Regional Bicycle Plan

March 1988

Prepared by
Chittenden County Regional Planning Commission
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INTRODUCTION

Bicycle transportation has emerged as an important issue for many Chittenden County communities. Several communities have aggressively pursued planning and construction of bicycle facilities. Moreover, many highway construction/reconstruction projects now have bicycle facilities incorporated into their final design. Area planners have long recognized the importance of planning for transportation facilities on a regional basis. That is, transportation and recreation needs do not end at municipal boundaries. Consequently, the Chittenden County Regional Planning Commission (CCRPC), at the request of the Chittenden County Metropolitan Planning Organization (CCMPO), has prepared this regional bicycle plan. The plan provides guidelines and a framework for development of an integrated regional bicycle network. The emphasis of the plan is on major facilities: Class I and Class II bike facilities. However, it was necessary to inventory all facilities, including Class III facilities, and incorporate them into the regional network. Although this plan concentrates on the nine MPO communities, it was important to illustrate and plan for links into all Chittenden County communities. (See Map 1, Base Map). The following pages identify the methodology used to develop the plan, present an inventory and evaluation of existing facilities, and present recommendations for new or upgraded, Class I and II facilities. The plan concludes with suggestions for financing and constructing the recommended facilities. This plan is the product of an interdisciplinary effort, involving CCRPC staff, a landscape architect and a University of Vermont senior in recreational management. In addition, many valuable comments were contributed by the local planning community and the CCMPO Technical Advisory Committee.
BACKGROUND

The conclusions and recommendations reached in this plan draw on an inventory of existing and proposed bicycle facilities focussing on the nine MPO communities (Burlington, Colchester, Essex, Essex Junction, Milton, Shelburne, South Burlington, Williston and Winooski). Data on facilities were collected by contact with town planners, recreation directors and street department superintendents in combination with field surveys of existing facilities throughout the county. The information which town officials provided was essential in completing this plan. The data received was then compiled into a map of existing facilities along with an overlay depicting locally proposed facilities. Bicycle facilities fall into one of three classes (See Figure 1)

Class I (Bike Path): a paved path separate from the street.
Class II (Bike Lane): a separately marked lane on existing roads.
Class III (Bike Route): A facility that is signed and where the bicycle shares the road with motor vehicles.

The map of existing facilities was used to identify gaps and misalignments in existing and proposed facilities. The identification of these gaps was an important first step in establishing a regional network that would foster work and recreational bike travel between communities. This plan, however, goes beyond merely suggesting connections between existing routes. It views bicycle travel within the context of the regional transportation system, and emphasizes the need to coordinate bikeway planning and construction with other modes, particularly automobiles and public transportation.

Research of successful bicycle networks in Eugene, Oregon, Ottawa, Canada and other small scale projects provided pertinent information about establishing, operating, maintaining and funding a successful network of bicycle facilities. One point which was stressed throughout the literature was that bicyclists choose the bicycle as their mode of transportation for many different reasons. These bicycle trip purposes can be divided into two broad types: utilitarian and recreational. For utilitarian trips the primary objective is to reach a specific destination quickly and safely with few interruptions. By contrast, the recreational trip is by definition, for pleasure, with speed of travel generally less important. New bicycle facilities, therefore, should be designed to accommodate the needs of the anticipated mix of bicyclists by providing safe aesthetically pleasing facilities which take commuters from points of destination as directly as possible.
BIKE PATH
(CLASS I)

BIKE LANE
(CLASS II)

SHARED ROADWAY
(CLASS III)

Figure 1. Bicycle Facility Alternatives
Before a bike route can be selected from among the various alternatives, a host of factors need to be analyzed. These factors help to define the requirements of a good route for bicyclists and are included in a matrix on page 25. These factors include those items that respond to the needs and desires of cyclists (alignment factors) and those that reflect the degree to which a street or highway accommodates the shared use of motor vehicles and bicycles (suitability factors).

