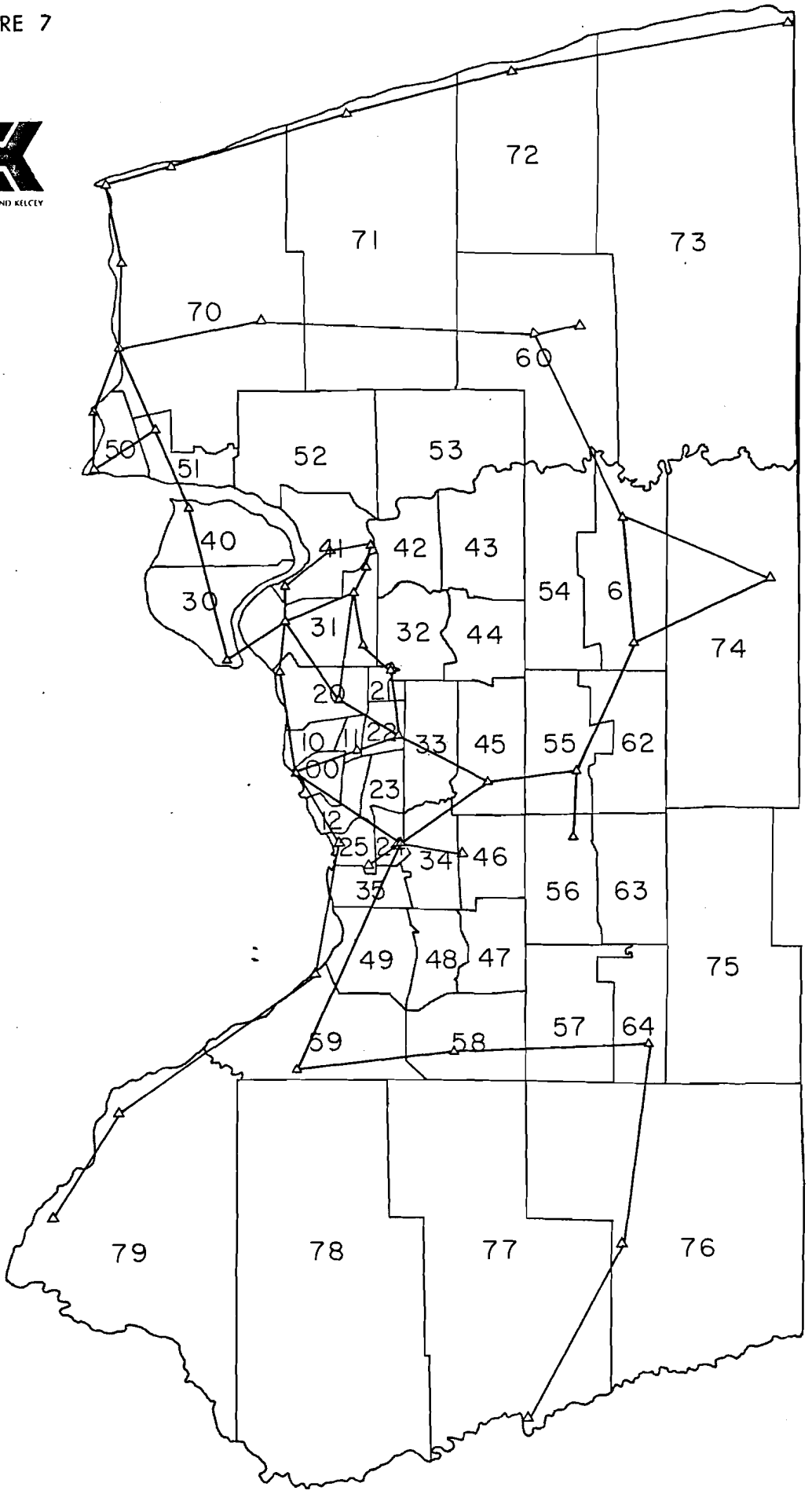
FIGURE 6



UTILITARIAN TRAVEL DEMANDS

FIGURE 7

EDWARDS AND KELCEY



RECREATIONAL TRAVEL DEMANDS

The combination of the utilitarian and recreational travel demands resulted in the total demand corridors as shown in Figure 8. These corridors represent the general areas for which the bicycle system is designed. Actual routes of the final plan were selected from these corridors based on selected locational criteria. A preliminary classification of the demand corridors is outlined in Table 3.

The definitions of these classifications are as follows:

A transportation linear corridor serves utilitarian trips and provides bikeway facilities that parallel major transportation corridors such as freeways, toll roads, and transit routes.

An environmental linear corridor serves recreational trips and provides scenic bike routes along stream valleys, ridge lines, and other such scenic attractions.

A penetrator system serves to provide access into trip generator areas.

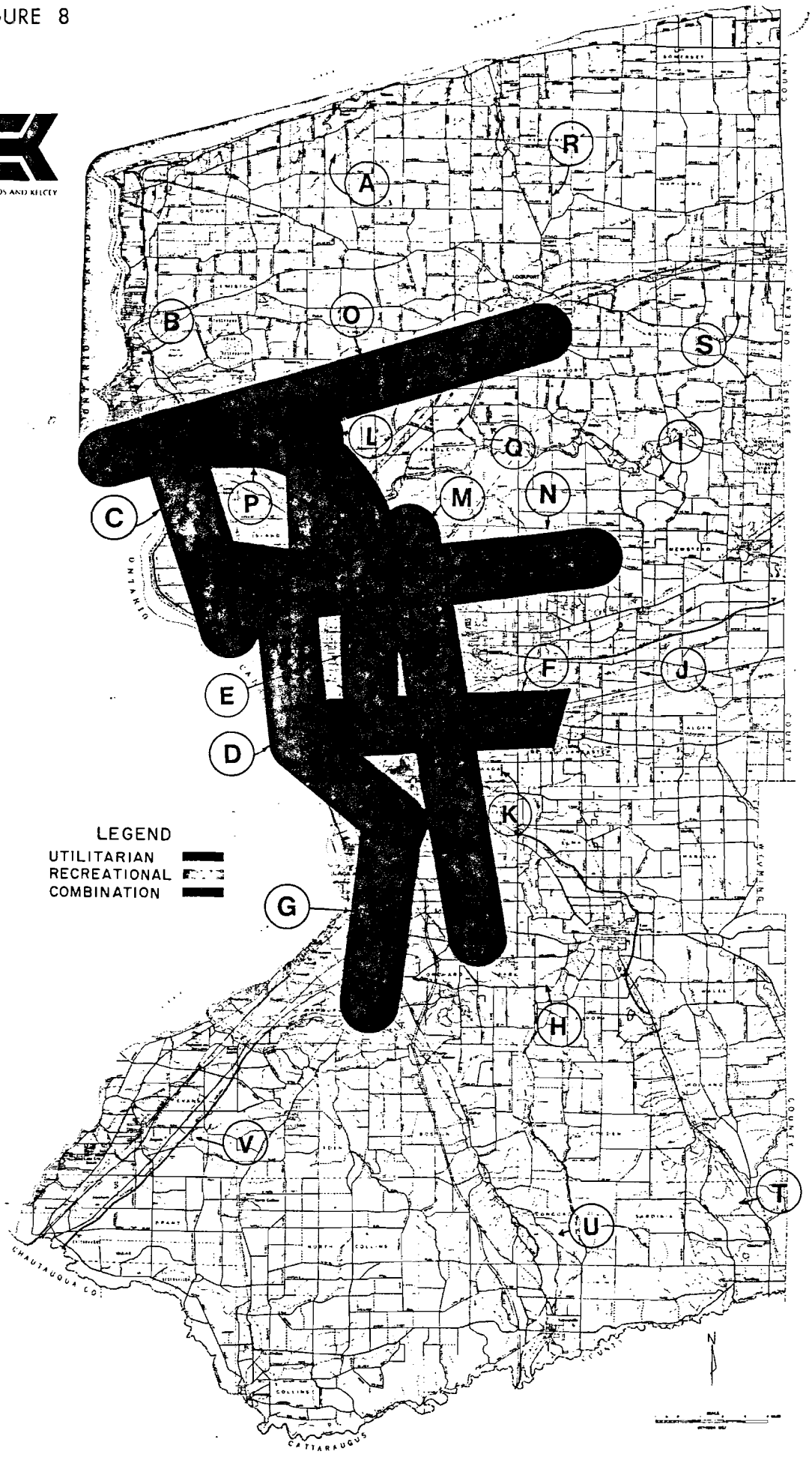
New land developments serve both utilitarian and recreational trips and provide bikeway facilities separate from transportation corridors in newly developed areas.

An internal system serves both utilitarian and recreational trips and provides a bikeway network within a contained or specified area such as colleges, universities, parks and recreational areas.

A recreational loop system serves recreational trips and provides a signed loop system on low-volume streets.

As a rule, more emphasis was generally placed on demand corridors classified as linear, rather than loop or internal.

FIGURE 8



DEMAND CORRIDORS

TABLE 3

CLASSIFICATION OF DEMAND CORRIDORS

Corridor	Classification	Purpose	Description
A	Environmental Linear	Recreational	Lake Ontario Shoreline
B	Environmental Linear	Recreational	Niagara River shoreline north of Niagara Falls
C	Transportation Linear	Combination	From Niagara Falls through Grand Island
D	Transportation Linear	Combination	From So. Toll Bridge through Buffalo along western shore
E	Penetrator	Combination	From North Tonawanda to Buffalo
F	Transportation Linear	Combination	From Lancaster to Downtown Buffalo
G	Transportation Linear	Combination	From Hamburg to Buffalo
H	Environmental Linear	Recreational	From Hamburg to East Aurora
I	Environmental Linear	Recreational	From Lockport to Akron
J	Environmental Linear	Recreational	From Clarence to East Aurora
K	Environmental Linear	Recreational	From Lackawanna to Cheektowaga
L	Penetrator	Utilitarian	From Wheatfield to North Tonawanda
M	Transportation Linear	Utilitarian	From Amherst to Orchard Park
N	Penetrator	Utilitarian	From Clarence to Tonawanda
O	Penetrator	Combination	From Niagara Falls to Lockport
P	Penetrator	Combination	From Niagara Falls to North Tonawanda
Q	Environmental Linear	Recreational	From North Tonawanda to Lockport
R	Environmental Linear	Recreational	From Olcott to Lockport
S	Environmental Linear	Recreational	From Middleport to Lockport
T	Environmental Linear	Recreational	From East Aurora to Sardinia
U	Environmental Linear	Recreational	From Orchard Park to Springville
V	Environmental Linear	Recreational	From Hamburg to Angola

II.2 OPPORTUNITIES

There are certain opportunities for bicycling and bicycle facilities. One example is the entire highway system, exclusive of expressways. Converting abandoned railroad and utility rights-of-way into bikeway facilities is another opportunity with tremendous potential. Figure 9 and Table 4 depict inactive railroad rights-of-way and proposed railroad abandonments in the Buffalo area as surveyed by the NFTC staff. These abandoned rights-of-way represent potential separate facilities (bike paths). The highway system represents potential locations of shared facilities such as bike lanes or bike routes. Detailed descriptions of facility types is provided in Section II.4.

II.3 SYSTEM CONSTRAINTS

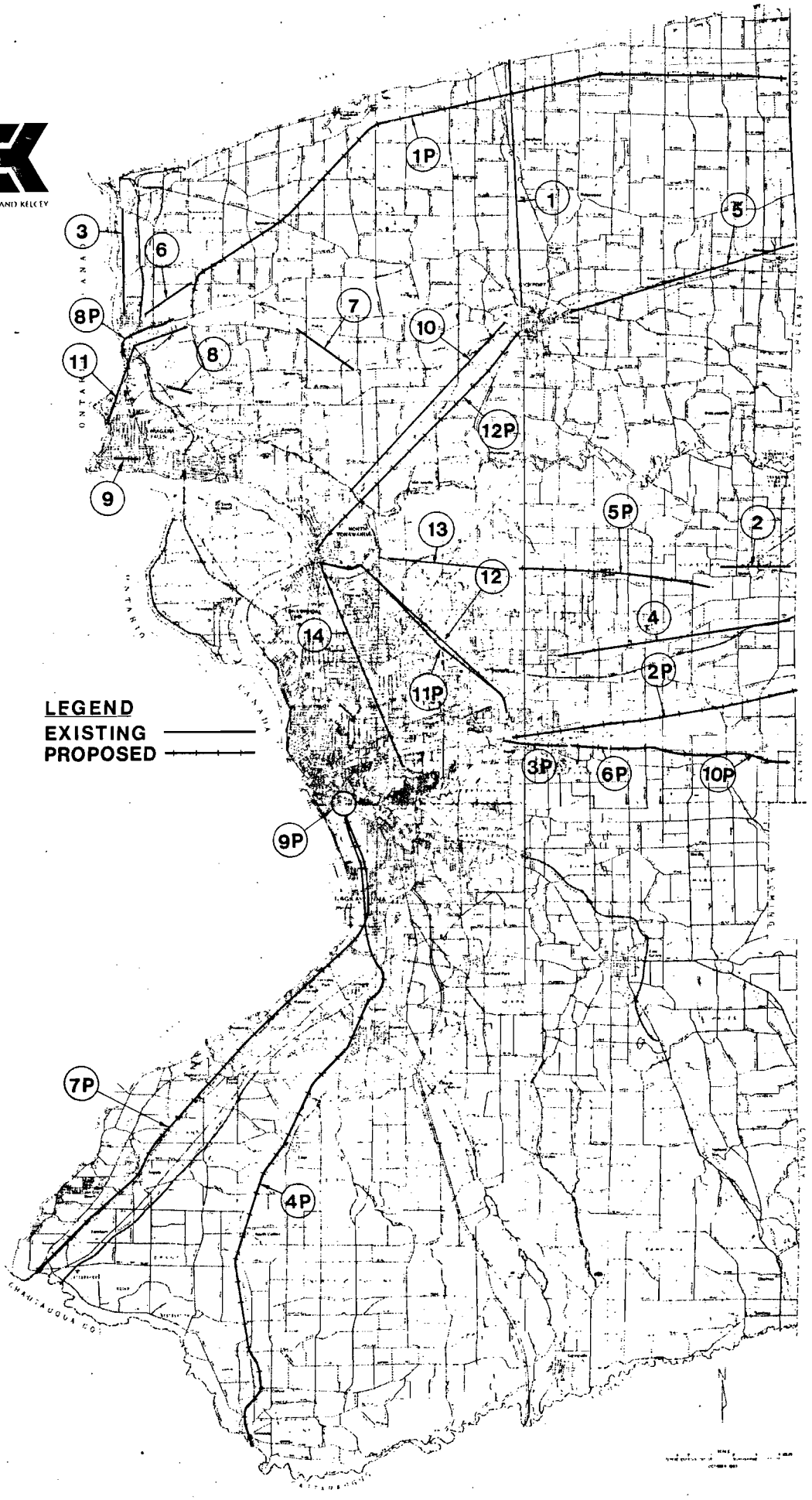
Within the study area, there exist facilities which by law prohibit bicycle usage. These facilities usually exhibit high vehicular volumes and speeds, and may be difficult and dangerous for a cyclist to use. These bicycle prohibited roadways include:

I-90	NYS Thruway
I-190	NYS Thruway (Niagara Section)
I-290	Youngmann Highway
NY 5	Skyway (South Buffalo)/Father Baker Bridge
NY33	Kensington Expressway (Airport to Buffalo CBD)
NY 198	Scajaquada Expressway (NY33 to I-190) (Buffalo)
NY 179	Milestrip Expressway (NY 5 to I-90 - Hamburg)
NY 400	Aurora Expressway (I-90 to NY 16 - Southtowns)
US 219	Southern Expressway (I-90 to So. Erie Co.)