A proposed alignment for a bicycle facility is a function of the route's attractiveness, grades, security, directness and continuity. Attractiveness is a subjective quality based on aspects of scenery, points of historical interest, access to water bodies, variety of terrain and access to recreation opportunities, as well as other services. Depending on the trip purpose, the significance attractiveness plays in the bicyclist's choice of route will vary. Grade is also an important aspect of a bicycle route's desirability. Some cyclists seek the challenge of steep grades; in contrast, others avoid steep, hilly terrain. Bicyclists are capable of negotiating 15% grades over short distances. However, grades of 4% to 5% represent maximum desirable grades except at overpasses or underpasses.

The level of security a bicyclist feels must also be considered. Adequate lighting and avoidance of remote areas are important guidelines to follow when selecting routes. The potential for criminal acts against the bicyclist is an obvious deterrent to the prospective bicyclist, particularly in urban areas. It should also be noted that oftentimes remote areas cannot be avoided while traveling between destinations; and that remote environments may be considered desirable for recreational bicyclists provided there is good visibility which fosters a sense of security for the bicyclists. In addition, secure bicycle parking facilities, such as racks or lockers which help protect parked bikes from theft or vandalism are important. The extent to which a route covers the shortest distance between two points, also known as directness, is a key characteristic to consider. As mentioned earlier, directness is particularly important to the utilitarian bicyclist who has an exact destination.

For a route to serve the needs of bicyclists it must be continuous and logical. The route should provide clear connections to the destinations bicyclists are likely to seek, and should avoid hazardous conditions. Overall feasibility of a prospective route is the final alignment factor to consider. The route must be free of barriers and bottlenecks, and it must not pose too many difficulties for the anticipated users. The bicycling environment it provides must be viewed as superior to alternate routes or choices of transportation.

It is important next to identify factors which make a particular segment of a street or highway suitable for bicycle use. These suitability factors include shared use, frequency and
The most important factor in establishing suitability is the degree to which a street or highway can safely accommodate shared use by motor vehicles and bicyclists. In determining whether adequate space is available it is necessary to assess what space is available, and then determine how much is actually desired to accommodate shared use under present roadway conditions. The amount of space available is determined by the presence and condition of a paved shoulder and the condition of the right most useable pavement.

The pavement condition including the presence of collected debris on the right hand side of a lane and possible surface deterioration, such as rutting or raveling, will affect the amount of available space. The amount of space required for shared use will also be affected by traffic volume and speed; as both variables increase so will the amount of space desirable for separation between bicycle and motor vehicle. The presence of parking on a street will essentially either reduce the amount of space available or increase the amount of total space desired for shared use. If diagonal parking exists a greater amount of space is necessary for providing safe bicycling facilities.

Since intersections and driveways are the location of the majority of bicycle/motor vehicle collisions, they should be considered an important factor in assessing the suitability of potential bicycle routes. Since intersections and driveways cannot be avoided, it is important to determine the number of each per mile so comparison of potential alternative routes can be accomplished. Restricted sight distance for both bicyclists and motorists is another important consideration in assessing suitability. Where hazards are found, the appropriate response would be to treat the location rather than eliminate the route from further consideration.

The presence or absence of traffic control devices can affect the suitability of a route for bicycle travel. Traffic signals on bicycle routes should have sufficient clearance intervals to allow cyclists to safely and legally clear the intersection.

Pavement and surface features are acutely important to the bicyclist because of the narrow tires and high center of gravity which make bicyclists aware of the smoothness of the pavement. The area of the pavement most frequently used, the right portion of the roadway, is also the most likely area to deteriorate, and least likely to be maintained. Pavement irregularities such as railroad crossings, utility covers and drainage grates pose an obvious hazard to the bicyclist. Treatments such as rubberized railway crossing and bicycle safe drainage grate insets should be installed, thereby enhancing the riding surface, as well as helping to alleviate liability risks for state or local agencies.
Marking and warning signs are recommended for those hazards that cannot be easily corrected. All signing and pavement marking should be in strict adherence to the Manual on Uniform Traffic Control Devices (MUTCD).