Robert Moses Parkway (I-190/LaSalle Expressway (Niagara Falls) to Youngstown)

LaSalle Expressway (Robt. Moses Parkway/I-190 to NY 384 - Niagara Falls)

FIGURE 9



EXISTING AND PROPOSED RAILROAD ABANDONMENTS

TABLE 4

EXISTING AND PROPOSED RAILROAD ABANDONMENTS

EXISTING

1. Old International Railway Company (IRC) Line (Lockport & Olcott)
2. Peanut Line Extension (AKRON)*
3. Lewistown-Youngstown Railroad
4. Old Erie Railroad (Eastern Erie County)
5. Rochester, Lockport and Buffalo (R, L, & B) (Lockport - Middleport)
6. New York Central (NYC) (Lewiston Area)
7. Pekin Spur
8. Power Reservoir (Niagara Falls)
9. Buffalo Avenue Extension (Niagara Falls)**
10. Penn Central (Lockport - North Tonawanda)
11. Penn Central (Lewistown - Niagara Falls)
12. Conrail (Williamsville - North Tonawanda Junction)**
13. Peanut Line (Amherst)
14. IRC (Kenmore to North Tonawanda)

PROPOSED

1. Penn Central, Hojack Line, Charlotte to Model City, 72.9 miles
2. Lehigh Valley, Main Line, Niagara Junction to Batavia, 27.0 miles
3. Erie-Lackawanna, Lancaster Spur, Depew Junction to Lancaster, 3.0 miles
4. Erie-Lackawanna, Buffalo and Southwestern (B&SW), BC Junction to Gowanda, 30.4 miles
5. Transit Road Running Track, Akron Junction to Transit Road, 8.6 miles
6. Erie-Lackawanna, Lancaster Spur, Lancaster east 1.7 miles
7. Penn Central, Chautauqua Branch, South Buffalo to Brocton, 45.8 miles
8. Penn Central, Hojack Line, Model City to Riverview, 3.5 miles
9. Lehigh Valley, Tift Yard Area
10. Erie-Lackawanna, old Delaware, Lackawanna and Western (DL&W) main line from Lancaster to Alexander, 20.4 miles
11. Conrail, Niagara Falls Branch (former Lehigh Valley) Niagara Junction to Tonawanda Junction, 10.5 miles
12. Conrail, Lockport Branch (former Erie-Lackawanna), North Tonawanda to Lockport, 13.3 miles

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* Has been purchased by Erie County for use as a potential bikeway
** Excellent prospects for bikeway facilities

II.4 TYPES OF FACILITIES

In any of the areas discussed as opportunities (II.2), three types of bicycle facilities may be considered. These are:

The **bike path** or Class I bikeway - a designated exclusive right-of-way for cyclists where interaction with pedestrian or vehicular flow is minimized or eliminated.

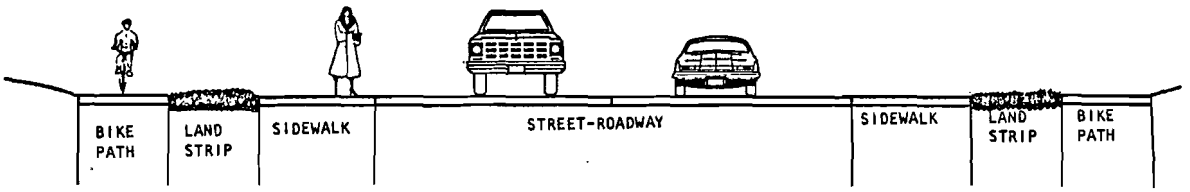
The **bike lane** or Class II bikeway - a designated semi-exclusive right-of-way where the cyclists' area of use is delineated by either a physical barrier or a painted stripe separating pedestrian and vehicular flow from bicycle flow. Bike lanes are also supplemented with bike lane signs and pavement markings which identify the lane's beginning, end, and direction at decision points.

The **bike route** or Class III bikeway - a shared roadway for bicycles and motor vehicles designated by bike route signs to alert motorists of the presence of bicyclists. This facility is applicable on roadways that have low traffic volume.

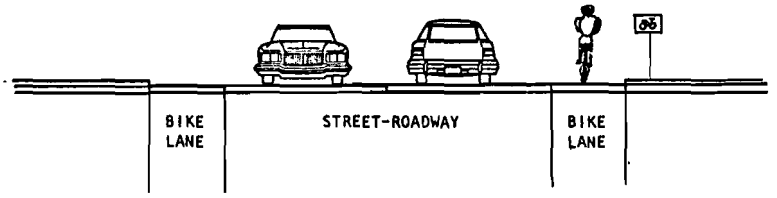
Illustrations of the aforementioned bicycle facilities, along with the bike signs used in conjunction with them, are depicted in Figures 10 and 11, respectively.

These facilities provide varying degrees of designated space to the cyclist; however, the implementation cost increases with increased designation of space. Presently, a controversy exists within the bicycle community over the designation or non-designation of facilities.

Proponents of undesignated facilities contend that designated facilities are detrimental to cycling because 1) they restrict the cyclist's mobility, 2) they limit access (unless there is a designated facility on every street), and 3) they give a false sense of security.



BIKEPATH
(Class1)



BIKELANE
(Class 2)

BIKEROUTE
(Class 3)

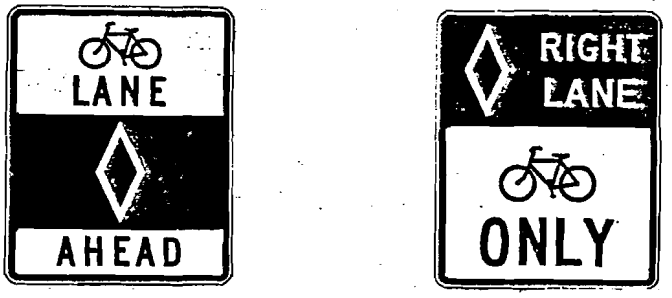
TYPES OF BIKEWAYS

D11-1
24" x 18"

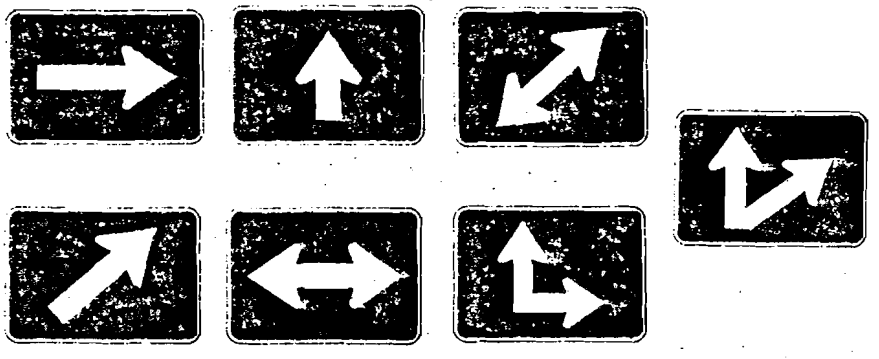
M1-8
12" x 18"

M1-9
18" x 24"

Bicycle Route Markers



Designated Lane Signs



M7-1 through M7-7

Supplemental Plaques

STANDARD BIKEWAY FACILITY DESIGNATIONS

Source: MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, USDOT 1978

On the other hand, proponents of designated facilities (bikeways) contend that designated facilities 1) provide roadway space in areas where competition for such space is intense, 2) provide bikeway continuity, 3) indicate a preferred alternate based on terrain, degree of conflict with other modes, or accident experience, and 4) alert drivers to the presence of bicyclists while designating an area where the driver may encounter them.

This plan was developed with the assumption that some designated facilities would be implemented based on the geometric design criteria contained in the appendix of this report.

II.4.1 Dual-Mode Facilities

The dual-mode or mixed-mode facility involves the bicycle and at least one other mode as a means of transportation or recreation. It offers a unique opportunity for expanding the range and usefulness of the bicycle. Some dual-mode facilities include the bicycle/auto dual-mode, the bicycle/bus dual-mode, bicycle/rail dual-mode and bicycle/boat dual-mode. These dual-modes have been tried with varying degrees of success; however, there are some drawbacks with respect to operation and maintenance costs. If dual-mode facilities are to be considered in the future, additional evaluation would be required to determine if the costs are justified.

The Bicycle/Auto Dual-Mode is one in which the bicycle is placed on a rack mounted on the automobile and transported to an intermediate point where a transfer to the bicycle mode is made for the final portion of the trip.

Bicycle/Bus Dual-Mode - combines the use of both the bicycle and the bus for a trip. This usually requires some modification to the bus to provide adequate space for both the cyclist and the bicycle. The long haul portion of the trip is accommodated by the bus and

the short haul is accomplished by the bicycle. This combination is especially desirable where bicycles are prohibited, i.e., some bridges and freeways.

The Bicycle/Rail Dual-Mode - refers to the technique used to combine the bicycle with some form of rail transit. In this case, the policy and procedures of the transit system are modified to allow bicycles on them. Although there are many restrictions regarding time and place for bicycle boarding it is at least a step in the right direction. Two examples are described below:

PATH - The Port Authority Trans Hudson (PATH) rapid transit, which links New York and New Jersey will allow bicycles to be transported during certain hours. A special pass must be obtained (at no cost) in order to be admitted through the entry points.

BART - The Bay Area Rapid Transit in California, on an experimental basis, reserved the last car for bicycle and bicyclists. In both cases (PATH and BART) the cyclist only pays for his or her fare, there is no charge for the bicycle.

Bicycle/Boat Dual-Mode - Commuter boat service in some large urban areas allow bicycles aboard. Ferryboat systems in New York, San Francisco, Seattle and Vancouver have been very successful with the bicycle/boat dual-mode. An example in the study area could include a service between Toronto and Youngstown or Niagara-on-the-Lake.

II.5 POTENTIAL ROUTES

The potential routes for the Plan were developed by considering the existing and future generators, estimated travel patterns and volumes, bicycle prohibited roadways, local plans, existing highway system, avail-

able right-of-way and information from local bike clubs and town officials. A wide range of alternate routes within each corridor were subsequently mapped as a basis for evaluation and selection.

These candidate routes consisted of approximately 185 miles of potential utilitarian routes, approximately 480 miles of potential recreational routes and approximately 235 miles of potential combination routes. A description of each route is contained in a technical appendix under separate cover.

III. ROUTE EVALUATION AND SELECTION

As part of the route evaluation and selection process, criteria were selected and a methodology was developed to rate the candidate routes. The potential for coordination of related projects/joint development with the master plan was also considered. In order to assess the economic feasibility of the routes, estimated costs, maintenance, liability and funding sources were investigated.

III.1 CRITERIA/METHOD

The criteria/method used for the route evaluation and selection drew heavily upon a variety of individuals and groups, each contributing in a unique manner. Local bicyclists shared their personal riding experiences as well as their knowledge of existing roadways. Town/city officials added the necessary local element by identifying preferred routings through their localities along with additional desires and concerns. Finally, consultant and NFTC staff expertise were utilized.

The locational criteria selected for the route evaluation process included the following:

- Basic width - available roadway space.
- Bicycle safe grate - sewer grates with bars not parallel to roadway.
- Competing uses - other modes of transportation competing for space, i.e., auto and pedestrian.
- Automobile speed and volume - the intensity of vehicular speed and volume.
- Truck and bus traffic - percentage of trucks and buses.
- Security - of property and person.
- Safety - with respect to traffic.
- Attractiveness - the bicycling environment with respect to sight, sound, and smell.

Actual field reconnaissance by bicycle was conducted to determine if the routes were conducive to cycling with respect to the above criteria. The

resulting selected routes provided a continuous regional framework or "skeletal system" that could also tie together local systems. Additional factors were considered for the final selection of the route such as overlapping routes, coordination of the Plan with existing or committed bikeway facilities and Transportation Improvement Program Projects. One item not considered a determining factor in the route evaluation process was pavement surface quality. This was because all selected routes must be further analyzed during the implementation phase, and at that time necessary roadway improvements will be identified and corrected before designation.