A planning consideration that has recently emerged is bicycle access to public transportation. It has been suggested that bicycle-transit linkages can enhance transit performance and ridership, and reduce energy use, air pollution and traffic congestion. Promotion of transit access by bicycle could open new markets for suburban public transportation. The Surface Transportation Assistance Act of 1987 (Title III, Sec. 326) specifically includes 90% federal funding for projects that "provide access for bicycles to mass transportation facilities, to provide shelters and parking facilities for bicycles in or around mass transportation facilities, or to install racks or other equipment for transporting bicycles on mass transportation vehicles." Such activities are deemed to be construction projects eligible for assistance under sections 3 and 9 of the mass transportation act. "Access for bicycles to mass transportation facilities" is interpreted by UMTA to mean immediate access to transit stops or stations, but not construction of bikeways to transit stations from surrounding neighborhoods. Accordingly, regional officials should work with the CCTA to determine whether funding should be sought for eligible projects. Potential projects include: enhancing immediate bicycle access to the Cherry Street terminal, including establishment of secure racks. At CCTA's request, CCRPC could examine the feasibility of improving access and storage at this as well as other high use bus stops.

The dimensions of a bicycle and rider form a foundation to develop facility standards. Although dimensions may vary slightly with model and size, the standards of the average adult rider and the bicycle are:

width (Handle bar): 2.00 feet
length: 5.75 feet
height: 7.40 feet

It is possible to attain speeds in excess of 30 mph on a bicycle, but normal speeds range from 7 to 20 mph. A desirable working design speed is 20 mph.

When intended to accommodate bicycle travel, shoulder width should be a minimum of four (4) feet: If motor vehicle speeds exceed 35 mph and if the proportion of heavy vehicles in the traffic stream is high, then additional width is desirable. In those cases where Class II facilities (i.e. bike lanes) are under design, a minimum bicycle lane width, under ideal conditions, is four (4) feet for one-way travel. Figure 2 illustrates typical bicycle lane cross sections for design purposes.
When designing Class I facilities. (i.e. bicycle paths on a separate right-of-way) a desirable minimum width for two direction travel is ten (10) feet, but eight (8) feet is acceptable.

For an outline of design guidelines (horizontal alignment, super elevation, and sight distance) refer to the "Guide for Development of New Bicycle Facilities" (AASHTO, 1981).
(a) CURBED STREET WITH PARKING

(b) CURBED STREET WITHOUT PARKING

(c) STREET OR HIGHWAY WITHOUT CURB OR GUTTER

Figure 2. Typical Bicycle Lane Cross Sections
INVENTORY OF EXISTING FACILITIES

This section presents a description of the bicycle facilities available in each MPO community. All Class I and Class II existing facilities are shown on Map 2, Existing and Locally Proposed Bicycle Facilities.

Milton

- Class II bike lane from border with Colchester on US 2 to Sand Bar State Park. Currently heavily traveled road (approximately 7,000 ADT) at high speeds; well signed; 8-10 foot shoulders on both sides. Wide shoulder continues up until border with Grand Isle but bike route signs end at Sand Bar.

Colchester

- Class III route on Jasper Mine Road (Old US 2) crossing over to new US 2 at Lamoille River. Signed at all major connecting roads, very little traffic on old US 2 with only residential local traffic since road cul-de-sacs at the Lamoille River.

- Class III on VT 127 from Prim Road to Malletts Bay Avenue where it changes over to Class II and turns on to Blakely Road (moderate to heavy traffic - 5,830 ADT) until US 7 where the bike lane crosses over to Severance Road; ending where Severance meets Kellogg Road. Signed where it connects with US 7, but otherwise poorly marked and signed. Minimal existing shoulder except in school zones.

Shelburne

- Class II lane beginning at northern boundary with South Burlington on Spear Street running south until it reaches Morse Drive. Daily traffic volume was 3,480 in 1985. Lane is only on western side of road. Inadequate shoulder width, and adequate signing. Currently used by high volume of bicycle traffic from Burlington area bicycling clubs.

Essex Junction

- On VT 117 (Maple Street) a Class II lane from Railroad Street, east to Albert D. Lawton School. On both sides of road, well marked, signed and maintained. This is a heavily used lane, particularly by students; some students ride against the vehicle flow. This is an unsafe practice which needs to be addressed by village school officials.