III.2 COORDINATION OF POTENTIAL PROJECTS AND JOINT DEVELOPMENT

The coordination of potential projects and joint development refers to that aspect of the Plan that addresses other bicycle projects or programs (such as the Buffalo Bikeway Plan), as well as non-bicycle projects (such as the Erie and Niagara Counties Regional Planning Board's Open Space Plan) that might incorporate bicycle facilities as an incidental feature. The City of Buffalo's bicycle plan was developed by others outside the scope of this study and has not as yet been adopted by the city. The Buffalo plan was referenced during the route selection process of this study primarily to ensure continuity. This master plan will coordinate with it during implementation so that all updates and revisions to the Buffalo plan will be incorporated and accommodated. An additional coordination effort involved meeting with other town and city officials to establish an awareness of all local projects and studies that might affect or be affected by the master plan.

Existing and proposed bikeway facilities, as illustrated in Figure 12 and listed in Table 5, were also identified and considered during the route selection process. If a route coincided with, or closely parallelled an existing or proposed route, efforts were made to give that added emphasis during the selection process. Also considered in the Plan were the Transportation Improvement Program (TIP) projects. A discussion of the NFTC TIP and a listing of TIP projects coordinated with the Plan are contained in the following section.

EXISTING AND PROPOSED BIKEWAY FACILITIES

TABLE 5

EXISTING AND PROPOSED BIKEWAY FACILITIES

	Facility	Approximate Miles	Year of Implementation
1.	The Grand Island Bikeway	6	1982
2.	The Ellicott Creek Bikeway	4	1990
3.a	Riverwalk - Buffalo	6	Under Construction 1984
3.b	Riverwalk - Tonawanda	7	1985-86
4.	The City of Buffalo Bikeway*	65	Proposed
5.	The Amherst Canal Trailway - Part I	3	Existing
	(Barge Canal) - Part II	5	1990
6.	Brineway	4	Proposed
7.	Ransom Oaks	6	Existing
8.	Got Creek	2	Proposed
9.	Amherst R.O.W. (Peanut Line)	6	Proposed
10.	Power Line	6	Proposed
11.	Audubon (Walton Woods & Walton)	3	Existing
12.	State University of New York at Buffalo (Amherst Campus)	4	1990
13.	Lockport Expressway	5	1984
14.	Intercampus Bikeway	4	1981

*Delaware Park loop and McKinley Parkway are existing bikeway facilities in Buffalo.

III.2.1 Transportation Improvement Program

The Transportation Improvement Program (TIP) is the capital programming component of the overall Erie-Niagara transportation planning process. This program consists of a listing of specified federally funded projects being considered for implementation in the next five year period. It is updated each year based on the continual re-evaluation of long and short-range planning activities. Those projects of high priority are selected, each year, for funding and implementation.

The Federal Highway Administration and the Urban Mass Transportation Administration provide the majority of the financing for transportation projects. These projects include urban highway and transit projects; bikeways; bus equipment and operating assistance; and other transportation-related projects of regional significance.

TIP projects considered during the development of the Plan include:

1. The Riverwalk
2. The Intercampus Bikeway
3. The Lockport Expressway and bikeway proposal
4. The LRRT

In addition, all roadway improvement projects, on the Program, such as the Como Park Boulevard Improvement and the William Street Improvement were considered in evaluating and selecting routes. The incorporation of bikeway facilities (Class II or III) in all such projects is encouraged.

Based on the evaluation and selection described above, routes were selected and are discussed in Chapter IV. Also discussed are remedial measures for some of the selected routes that require upgrading.

III.3 ESTIMATED COSTS

Construction costs for bikeway facilities vary considerably throughout the country. Therefore, the estimated costs for Class I, Class II, and Class III bikeway facilities for the study area were developed based on the most recent Western New York prices. The estimates shown on Table 6 indicate that a Class I facility may be five times more expensive than a Class II facility, and a Class II facility may be nine times more costly than a Class III facility.

It should be noted that some items shown on the table, such as concrete curbs, are not always used on bikeways. However, based on past experience, such items may save time, money and the facility itself in the long run. The option of including or not including such items suggests that a range in costs must be considered for each facility type. Thus, Class I facilities may cost less than shown without curbs and with variation in base material, whereas a Class II facility may cost more if curbs and other street work are included. Experiences within the region verify that these ranges will exist.

III.4 MAINTENANCE

An important aspect of bicycle planning is the maintenance consideration. Some of the problems associated with bikeway maintenance include raked leaves, drifted sand, debris, accumulated water, broken glass, overhanging branches and signs, etc. A program of regular sweeping and inspection of the bikeway should be established. The agency having jurisdiction over the bikepath or the operating agency should assume the maintenance responsibility before the facility itself is implemented.

III.5 LIABILITY

As for most transportation facilities, the design agency and operating agency assume the liability. It should be noted that the degree of liability for bicycle facilities should not be different than that associated with any other transportation facility.

TABLE 6
ESTIMATED BIKEWAY COST PER MILE*

ITEM	CLASS I	CLASS II	CLASS III
2 Inch FA BC-1/Black Top[2]			
2 tons/C.Y., 520 tons/mile @ $60/ton	$ 31,200	$31,200[1]	-
4 Inch Bituminous Stabilized Base			
2 tons/C.Y., 1040 tons/mile @ $60/ton	62,400	-	-
CONCRETE CURB			
5280 ft. x 2 = 10,560 L.F. @ $7/L.F.	73,920	-	-
SIGNS			
5 signs/mile @ $82/sign	410	-	-
50 signs/mile @ $82/sign	-	4,100	4,100
ROADWAY MARKINGS			
Incl. lane lines and bike symbols	1,740	1,740	____
Sub-total	$169,670	37,040	4,100
Contingency (15%)	25,450	5,556	600
Total	$195,120	$42,596	$4,700

* Western New York (in place) Prices as of November 1980 from local area contractors

(1) if resurfacing is required (for bike lane portion only).

(2) assumes a facility 8 feet wide.

Suggested warrants in the 1974 New York State Manual of Uniform Traffic Control Devices regarding the designation of a Class III or bike route facility stated that

> "the following should be considered before a bike route sign is installed along a highway where the roadway would be jointly used by vehicles and bicycles. The number of vehicles on rural highways should not exceed 1000 on any one day. The number of vehicles on urban highways should not exceed 3000 on any one day."

The New York State Department of Transportation is presently reviewing this warrant.

In light of this suggested warrant some towns felt that it was not feasible to designate Class III facilities since they interpreted the suggested warrant as being mandatory and wanted to avoid any liability. It was decided that vehicular counts would be taken prior to implementation and if the counts were greater than 3000 per day then one of the following options would be considered: 1) implementing a Class II (bike lane) facility, or 2) choosing a parallel street that does meet that warrant.

On existing facilities in the Niagara Frontier, the City of Buffalo is responsible for the maintenance and assumes the liability for the existing bikeway facilities in the city. In the case of the Grand Island Project, the Recreation Department of Grand Island is responsible for maintenance and assumes liability.

III.6 FUNDING

There are a variety of sources, both public and private, from which funding for bicycle programs may be obtained. Large corporations often provide funding or literature regarding bicycle safety. However, the major source of funding for bicycle projects is the federal government which has established a variety of programs. These programs are funded with a pre-determined federal share for each program with the remainder contributed by state and local governments. Federal programs along with possible state and local funding sources are contained in the appendix.

The Niagara Frontier Transportation Committee is responsible for federal highway and mass transit fund programming. In this capacity the NFTC can be a source for initiating projects in those areas. Other cities have devised additional methods for generating bicycle funds. Some areas of the country obtain program funds from the fees collected for bicycle registration. Another has allocated a percentage of the local gasoline tax to bicycle projects.

III.7 ROUTE SELECTION

Candidate routes were each evaluated according to the items discussed in this chapter. A preferred route(s) was then selected within each demand corridor from the many possible alternatives. After much review of the initial route selections, a regional bicycle plan was produced and is presented in Chapter IV.

IV. THE BICYCLE MASTER PLAN

This bicycle master plan consists of policies, routes and priorities, ancillary facilities, education programs, enforcement and marketing. Although the plan considered the constraints of cost and funding, and was therefore limited, it did incorporate primary utilitarian and recreational routes which were the main arteries of the system. Furthermore, the plan emphasizes the role of the bicycle as a mode of transportation instead of just a recreational device.

IV.1 RECOMMENDED POLICIES

- **Use of Designated Bicycle Areas**

The Vehicle and Traffic Law of New York, Section 1234(c) states:

> "Whenever a usable path, lane or shoulder for bicycles has been provided on or adjacent to a roadway, bicycle riders shall use such path, lane or shoulder and shall not use the roadway or a portion of the roadway not laned for bicycles."

As a result of this state law some cyclists have been fined for using the undesignated portion of the roadway instead of the designated bicycle facility on the same roadway. Some members of the Niagara Frontier Transportation Committee's Bicycle Subcommittee have expressed concern regarding this matter and contend that in some instances bike lanes are not "usable" due to a condition that may either damage the bicycle or result in personal injury. A usable bike path, lane or shoulder should be:

- Adequately maintained (free of glass or debris)
- safe (with adequate lighting and visibility)
- clear for intended use (free of motor vehicles or any other obstructions)

- accessible to desired destination
- signed and/or marked.

A policy should be established that would not penalize a cyclist for using the undesignated portion of the roadway provided that an unsafe condition exists and can be verified. The NFTC member agencies should work to have this law clarified. In addition, efforts should be made to penalize motorists for using bike lanes.

In view of the above, it is recommended that a contact (e.g., address and/or phone number of appropriate agency) be established to allow bicyclists to report any conditions on designated facilities that would make the facilities unsafe or inhibit bicycle flow. Each report should be recorded, investigated and corrected if deemed necessary.

- **Bicycle Considerations in New Projects**

The needs of bicyclists should be considered during the planning or design stages of any new or improved transportation facility. Special efforts should be placed on those facilities identified in the bicycle master plan. With such facilities, design alternatives with bicycle provisions should be carried throughout the entire design process.

- **Assistance to Local Officials or Developers**

The NFTC encourages development of local bicycle plans and/or facilities to complement the regional plan. The NFTC should provide guidance and technical expertise and should be contacted to allow proper coordination of the bicycle system.

- **Provision of Bicycle Coordination**

To insure that all plans, programs or projects concerning bicycling can be coordinated and efficiently implemented, the

NFTC should provide bicycle coordination through its staff and through the staffs of the member agencies.

- **Continued Involvement of Bicycle Users**

Through the NFTC's Bicycle Subcommittee, there should be continued involvement by those who use bicycles on a regular basis. Such participation should occur in implementing the various facilities in the plan as well as in education, enforcement and marketing programs. Particularly, this subcommittee should be consulted in the development of all bicycle facilities.

- **Maintenance**

NFTC member agencies should work to improve maintenance of those highways designated as bike facilities. This recognizes the added maintenance necessary to provide a facility safe for the bicycle. It is more vulnerable to debris, potholes, glass, etc. than a car would be.

- **Review/Re-evaluation of Plan**

As a policy, this plan should be reviewed and updated as necessary after a three-year period. Priorities should be reviewed annually. Meanwhile, the policies and plan stress flexibility.

- **Enforcement and Accident Reporting**

The NFTC should encourage the various police agencies to increase enforcement of traffic laws for bicyclists as well as motorists and to make an effort to improve reporting of bicycle accidents to identify causes and particularly unsafe areas.

IV.2 SELECTED ROUTES AND PRIORITIES

The selected routes were evaluated and chosen according to the criteria and methodology set forth in Chapter III. The resulting plan also incorporated the views and opinions of the Bicycle Subcommittee, local officials, various implementing agencies, the NFTC staff, and the consultant. The plan is a skeletal system that provides regional access to numerous points of interest, and could tie together any local system which may develop. The potential for future funding provided a realistic constraint on the selection process, and helped to keep the plan reasonably achievable.

The bicycling population consists of children, occasional weekend riders, and experienced riders of all ages. Because transportation or utilitarian purpose routes were generally favored over recreation ones, some of the identified facilities are more appropriate for the experienced rider who wishes to commute, and may not be safe for children or the novice rider. In addition, some selected routes may not be ready for use until improved. This improvement would occur in the implementation phase (Chapter V). The plan is flexible so that the location and/or type of facility may change based on future considerations. Improvements to an adjacent facility may in fact provide an adequate alternative to the initial route selection.

Funds for the implementation of the entire Plan may not be available in any given year. Therefore a prioritized plan and implementation schedule was developed. The prioritized plan allows for the implementation of the master plan in stages that allocate the available funds to the implementation of those routes considered to be most beneficial. Factors considered in the prioritizing of the selected routes included:

- type of facility - i.e. utilitarian, combination, or recreational
- coordination with existing or proposed bikeway facilities

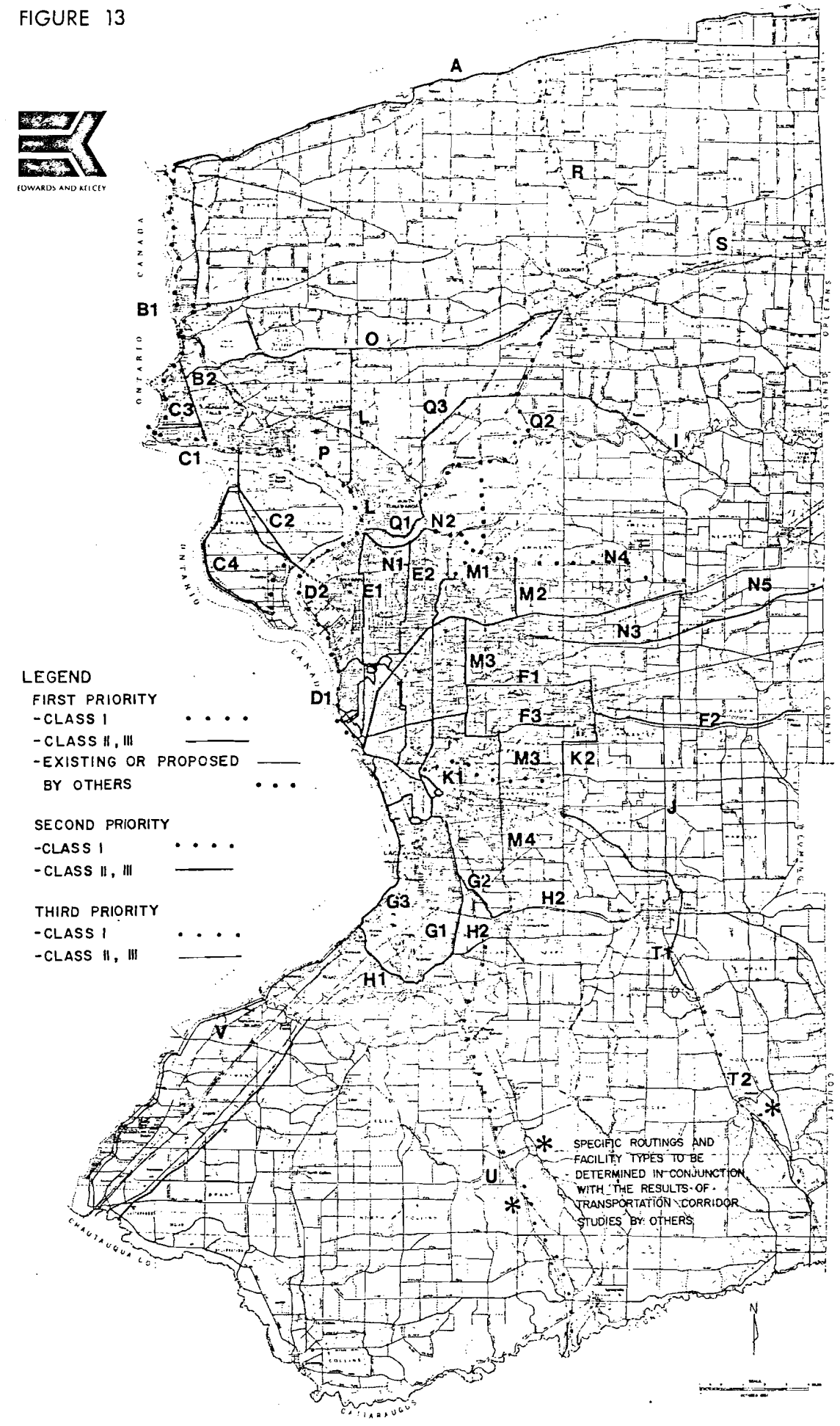
- coordination with new developments
- stage continuity
- viewpoints of the subcommittee and local officials.

The designation of bikeway facilities with utilitarian or combination purpose was considered more beneficial than the designation of purely recreational routes because competition for roadway space is more intense in the case of the former. The recreational routes by their nature are usually located in rural settings. The second factor considered whether the selected routes coincided with or tied into an existing or proposed bikeway facility. If so, it was considered a higher priority. The third factor considered was if the selected route tied into or came close to proposed major new developments. If so, it was also given a higher priority. Routes that provided continuity at the various stages were designated as required. Finally, subcommittee members and local officials participated in sorting out the priority stages.

The three priority groupings serve to direct implementation efforts. First priority routes are deemed most desirable in that they connect major points of interest and/or are currently heavily traveled corridors. All routes proposed by others are also in this group. Second priority routes provide additional access throughout the region. Third priority routes "fill-in" or round-out the system, making it truly continuous. Priority groupings imply a preferred order of emphasis, but should not be taken as a strict scheduling sequence.

With complete implementation of the master plan, a total of approximately 400 miles of bikeways would exist. These include roughly 90 miles of priority group I routes, 140 miles of priority group II routes, and 170 miles of priority group III routes. Implementation of Buffalo's plan, if adopted, could potentially add an additional 65 miles of bikeways. Figure 13 depicts the various stages of route implementation for the master plan along with the existing and proposed bikeway facilities by others. Table 7 provides a descriptive summary of the plan.

FIGURE 13



THE PRIORITIZED PLAN

TABLE 7

THE PRIORITIZED PLAN AND IMPLEMENTATION SCHEDULE

PRIORITY I

Corridor	Description	Type	Section	Length	Class	General Routing	Comments
B	Youngstown to Niagara Falls	Recreational	B1	14.5 miles	I	Robert Moses Parkway ROW (R.M.P.)	Serves downtown Niagara Falls. Consistent with previously proposed Lower Niagara Bikeway. Alternate routing along Lower River and Lewiston Road.
			B2	4 miles	II/III	Hyde Park Blvd.	Links Grand Island and Lewiston and North; bypasses business and tourist centers.
C	Downtown Niagara Falls, Grand Island, Tonawanda	Combination	C1	4 miles	I	R.M.P.	Links Grand Island Routes and Niagara Falls CBD.
			C2	6.5 miles	II/III	Grand Island Blvd.	Links "Riverwalk" to Niagara Falls, access to existing route on Beaver Island Pkwy.
			C3	3.5 miles	II/III	Walnut and Ferry Sts., Niagara Falls	One-way east-west routes through Niagara Falls.
D	Buffalo to City of of Tonawanda	Combination	D1 D2	6 miles 7 miles	I I	"Riverwalk" Ph. 1 "Riverwalk" Ph. 2	Under construction; Programmed for 85/86.
E	Tonawanda to Buffalo, Ellicott Creek to Delaware Park	Combination	E1	4.5 miles	II/III	Military/Elmwood	Links City of Tonawanda to Buffalo, accesses several routes to/from Tonawanda.
F	Buffalo to Lancaster	Combination	F1	10.5 miles	II/III	Broadway/Harlem/ George Urban	Connects to proposed Buffalo plan.
G	Buffalo to Hamburg	Combination	G1	8.5 miles	II/III	Abbott Road, Clark St.	Access to E.C.C. South, Rich Stadium, Lackawanna, Fairgrounds, Hamburg, also to Buffalo plan.
M	Amherst to Orchard Park	Utilitarian	M1	8.5 miles	I and II/III	Sweethome, Expressway, Audubon	Intercampus Bikeway proposed Spring '81 construction. Other sections in conjunction with highway projects by others (Lockport Expwy.) and Audubon Development. Links campuses of SUNY/Buffalo.
N	Clarence to Grand Island	Utilitarian	N1	3.5 miles	II/III	Ellicott Creek Road	Connects City/Town of Tonawanda Tonawanda and Amherst.
			N2	2 miles	I	Flood diversion channel	By U.S. Corps of Engineers; connects to Audubon, Campus.
			N3	12 miles	II/III	Main Street	Main east-west route through Buffalo and Amherst.
		SUBTOTAL		95 miles			

TABLE 7 (Cont'd)

THE PRIORITIZED PLAN AND IMPLEMENTATION SCHEDULE

PRIORITY II

Corridor	Description	Type	Section	Length	Class	General Routing	Comments
A	Youngstown to Niagara/Orleans County Line	Recreational	A	32.5 miles	II/III	Lake Rd., Rt. 18	Follows Lake Ontario shoreline, access to parks and rec. areas.
E	Tonawanda to Buffalo, Ellicott Creek to Delaware Park	Combination	E2	4.5 miles	II/III	Parker Blvd./ Starin Ave.	North-south routes from Ellicott Creek to Delaware Park when connected to Buffalo route.
F	Buffalo to Lancaster	Combination	F2	9.5 miles	II/III	Broadway	Lancaster to Alden, extension of other routes.
G	Buffalo to Hamburg	Combination	G2	4 miles	II/III	Webster Street/ California	Spur to Orchard Park Village.
			G3	5.5 miles	II/III	Rt. 5	Continues system along or parallel to the lake. Access to Hamburg and town park.
H	Lakeshore to Emery Park	Recreational	H1	4.5 miles	II/III	Rogers/Pleasant Ave.	Route through Hamburg Village to Lakeshore and town park.
K	Cazenovia Park to Como Park	Recreational	K1	7 miles	I	Buffalo Creek	Proposed in previous ENCRPB Open Space/Rec. Plan for Buffalo Creek.
			K2	4.5 miles	II/III	Bordon/Lossen/Lake	Continues from K1.
L	Niagara County Community College to North Tonawanda	Utilitarian	L	9 miles	II/III	Ward Rd., River Rd.	Part of this route could be Class I along River; connect to Riverwalk.
M	Amherst to Orchard Park	Utilitarian	M2	2.5 miles	II/III	Hopkins Road	N-S link from Village of Williamsville to new developments north and thence to Audubon, SUNY.
			M3	8 miles	II/III	Harlem/William/ Union	Two segments that provide continuous N-S access to points in Cheektowaga, W. Seneca town parks, etc.
N	Clarence to Grand Island	Utilitarian	N4	12 miles	I	"Peanut Line"	Clarence to Audubon/SUNY. Also eventually links Ellicott Creek to Akron Park.
O	Niagara Falls to Lockport	Combination	O	18.5 miles	II/III	Saunders Settlement Rd.	Niagara Falls to N.C.C.C. and Lockport.
Q	North Tonawanda to Lockport	Recreational	Q1 Q2	4.5 miles 12.5 miles	II/III I	Sweeney St. Barge Canal	Through North Tonawanda consistent with NYS Dept. of Recreation plan for Canal North Tonawanda to Lockport.
		SUBTOTAL		139 miles			

TABLE 7 (Cont'd)

THE PRIORITIZED PLAN AND IMPLEMENTATION SCHEDULE

PRIORITY III

Corridor	Description	Type	Section	Length	Class	General Routing	Comments
C	Downtown Niagara Falls, Grand Island, Tonawanda	Combination	C4	8.5 miles	II/III	West River Pkwy.	Links Buckhorn and Beaver Island State Parks by the River route.
F	Buffalo to Lancaster	Combination	F3	5 miles	II/III	Como Park Blvd.	Alternate access to park and shopping.
H	Lakeshore to Emery Park	Recreational	H2	9.5 miles	II/III	Armor-Duells, Quaker Rd.	Completes east-west link Hamburg, Orchard Park, East Aurora. Access to Chestnut Ridge Park via Corridor U.
I	Lockport to Akron	Recreational	I	18.5 miles	II/III	Beattie, Rapids Roads	Access to Akron Park, Wildlife Game Preserve, City of Lockport.
J	Clarence to East Aurora	Recreational	J	16.5 miles	II/III	Ransom, Schwartz Girdle Roads	Primary N-S link in rural towns, links parks and rec. area.
M	Amherst to Orchard Park	Utilitarian	M4	7 miles	II/III	Union Road	Links W. Seneca and Orchard Park with N-S route.
N	Clarence to Grand Island	Utilitarian	N5	4.5 miles	II/III	Main St. (Rt. 5)	Links Akron to Clarence and various bike routes.
P	Niagara Falls to North Tonawanda	Combination	P	5.5 miles	I	River Road or Shoreline	Could be continuation of Riverwalk project.
Q	North Tonawanda to Lockport	Recreational	Q3	9.5 miles	II/III	Beach Ridge	Alternate or supplementary North Tonawanda to Lockport route.
R	Lockport to Olcott	Recreational	R	11.5 miles	I	Abandoned Rail ROW	Links Lockport to Shoreline. Addressed in ENCRPB Open Space Plans.
S	Lockport to Middleport	Recreational	S	13 miles	I	Barge Canal	Potentially part of a statewide system along the canal.
T*	East Aurora to Emery Park and south	Recreational	T1 T2	6 miles 14 miles	II/III I	Center Road Route 16	Access to Emery Park. Major corridor study underway, bicycle considerations to be addressed.
U*	Orchard Park to Springville	Recreational	U	20.5 miles	I	Route 219	Multi-use study in conjunction with Southern Expressway development should address this. Access provided to Chestnut Ridge Park
V*	Hamburg to Cattaraugus County	Recreational	V	20.5 miles	II/III	Route 5	Several points of interest along the lakeshore would be served.
		SUBTOTAL		**170 miles**			
		TOTAL		**404 miles**			

*Specific routings and facility types may require more extensive corridor analysis.

IV.3 ANCILLARY FACILITIES

Ancillary or support facilities should be provided to meet the needs of bicyclists. Secure bicycle parking and storage facilities have been cited as a critical item by many potential cyclists. These and other support facilities are described below.

IV.3.1 Bicycle Parking and Storage Facilities

Bicycle parking and storage facilities include hardware or space located at those points of a trip where cycling begins and ends. When properly located at transit terminals, these facilities interface the bicycle with other modes of transportation and provide storage and security from theft in varying degrees.

In order to provide secure bicycle parking facilities, three factors should be considered:

- type
- location, and
- protection

The type of bicycle parking and storage facility can be categorized into the following three classes as shown in Figure 14.

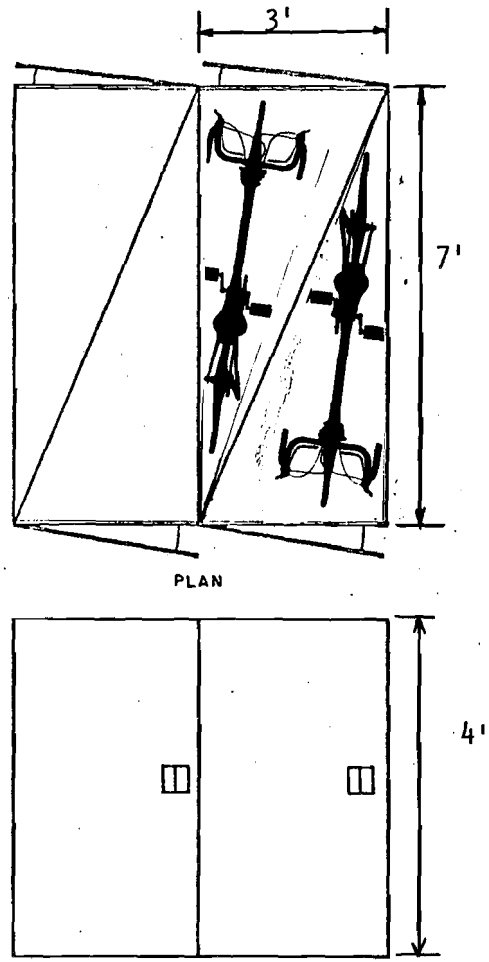
Class I Lockers or controlled access areas where bicycles may be stored, protected from theft, weather and vandalism.

Class II Devices that lock the bicycle frame and wheels, commonly referred to as a three point rack. The individual may have to provide a padlock.

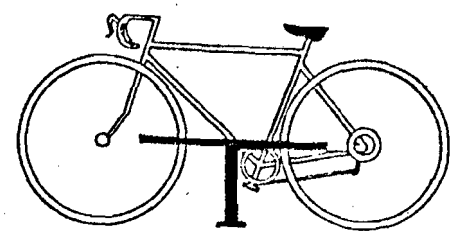
Class III Bicycle racks or fixed objects to which a bicycle may be secured by the individual's own locking device.

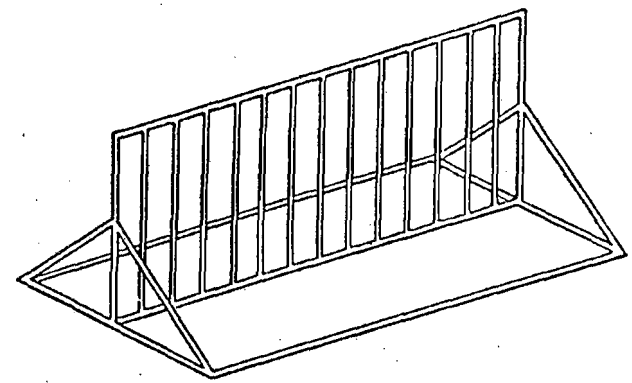
FIGURE 14

CLASS I BICYCLE LOCKERS



CLASS II THREE POINT BICYCLE RACKS





CLASS III STANDARD RACK

SOURCE: Edwards and Kelcey, Bikeway Planning and Policy Guidelines for New York City, New York City Department of Transportation, New York, New York, July, 1978.

TYPES OF BICYCLE PARKING AND STORAGE FACILITIES

The location of the bicycle storage devices should be in a well-lighted area of high visibility and exposed to many passers-by to deter thefts. It is also important that the bike parking be close to the cyclist's destination. It may be desirable to formulate a bicycle parking ordinance into the local zoning ordinance to provide for allocated spaces for bicycle parking. For example, a zoning ordinance in Palo Alto, California[4] has dedicated 5 percent of the total required parking space to secure bicycle storage facilities. The ordinance also defines what type of storage facility (Class I, II, or III) must be provided.

Weather protection for the bicycle should be considered when designing for long-term commuter parking. Protection from the elements can be provided by awnings or canopies, interior spaces or Class I storage facilities.

Potential bicycle storage locations on the Niagara Frontier are generally synonymous with the sites of those major generators identified in Figures 3 and 4. These include major shopping plazas, malls, recreation areas, employment centers, educational institutions, and government buildings. Provisions for bicycle storage should also be considered at all LRRT station locations, as well as at any designated park-n-ride lot.

IV.3.2 Other Support Facilities

Bicycle support facilities such as informational signs, bicycle mapping, shower and dressing room facilities do encourage bicycling. Many potential cyclists choose not to use their bicycle for a commuter trip due to the lack of these support facilities.

IV.4 THE MARKETING ELEMENT

The purpose of the marketing element is to inform the public of the bicycle program and to solicit participation from a variety of different

[4] City of Palo Alto, "Zoning Regulations", adopted March 20, 1978, Sections 18.83.040 through 18.83.070.

organizations. This results in the creation of community-wide involvement. Methods of implementing the marketing element include:

- a coordinator for bicycle planning and activity
- newspaper and radio coverage
- public displays
- community participation
- a brochure that will be distributed when this plan is adopted

Each is further described in a technical appendix available under separate cover.

IV.5 THE EDUCATIONAL ELEMENT

To foster safe traveling practices, the public must first understand the law and second, be able to recognize and avoid potential hazards while traveling on the street. To attain these goals, the educational element should be comprised of two parts: classroom education and on-street education.

Classroom Education

Classroom education should consist of a series of sequenced educational units designed specifically for each grade level. Educational units should be developed for each grade starting with kindergarten and should contain a work plan with visual aids. By the use of these materials the students will be versed in the knowledge and interpretation of traffic control devices, laws and ordinances. Safety education can be incorporated into other subject plans, such as, art or english in which posters or compositions with safety themes are assigned. The designers of these educational units should train the school teachers in safety education and in the use of the educational materials. The National Safety Council has developed a safety program entitled, "All About Bikes" which may be useful.

Local safety programs can be found in the Towns of Hamburg, Tonawanda, and West Seneca, and in the City of Lackawanna. The Auto Club of

Western New York (AAA) and the League of American Wheelmen (LAW), also have their own bicycle safety programs. Each can provide specific details of their organization and effectiveness.

On-Street Education

Classroom education should be reinforced by on-street education. On-street education should emphasize safe and defensive practices in a school yard atmosphere prior to the on-street bike hike and should include the following:

- Maintenance and inspection of the bicycle
- Proficiency tests
- Defensive and proper bicycle operating techniques
- Proper attire and accessories
- Review

Many communities in the region annually participate in the Chamber of Commerce/Jaycee Bicycle Rodeo Program which includes these elements.

The students should participate in bike hikes after attaining a thorough understanding of the safety material and proficiency in the operating skills described in the above items. The education of motorists is also necessary to make them aware of cyclists' rights. This could be accomplished by adding a section to the drivers' manual regarding bicycles, and to the mandatory drivers' training course. Efforts should be pursued to accomplish this.

IV.6 THE ENFORCEMENT ELEMENT

This element should include a two-county registration program, a bike patrol program and a peer court system. The enforcement element is not intended to be punitive in nature, but rather an extension of the educational element. A mandatory registration program should be established to maintain a file of all bicycles in a specified area. Bicycle

owners should be required to have their bicycles registered and inspected at specific locations. Pertinent information including the bicycle serial number would be recorded. This should help to increase the chances of recovering stolen bicycles.

V. PLAN IMPLEMENTATION

Now that a plan has been developed, much work will be required in its implementation. Appropriate local jurisdictions should be involved, along with the bicycle subcommittee, to maintain a user's viewpoint. Some analysis of each potential facility will be necessary to determine if conditions have changed. This analysis will vary with the type and location of the facility.

It will be necessary for the subcommittee and bicycle coordinators to work diligently to maintain interest and to pursue each project. It will be up to these people, along with the NFTC/PCC, to insure that the plans become a reality. This includes the need to pursue all reasonable funding sources.

It is during the implementation of routes suggested in the plan that design details can be resolved. This would include decisions regarding the type of facility (Class I, II, or III), exact location, terminus points, and other factors. The agency responsible for implementing the facility should work closely with the local jurisdiction and the potential users of the facility to ensure that an optimal project is pursued. Detailed cost estimates would also be prepared at that time.

As additional information becomes available during implementation, it is possible that the alignment may be changed from that shown on the plan (Figure 13). The flexibility to change alignment takes advantage of such detailed analysis as it becomes available and should certainly be construed as consistent with the overall plan. Furthermore, if transportation projects are being pursued on routes generally parallel to a suggested bike route, consideration should be given to rerouting the bike facility and incorporating bike provisions into the project.

Localities and/or developers should be encouraged to design and implement local systems or programs to complement the NFTC plan. The NFTC staff, and subcommittee should offer technical assistance, guidance, and coordination of local efforts. In the course of assisting local efforts, updated design standards

such as those contained in the appendix to this report should be referred to and used. Continuity from a local system to the master plan is essential.

Continual maintenance of all facilities should be agreed upon prior to construction. This would include assigning the maintenance responsibility to an agency, setting up a schedule, and establishing a hot-line to report unsafe conditions. Maintaining the system is as much a part of implementing the plan as is the building of facilities.

APPENDIX

The following chapter on geometrics represents part of a draft document prepared by the Bicycle Transportation Committee, Urban Transportation Division of the American Society of Civil Engineers and is pending formalization. Major contributors to this document are: William Hoey, III, Jerrold Kaplan, Walter Kraft, Richard Rogers, and James Konski, Chairman.

Chapter III

GEOMETRICS

Geometrics for various types of bikeway facilities are discussed under the following sections.

CLASS I BIKEWAYS

Class I bikeways (bike paths) are facilities with exclusive rights-of-way, with cross flows by motorists minimized. Class I bikeways should be defined as serving "the exclusive use of bicycles and pedestrians". However, experience has shown that if significant pedestrian use is anticipated, separate facilities for pedestrians are necessary to minimize conflicts.

Sidewalk facilities are not considered Class I facilities because they are primarily intended to serve pedestrians, generally cannot meet the design standards for Class I bikeways and do not minimize motorist cross flows. (See "Class III Bikeways" for discussion relative to sidewalk bikeways.)

Widths

The minimum paved width for a two-way bike path should be 10 feet. The minimum paved width for a one-way bike path should be 6 feet. A minimum 4-foot-wide graded area should be provided adjacent to the pavement. (See Figure A-1.) Where the paved width is wider than the minimum required, the graded area may be reduced accordingly; however, the graded area is a desirable feature regardless of the paved width. If bicycle paths and footpaths cannot be physically separate, the bicycle portion should be at least 10 feet wide. The footpath should be of different color and level from the bike path, and should be on one side of the bike path. Development of a one-way bike path should be undertaken only after careful consideration due to the problems of enforcing one-way operation and the difficulties in maintaining a path of restricted width.

Where heavy bicycle volumes are anticipated and/or significant pedestrian traffic is expected, the paved width of a two-way path should be greater than 10 feet. Dual use by pedestrians and bicycles is undesirable, and the two should be separated wherever possible. Another important factor to consider in determining the appropriate width is that bicyclists will tend to ride side-by-side on bike paths, necessitating more width for safe use.

Where equestrians are expected, a separate facility should be provided.

Clearance to Obstructions

A minimum 4-foot horizontal clearance to obstructions should be provided adjacent to the pavement. (See Figure A-1.) Where the paved width is wider than the minimum required, the clearance may be reduced accordingly; however, an adequate clearance is desirable regardless of the paved width, as bicyclists traveling along the edge of the pavement will be subject to potential hazards without it. If a wide path is paved contiguous with a continuous fixed object (e.g., block wall), a 4-inch white edge stripe, 1 foot from the fixed object, is recommended to minimize the likelihood of a bicyclist hitting it. The clear width on structures between railings should be 12 feet. It is desirable that the clear width of structures be 18 feet between railings on short spans and should be not less than 12 feet under any circumstances.

It is recommended that the vertical clearance to obstructions across the clear width of the path should be a minimum of 10 feet.

Intersections with Highways

Intersections are a prime consideration in bike path design. If alternate locations for a bike path are available, the one with the most favorable intersection conditions should be selected.

Where motor vehicle cross traffic and bicycle traffic is heavy, grade separations are desirable to eliminate intersection conflicts. Where grade separations are not feasible, assignment of right-of-way by traffic signals should be considered. Where traffic is not heavy, stop or yield signs for bicyclists may suffice.

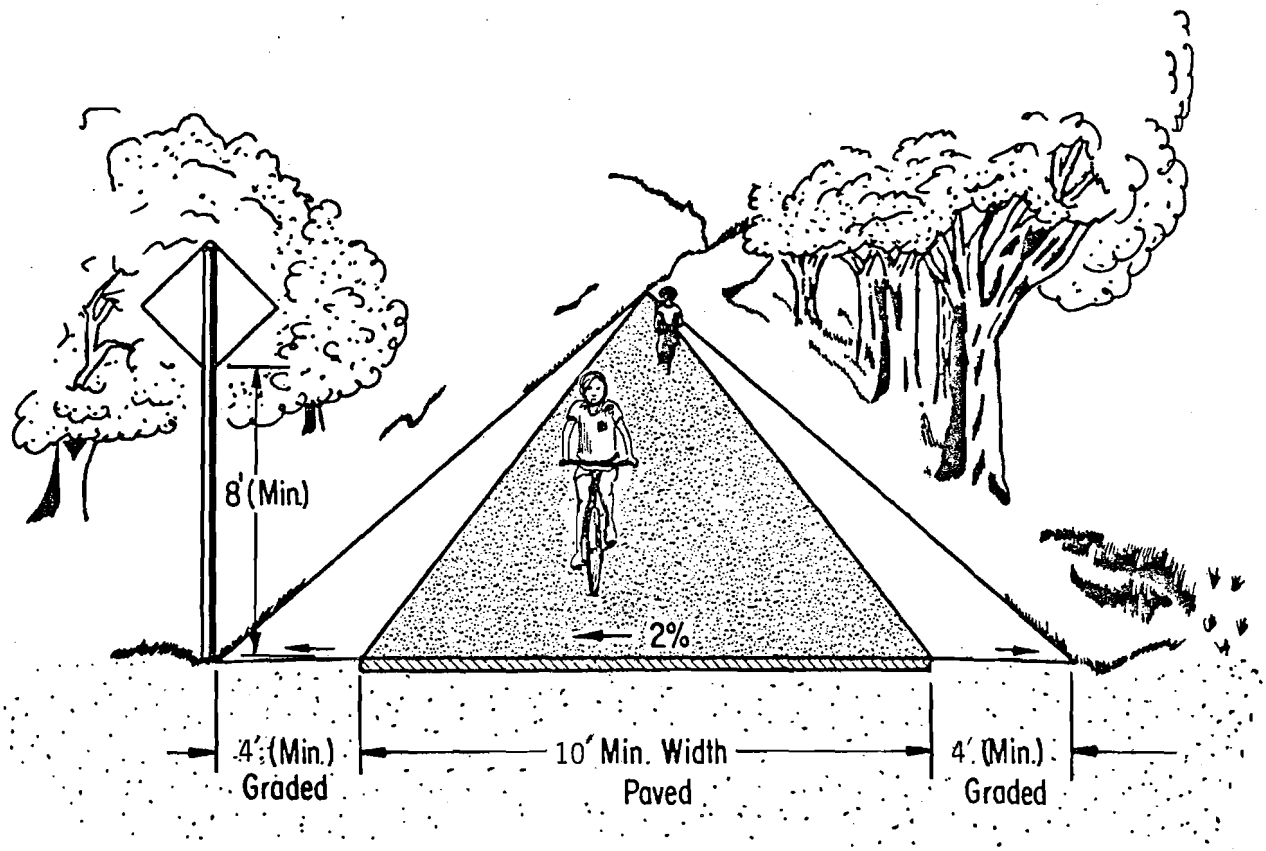
When crossing an arterial street, the crossing should either occur at the pedestrian crossing, where motorists can be expected to stop, or at a location completely out of the influence of any intersection to permit adequate opportunity for bicyclists to see turning vehicles. When crossing at midblock locations, rights-of-way should be assigned by devices such as yield signs, stop signs, or traffic signals that can be activated by bicyclists. Even when crossing within or adjacent to the pedestrian crossing, stop or yield signs for bicyclists should be placed to minimize potential for conflict resulting from turning autos. Where bike path signs are visible to approaching auto traffic, they should be shielded to avoid confusion. In some cases, Bike Xing signs may be placed in advance of the crossing to alert motorists. Ramps should be installed in the curbs, to preserve the utility of the bike path. Also see Chapter on Traffic Control Devices.

Separation Between Bike Paths and Highways

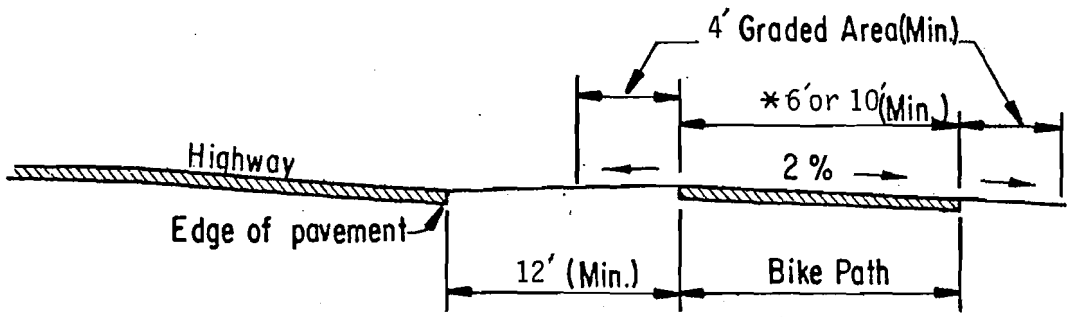
A wide separation is recommended between bike paths and adjacent highways. Bike paths closer than 12 feet from the edge of a highway should include a physical divider to prevent bicyclists from encroaching onto the highway. Suitable dividers could include chain link fences or dense shrubs. Low barriers

FIGURE A-1

TWO-WAY BIKE PATH ON SEPARATED RIGHT-OF-WAY



TYPICAL CROSS SECTION BIKE PATH ALONG HIGHWAY



*One-Way: 6 Minimum Width
Two-Way: 10 Minimum Width

Based on the Planning and Design Criteria for Bikeways in California.

(e.g., dikes, raised traffic bars) next to a highway are inappropriate because bicyclists could fall over them and into oncoming automobile traffic. In instances where there is danger of motorists encroaching into the bike path, a positive barrier (e.g., concrete barrier, steel guard railing) should be provided. (Refer to Structures Section of this report for criteria relative to bike paths carried over highway bridges.)

Bike paths immediately adjacent to streets and highways are not recommended. They should not be considered a substitute for the street, because many bicyclists will find it less convenient to ride on these types of facilities as compared with the streets, particularly for utility trips. Some problems with bike paths located immediately adjacent to roadways are as follows:

- They require one direction of bicycle traffic to ride against automobile traffic, contrary to normal rules of the road.

- When the bike path ends, bicyclists going against traffic will tend to continue to travel on the wrong side of the street. Likewise, bicyclists approaching a bike path will often travel on the wrong side of the street in getting to the path. Wrong-way travel by bicyclists is a major cause of bicycle/auto accidents.

- At intersections, motorists entering or crossing the highway often will not notice bicyclists coming from their right, as they are not expecting contraflow vehicles. Even bicyclists coming from the left may go unnoticed.

- When constructed in narrow roadway rights-of-way, the paved shoulder is often sacrificed, thereby decreasing safety for motorists and bicyclists using the roadway.

- Many bicyclists will use the highway (legally) instead of the bike path because they may feel the highway is safer, more convenient or maintained better. Bicyclists using the highway are often subjected to harrassment by motorists, who feel they should be on the path instead.

- Bicyclists using the bike path generally are required to stop or yield at all cross streets and driveways, while bicyclists using the highway will usually have priority over cross traffic.

- Stopped cross street motor vehicle traffic will often block the bike path crossing.

- Because of the closeness of motor vehicle traffic to opposing bicycle traffic, barriers are often necessary to keep motor vehicles out of bike paths and bicyclists out of motor vehicle lanes. These barriers cause many problems. They can be a hazard to bicyclists and motorists, and they can complicate maintenance of the facility.

For the above reasons, bike lanes or bike routes (shared use) are generally the best way to accommodate bicycle travel along highway corridors, when it has been determined that bikeways are appropriate.

Bike Paths in the Median of Highways

As a general rule, bike paths in the median of highways are not recommended because they require movements contrary to normal rules of the road. Specific problems with such facilities include:

- Bicyclist right turns from the center of roadways are unnatural for bicyclists and confusing to motorists.
- Proper bicyclist movements through intersections with signals are unclear.
- Left-turning motorists must cross one direction of motor vehicle traffic and two directions of bicycle traffic, which increases conflicts.
- Where intersections are infrequent, bicyclists will enter or exit bike paths at midblock.
- Where medians are landscaped, visual relationships between bicyclists and motorists at intersections are impaired.

For the above reasons, bike paths in the median of highways should be considered only when the above problems can be avoided.

Design Speed

The proper design speed for a bike path is dependent on the expected type of use and on the terrain. The minimum design speed for bike paths should be 20 mph. The following design speeds are recommended:

	Design Speed (mph)
Bike Paths with minimum grades	20
Bike Paths on Long Downgrades (steeper than 4 percent, and longer than 500 feet)	30

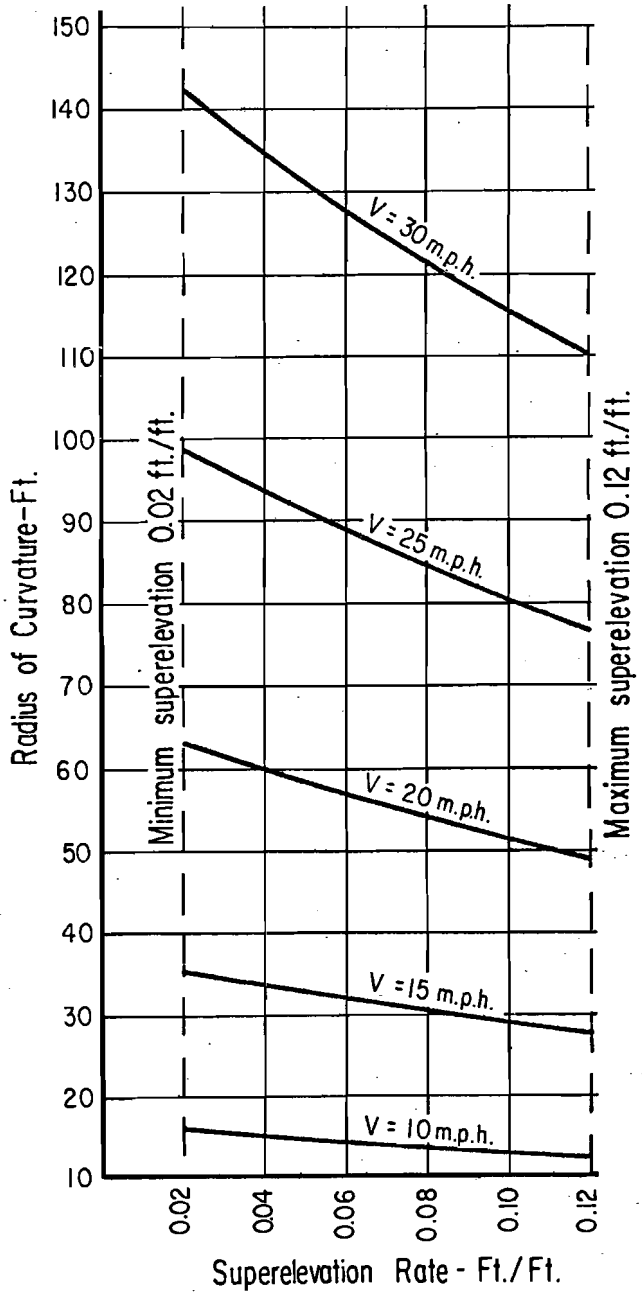
Installation of "speed bumps" or other similar surface obstructions, intended to cause bicyclists to slow down in advance of intersections, shall not be used. Such devices can cause bicyclists to fall and can result in serious injuries. These devices cannot compensate for improper design.

Horizontal Alignment and Superelevation

Minimum recommended curve radii and superelevations for various design speeds are shown on Figure A-2. When minimum curve radii are selected,

FIGURE A-2

CURVE RADII & SUPERELEVATIONS



plot of: $\frac{V^2}{gR} = \frac{\tan\theta + f}{1 - f\tan\theta}$

where: V = velocity, ft./sec.
g = acceleration due to gravity, ft./sec.^{2}
R = radius of curvature, ft.
f = coefficient of friction on dry pavement = 0.4 (based on maximum 20° lean)
tan θ = superelevation rate, ft./ft.

Source: State of Oregon, Bikeway Design, January, 1974

increased pavement width on the inside of the curve is recommended to compensate for bicyclist lean.

A straight 2 percent cross slope is recommended on tangent sections. Superelevations steeper than 2 percent should be avoided on bike paths expected to have adult tricycle traffic.

Stopping Sight Distance

Figure A-3 indicates the minimum stopping sight distances for various design speeds and grades. For two-way bike paths, the descending direction will control the design.

Length of Crest Vertical Curves

Figure A-4 indicates the minimum lengths of crest vertical curves for varying design speeds.

Lateral Clearance on Horizontal Curves

Figure A-5 indicates the minimum clearances to line-of-sight obstructions for horizontal curves. The required lateral clearance is obtained by entering Figure A-5 with the stopping sight distance from Figure A-3 and the proposed horizontal curve radius.

Grades

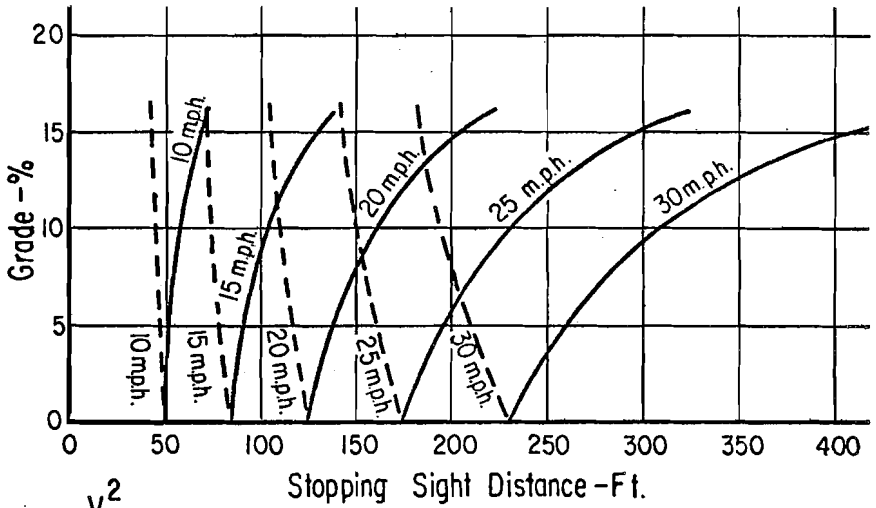
Bike paths generally attract less skilled bicyclists, so it is important to avoid steep grades in their design. Bicyclists not physically conditioned will be unable to negotiate long, steep, uphill grades. Since novice bicyclists often ride poorly maintained bicycles, long downgrades can cause problems. For these reasons, bike paths with long, steep grades will generally receive very little use. The maximum grade rate recommended for bike paths is 5 percent. It is desirable that sustained grades be limited to 2 percent if a wide range of riders is to be accommodated. Steeper grades can be tolerated for short segments (e.g., up to about 500 feet). Where steeper grades are necessitated, the design speed should be increased and additional width should be provided for maneuverability.

CLASS II BIKEWAYS

Class II bikeways (bike lanes) for preferential use by bicycles are established within the paved area of highways. Bike lane stripes are intended to promote an orderly flow of traffic, by establishing specific lines of demarcation between areas reserved for bicycles and lanes to be occupied by motor vehicles. This effect is supported by bike lane signs and pavement markings. Bike lane stripes

FIGURE A-3

STOPPING SIGHT DISTANCES*



$$S = \frac{V^2}{30(f \pm G)} + 3.67V$$

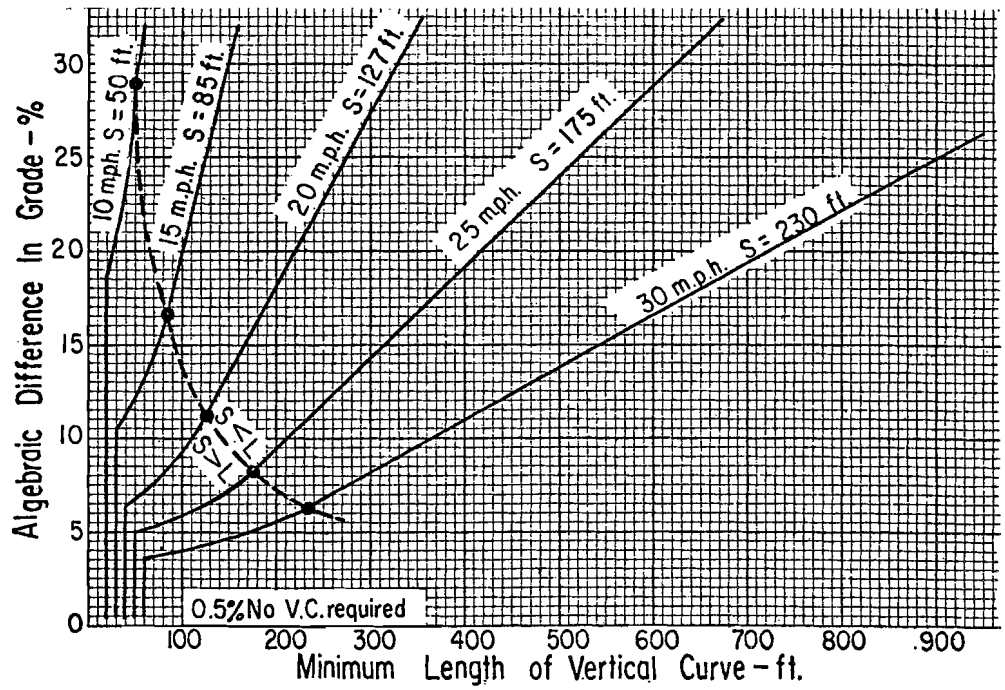
where: S = stopping sight distance, ft.
V = velocity, m.p.h.
f = coefficient of friction (use 0.25)
G = grade ft./ft. (rise/run)

Descend ———
Ascend - - - - - -

* Source: State of Oregon, Bikeway Design, January, 1974

FIGURE A-4

SIGHT DISTANCES FOR CREST VERTICAL CURVES*



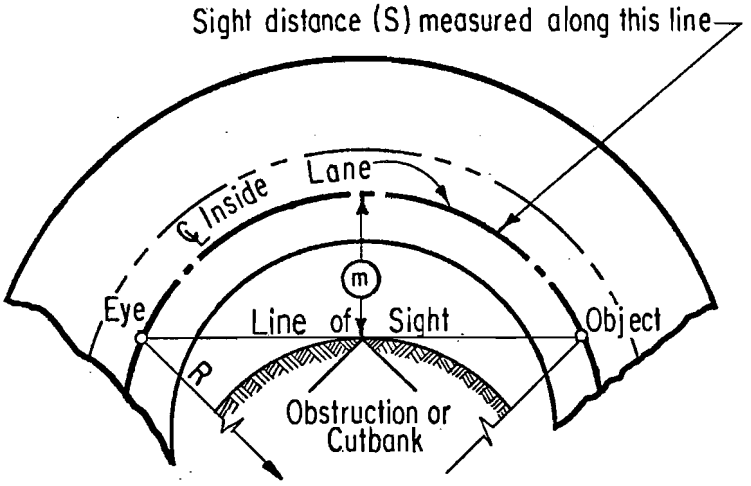
$$L = 2S - \frac{200(\sqrt{h_1} + \sqrt{h_2})^2}{A} \quad \text{when } S > L$$

$$L = \frac{AS^2}{100(\sqrt{2h_1} + \sqrt{2h_2})^2} \quad \text{when } S < L$$

where: S = Stopping sight distance.
A = Algebraic difference in grade.
h_1 = 4 1/2 ft. - eye height of cyclist.
h_2 = 1/3 ft. - height of object.
L = Minimum vertical curve length.

FIGURE A-5

LATERAL CLEARANCES ON HORIZONTAL CURVES



Line of sight is 2.0' above ℄ inside lane at point of obstruction.

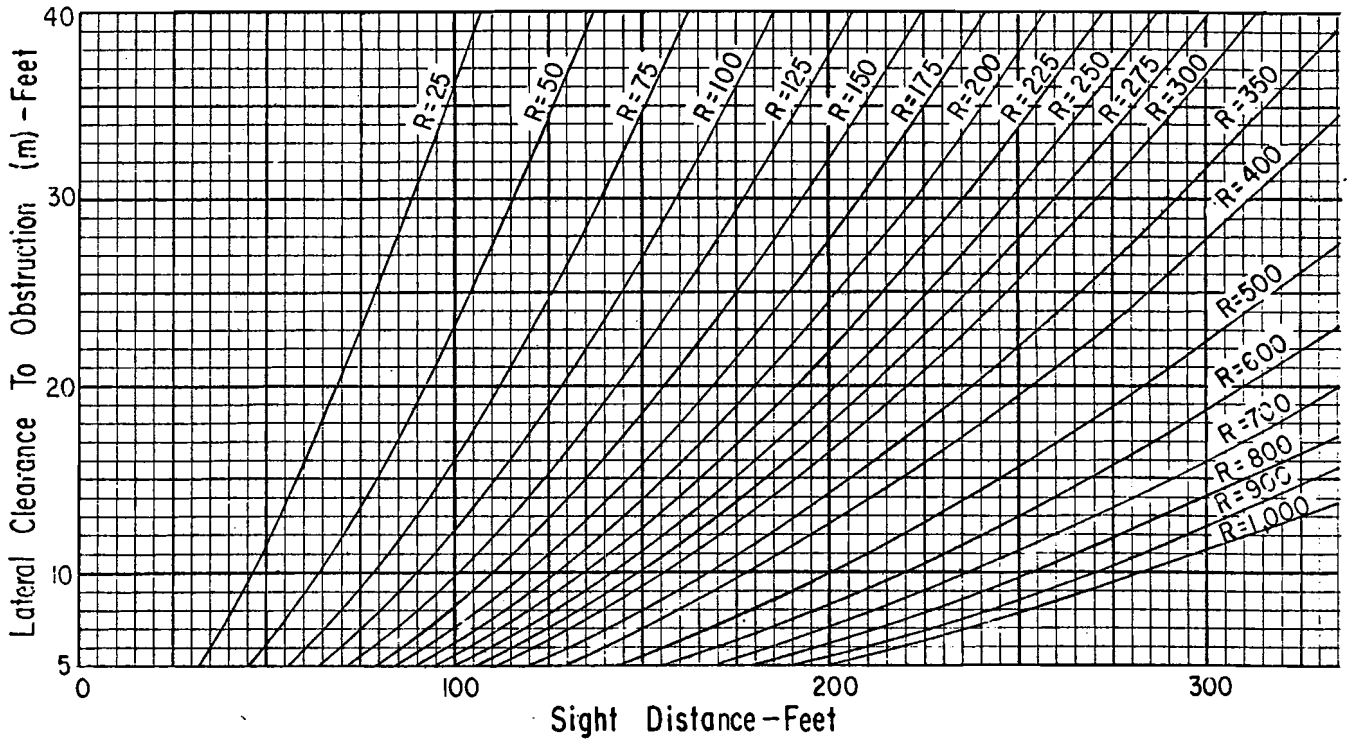
S = Sight distance in feet.
R = Radius of ℄ inside lane in feet.
M = Distance from ℄ inside lane in feet.
V = Design speed for S in M.P.H.

Angle is expressed in degrees

$$m = R\left[\text{vers}\left(\frac{28.65S}{R}\right)\right]$$

$$S = \frac{R}{28.65}\left[\cos^{-1}\left(\frac{R-m}{R}\right)\right]$$

Formula applies only when S is equal to or less than length of curve.



Source: Planning and Design Criteria for Bikeways in California

can increase bicyclists' confidence that motorists will not stray into their path of travel if they remain within the bike lane. Likewise, with more certainty as to where bicyclists will be, passing motorists are less apt to swerve toward opposing traffic in making certain they will not hit bicyclists.

Bike lanes must be one-way facilities. Two-way bike lanes (or bike paths that are contiguous to the roadway) should not be permitted, as such facilities have proved unsatisfactory for the same reasons given for bike paths immediately adjacent to streets and highways, as well as for the following additional reasons:

- They require one direction of bicycle traffic to operate against motor vehicle traffic, contrary to normal vehicle operation rules.
- The increased closing speed between wrong-way bicyclists and approaching autos reduces the available maneuver time for each and increases the likelihood of serious accidents.
- Where a two-way bike lane is wide enough, motorists might encroach within the lane to pass to the right of stopped motorists who are preparing to make a left turn. In such instances, the potential for head-on collisions with bicyclists is created.

Widths

Some typical Class II bikeway configurations are illustrated in Figure A-6 and are described below:

- **Figure A-6(A)** - depicts bike lanes on an urban-type curbed street where parking stalls (or continuous parking stripes) are marked. Bike lanes are located between the parking area and the traffic lanes. Minimum widths are shown.

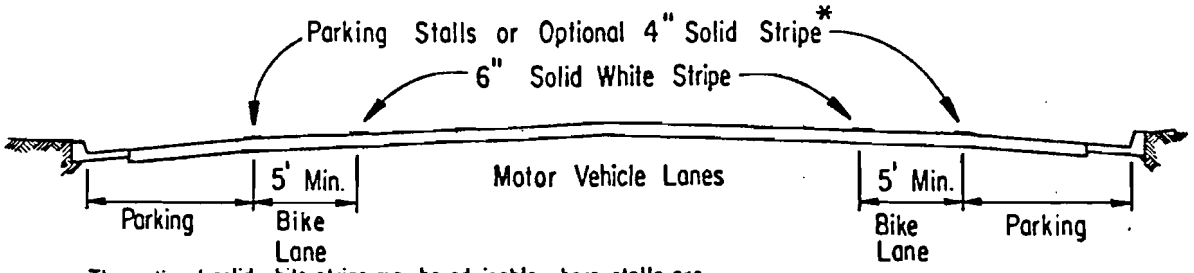
  Bike lanes should not be placed between the parking area and the curb. Such facilities create hazards for bicyclists, with opening car doors and poor visibility at intersections. Also, they prevent bicyclists from leaving the bike lane to turn left, and cannot be effectively maintained.

- **Figure A-6(B)** - depicts bike lanes along the outer portions of an urban-type curbed street, where parking is prohibited. This is generally the most desirable configuration for bike lanes, as it eliminates potential conflicts resulting from auto parking (e.g., opening car doors). Minimum widths are shown. With a normal 2-foot gutter, the minimum bike lane width should be 6 feet. The intent is to provide a minimum 4-foot-wide bike lane between the traffic lane and the longitudinal joint at the concrete gutter, since the gutter reduces the effective width of the bike lane for two reasons. First, the longitudinal joint will not always be smooth, and may be hazardous to ride along. Secondly, the gutter does not provide a suitable surface for bicycle travel.

FIGURE A-6

TYPICAL BIKE LANE CROSS SECTIONS

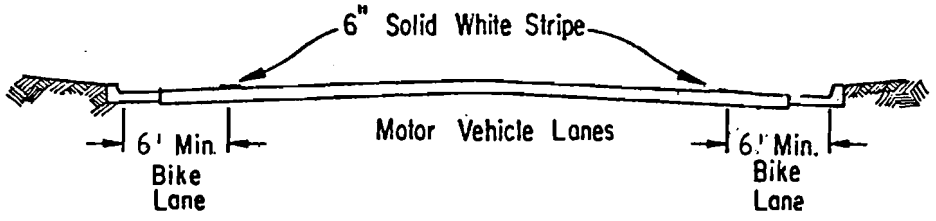
ON 2-LANE OR MULTI-LANE HIGHWAYS



* The optional solid white stripe may be advisable where stalls are unnecessary (because parking is light) but there is concern that motorists may misconstrue the bike lane to be a traffic lane.

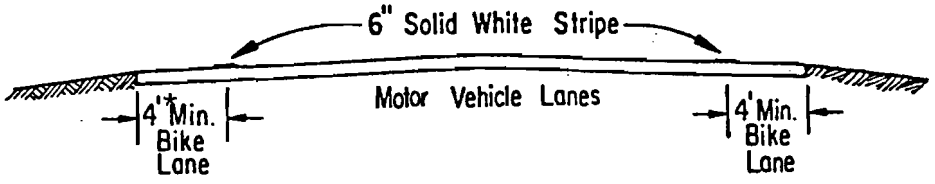
15' Min.

(A) PARKING PERMITTED



(B) PARKING PROHIBITED

URBANIZED AREA (CURBS & GUTTERS)



(C) TYPICAL ROADWAY IN OUTLYING AREAS

*5' where motor vehicle lanes are less than 12' wide

Based on the Planning and Design Criteria for Bikeways in California.

Striping bike lanes next to curbs where parking is prohibited only during certain hours should be done only in conjunction with special signing to designate the hours bike lanes are to be effective. Since most states' Vehicle Codes require bicyclists to ride in bike lanes where provided (except under certain conditions), proper signing is necessary to inform bicyclists that they are required to ride in bike lanes only during the course of the parking prohibition. This type of bike lane should be considered only if the vast majority of prohibition, and only if there is a firm commitment to enforce the parking prohibition. Because of the obvious complications, this type of bike lane is not encouraged for general applications.

- **Figure A-6(C)** - depicts bike lanes on a highway without curbs and gutters. Minimum widths are shown. Additional width is desirable, particularly where motor vehicle speeds exceed 40 mph. The bike lane should be at least 5 feet wide if the motor vehicle lanes are less than 12 feet wide.

The typical motor vehicle lane width next to a bike lane is 12 feet. There are situations where it may be necessary to reduce the width of motor vehicle lanes in order to stripe bike lanes. In determining the appropriateness of narrower motor vehicle lanes, consideration should be given to factors such as motor vehicle speeds, truck volumes, alignment and sight distance. Where favorable conditions exist, motor vehicle lanes of 11 feet may be feasible.

Bike lanes are not advisable on long, steep downgrades, where bicycle speeds greater than 30 mph are expected. As grades increase, downhill bicycle speeds will increase, which increases the danger of riding near the edge of the roadway. In such situations, bicycle speeds can approach those of motor vehicles, and experienced bicyclists will generally move into the motor vehicle lanes to increase sight distance and maneuverability. If bike lanes are to be striped, additional width should be provided to accommodate higher bicycle speeds.

If the bike lanes are to be located on one-way streets, other vehicle movements should be considered in determining whether the bike lane should be on the right- or left-hand side of the street. Bike lanes on the left side may cause bicyclists and motorists to undertake crossing maneuvers in making left turns onto a two-way street. On the other hand, there may be heavy bicycle/bus conflicts on the right side of the street or right-turn-only vehicle lanes may cause conflicts.

CLASS III BIKEWAYS

Class III bikeways (bike routes) are normally used to provide continuity to the bikeway system. Bike routes are established along through routes not served by Class I or II bikeways, or to connect discontinuous segments of bikeway (normally bike lanes). Class III bikeways are also used to indicate a preferred route for bicyclists to use, normally to show a route to a high demand

destination such as a school. Class III facilities are established by placing Bike Route signs along roadways.

Minimum widths for Class III bikeways are not presented, as the acceptable width is dependent on many factors, including the volume and character of vehicular traffic on the road, typical speeds, vertical and horizontal alignment, sight distance and parking conditions. Since bicyclists are permitted on all highways (except prohibited freeways), the decision to sign the route should be based on the advisability of encouraging bicycle travel on the route and other factors listed below. It is preferrable that roadways designated as Class III bikeways have a minimum of 15 feet outside traffic lanes, excluding motor vehicle parking width.

On-Street Bike Route Criteria

To be of benefit to bicyclists, bike routes should offer a higher degree of service than alternative streets. Routes should be signed only if some of the following apply:

- They provide for through and direct travel in bicycle-demand corridors.
- Connect discontinuous segments of bike lanes.
- An effort has been made to adjust traffic control devices (stop signs, signals) to give greater priority to bicyclists, as compared with alternative streets. This could include placement of bicycle-sensitive detectors on the right-hand portion of the road, where bicyclists are expected to ride.
- Street parking has been removed or restricted in areas of critical width to provide improved safety.
- Surface hazards to bicyclists have been corrected (e.g., utility covers adjusted to grade, potholes filled, etc.).
- Maintenance of the route will be at a higher standard than that of other comparable streets (e.g., more frequent street sweeping).

Sidewalk Bikeway Criteria

In general, the designated use of sidewalks (as a Class III bikeway) for bicycle travel is unsatisfactory, for the following reasons:

- Sidewalks tend to be used in both directions, despite any signing to the contrary. As such, bicycles coming from the right may go unnoticed by motorists crossing these facilities at intersections and driveways.

- At approaches to intersections, parked cars interfere with the visual relationships between motorists and bicyclists. At driveways, sight distances are often impaired by property fences and shrubs, etc.

- At intersections, motorists are not looking for bicyclists (which are traveling at higher speeds than pedestrians) entering the crosswalk area, particularly when motorists are making a turn.

- Sidewalks are typically designed for pedestrian speeds, and are not safe for higher-speed use. Conflicts between bicyclists and pedestrians traveling at low speeds (or exiting stores, parked cars, etc.) are common, as are conflicts with fixed objects (e.g., parking meters, utility poles, sign posts, bus benches, trees, hydrants, mail boxes, etc.). Also, bicyclists riding on the curb side of sidewalks may accidently drop off the sidewalk into the path of motor vehicle traffic.

It is important to recognize that the development of extremely wide sidewalks does not necessarily add to the safety of sidewalk bicycle travel, as wide sidewalks will encourage higher speed bicycle use and can increase potential for conflicts with motor vehicles at intersections as well as with pedestrians and fixed objects.

Sidewalk bikeways should be considered only under special circumstances, such as:

- To provide bikeway continuity along high-speed or heavily traveled roadways having inadequate space for bicyclists, and uninterrupted by driveways and intersections for long distances.

- On long, narrow bridges. In such cases, ramps should be installed at the sidewalk approaches. If approach bikeways are two-way, sidewalk facilities should also be two-way.

Whenever sidewalk bikeways are established, a special effort should be made to remove obstacles that will be hazardous to bicycle travel. Whenever bicyclists are directed from bike lanes to sidewalks, curb cuts should be flush with the street to assure that bicyclists are not subjected to the hazards of a vertical lip crossed at a flat angle. Also, curb cuts at each intersection are necessary, as well as bikeway yield or stop signs at uncontrolled intersections. Curb cuts should be wide enough to accommodate adult tricycles and two-wheel bicycle trailers.

In residential areas, sidewalk riding by young children too inexperienced to ride in the street is common. With lower bicycle speeds and lower auto speeds, potential conflicts are somewhat lessened, but still exist. Nevertheless, this type of sidewalk bicycle use is accepted. But, it is inappropriate to sign these facilities as bikeways. Bicyclists should not be encouraged (through signing) to ride facilities that are not designed to accommodate bicycle travel.

BICYCLES ON FREEWAYS

In some instances, bicyclists are permitted on freeways. Seldom would a freeway be signed or striped as a bikeway, but it can be opened for use if it meets certain criteria to be used in evaluating whether or not a particular segment of freeway should be opened for bicycle use. Essentially, the criteria involve assessing the safety and convenience of the freeway as compared with available alternate routes. If a reasonable alternate route exists, it would normally be unnecessary to open the freeway. However, if the alternate route is inconvenient (e.g., it involves substantial out-of-direction travel) and/or is considered unsafe for bicycle travel (e.g., high speed traffic, no paved shoulders, poor sight distance, etc.), the freeway may be a better alternative for bicyclists. However, a freeway should not be opened to bicycle use if it is determined to be inherently unsafe (e.g., narrow lanes, no shoulders, freeway-to-freeway interchanges, etc.). Normally, freeways in urban areas will have characteristics that make it infeasible to permit bicycle use. Where no reasonable alternative exists within a freeway corridor, development of a separate bike path should be considered if dictated by demand.

When bicyclists are permitted on segments of freeway, it will be necessary to modify and supplement freeway regulatory signs.

MULTIPURPOSE RECREATIONAL TRAILS

In some instances, it may be appropriate for recreational agencies to develop multipurpose recreational trails-- for hikers, joggers, equestrians, bicyclists, etc. Many of these trails will not be paved, and will not meet the standards for Class I bikeways. As such, these facilities should not be signed as bikeways. Rather, they should be designated as recreational trails (or similar designation), along with regulatory signing to restrict motor vehicles, as appropriate. If recreational trails are to serve primarily bicycle travel, they should be developed in accordance with standards for Class I bikeways.

FUNDING FOR BICYCLE FACILITIES

There are a variety of sources, both public and private, from which funding for bicycle programs may be obtained. Large corporations often provide funding or literature regarding bicycle safety. However, the major source of funding for bicycle projects is the Federal Government which has established a variety of programs. These programs are funded with a pre-determined Federal share for each program with the remainder contributed by State and local government.

FEDERAL FUNDING

Procedures and requirements for obtaining federal funding may vary from program to program and state to state. Although these programs are Federally-assisted, a number of them are administered exclusively through the States, which may impose their own requirements and procedures.

A partial listing of agencies that oversee the funding programs is shown below along with addresses and telephone numbers for further information.

CONTACT	TYPE OF PROJECT OR PROGRAM
The Department of Transportation - Federal-Aid Highway Program Federal Highway Administration U.S. Department of Transportation Washington, D.C. 20590 (202) 426-0314	Planning and construction of bicycle facilities as incidental feature of Federal-Aid Highways concurrent with highway construction.
- Niagara Frontier Transportation Committee 181 Ellicott Street P.O. Box 5008 Buffalo, New York 14205 (716) 856-2026	Planning and assistance of incidental and/or separate bikeway facilities.
- Highway Safety Program Office of Management Services Division of General Services NAD - 42 NHTSA U.S Dept. of Transportation Washington, D.C. 20590	Development of highway safety programs which may include bicycle accident studies.

CONTACT	TYPE OF PROJECT OR PROGRAM
The Department of the Interior - Land and Water Conservaton Fund Program Heritage Conservation and Recreation Service Northeast Regional Office 600 Arch Street Phladelphia, PA 19106 (215) 597-7391	Land acquisition and development of recreation facilities including bikeways.
- Historic Preservation Funds Office of Archaeology and Historic Preservation National Register Division Heritage Conservation and Recreation Service U.S. Department of the Interior, Washington, D.C. 20240	May be used for the development of bicycle trails on National Register Historic Properties.
The Department of Housing and Urban Development - Community Development and Block Grant Program Consumer Protection Information Center U.S. Department of Housing and Urban Development Washington, D.C. 20410 (202) 755-6240	May be used for the construction of bicycle facilities.
The Environmental Protection Agency - Wastewater Treatment Grants Program Office of Land Use Coordination, A-101, U.S. Environmental Protection Agency Washington, D.C. 20406 (202) 755-8835	May be used for bikeway planning between population centers, water bodies, and recreation areas.
The National Endowment for the Arts - Architecture, Planning and Design Architecture Planning, and Design Program, National Endowment for the Arts 2401 E. Street, N.W. Washington, D.C. 20506 (202) 634-4276	Provides grants to organizations including non-profit institutions, universities, and State and local government agencies to promote excellence in design quality.

CONTACT	TYPE OF PROJECT OR PROGRAM
- Design, Communications and Research Programs Architecture Planning, and Design Program, National Endowment for the Arts 2401 E. Street, N.W. Washington, D.C. 20506 (202) 634-4276	Provides grants to non-profit organizations for a broad range of activities in the area of design.
The Department of Health Education and Welfare	
- Safety Education Program U.S. Office of Education Division of State Education 400 Maryland Avenue, S.W. ROB 3, Room 3010 Washington, D.C. 20202	Provides funding to States for safety education on the basis of school age population.
The Department of Commerce	
- Public Works Grant Program Economic Development Administration Office of Public Affairs 14th and Constitution Avenues, N.W. Room 7019 Washington, D.C. 20330	Provides grants to thousands of communities with a wide variety of public works projects, in a few cases, have included bikeways.
The Department of Energy	
- Appropriate Technology Small Grants Program U.S. Department of Energy Freedom of Information Office Washington, D.C. 20545	Grants awarded to individuals, small businesses, local non-profit organizations and Indian tribes to support small scale technologies. Bicyle oriented proposals could be considered.
The Department of Labor	
- Employment Programs Office of Community Employment Programs Room 5317 U.S. Department of Labor 601 D Street, N.W. Washington, D.C. 20213	Provides funds to municipal governments of areas of more than 100,000 population to create new jobs. May be used to provide salaries for bicycle coordinators and for bicycle related projects.

CONTACT	TYPE OF PROJECT OR PROGRAM
The Department of Agriculture - Watershed Protection Program Information Division Soil Conservation Service U.S. Department of Agriculture P.O. Box 2890 Washington, D.C. 20013	Grants for providing technical and funding assistance to State and local governments for water-related conservation projects including bike trails.
- Resource Conservation and Development Program Ecological Science Technology Division Soil Conservation Service U.S. Department of Agriculture P.O. Box 2890 Washington, D.C. 20013	Grants to develop economic opportunities and improve the quality of the environment through the conservation of natural resources. Projects such as bikeways along beach or marshland improvements might be considered.

STATE FUNDING

Major sources of bicycle funding from the State of New York include:

CONTACT	TYPE OF PROJECT AND PROGRAM
The Niagara Frontier State Park and Recreation Commission Prospect Park Niagara Falls, New York 14303 716-278-1770	Bikeway planning and construction in order to connect parks
The New York State Department of Transportation General W.J. Donovan State Office Building Buffalo, New York 14203 716-842-4435	Planning and construction of incidental and/or separate bikeway facilities

LOCAL FUNDING

Local funding sources within the study area were investigated by contacting county and municipal agencies. For the most part local funding sources were nearly non-existent except for matching shares related to federal programs such as the City of Buffalo that provided funds for some of the bike routes in the City in conjunction with the Urban Mass Transportation Administration.

A source of fund-raising on the local level is to organize a bike-a-thon like the "Bucks From Bike-A-Thon For Bikeways" which was developed for the Huffy Corporation. Bike-a-thons have raised as much as $149,400, as described in the Huffy publication booklet. According to the booklet:

> "A bike-a-thon is simply an organized community event that generates funds and public awareness for the cause that sponsors it, while at this same time, providing a safe, meaningful ride for the bikers of a community. Because people develop a desire to participate in the event, they become solicitors and donors for the sponsoring cause.

The basic principles of a bike-a-thon are simple. The object is to recruit as many bikers as possible to ride a prescribed distance. The bikers ask for and obtain financial sponsorship from friends, relatives, neighbors, and businesses at a pledged amount of money per mile. Each person riding will pass through checkpoints to have his route card validated. After the event, collected pledges are contributed to the sponsoring charitable or civic group."

The booklet that describes how to set up a bike-a-thon may be purchased from the Huffy Corporation, P.O. Box 1204, Dayton, Ohio 45401 at a cost of one dollar per copy.

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