Burlington

- Burlington Bikeway Class I facilities running from the mouth of the Winooski River to Waterfront Park along Lake
Champlain. When it crosses the railroad tracks near the Burlington Water Department it becomes a Class II lane as it follows Lake Street but then returns to Class I at the intersection with College Street and extends to Perkins Pier.

- From Perkins Pier Class III bike route heads east up Maple Street until it reaches Pine Street and turns south on Pine until Lakeside Avenue where it becomes a Class II route following Proctor Street until it deadends. The Bikeway then becomes a Class I path connecting Proctor with Flynn Avenue to Oakledge Park and through the park to Austin Drive.

- Beginning on North Avenue at its intersection with North Street a Class II lane runs northwest on both sides of North Avenue until Institute Road (Burlington High School entrance).

- Class I path paralleling VT 127 (Northern Connector) from Winooski Valley Park District main office to bridge crossing at the end of Ethan Allen Parkway.

- Class I path and walkway which begins several hundred feet from Heineberg Bridge continuing across the bridge to Colchester.

- Class II lane only on north side of road along Riverside Avenue from Colchester Avenue to North Willard Street; it is not actively maintained, a lot of debris vegetation obscures signs and encroaches on lane, is moderately used.

- Class III facilities running westward on North Street from North Willard to North Avenue.

In general, the Class I facilities are heavily used for utilitarian and recreation trips.

**South Burlington**

- Class III route on Spear Street running from intersection with Allen Road north to Swift Street intersection; continues east and west on Swift Street until it meets Dorset Street and Route 7, respectively. Then turns north on Dorset to South Burlington High School and changes to Class I path behind schools on sewer line right-of-way to residential Hopkins Street.

- Class III running from Williston Road/Spear Street intersection and changes to Class II until Spear Street passes under I-189 where lane ends.

**Williston**

- Presently has no designated bicycle facilities.

**Essex Town**

- Class I running along Allen Martin Drive into the Saxon Hill industrial park.
EXISTING AND LOCALLY PROPOSED BICYCLE FACILITIES

Existing:
- Class I
- Class II

Proposed:
- Class I
- Class II

Map 2

1" = 1.75 Miles
DISCUSSION OF LOCALLY PROPOSED BICYCLE FACILITIES

BURLINGTON

For the last ten years the City of Burlington has been committed to the provisions of pedestrian/bicyclist access, which can be evidenced by the Burlington Bikeway. Negotiations are currently underway to complete the lakeshore route between the barge canal and Oakledge Park. In addition, Class I facilities are proposed to follow the Southern Connector on its east side from Queen City Park Road to the connector's terminus with Pine Street and from Home Avenue to Queen City Park on the west side of that highway. Burlington has now undergone a complete review of bike lanes, Class I, II and III.

COLCHESTER

The town intends to reconstruct Blakely Road in the near future; this project will include features that will enhance bicycle travel: widened shoulders. In addition, Class II facilities are included in a proposed improvement project along Lakeshore Drive, Bay Road and Route 127. In the preliminary study of this project dated September 1987, a proposal for a four foot lane on one side of Lakeshore Drive between Bayside Park and 300 feet onto Bay Road is considered. Bicycle facilities are not recommended for only one side of the road because bicyclists are forced to travel against the flow of traffic increasing the possibility of an accident occurring. Facilities on both sides are preferable, particularly on roads such as this which see moderate to heavy traffic volumes. Also the possibility of the community purchasing private lands along Lakeshore Drive to create public parkland provides additional incentive and demand for a bicycle lane on both sides of Lakeshore Drive. Also included in this improvement project is a Class II network on both sides of Bay Road until it intersects with Route 7.

ESSEX

The Town of Essex outside the Village, has had a long standing policy of planning for and encouraging the construction of bikeways. In a publication entitled "Proposal for a Quality Environment Plan for Essex Town" (1973), there is a statement which summarized the philosophy of the Town at that time.

"Planning for a quality environment seeks to reduce the dominance of the auto in our land use and to provide alternative means of movement."

In April of 1980, the Planning Commission held an informal work session to discuss a sidewalk development plan for the Town outside the Village. The following locations were suggested:

- Bikeway from the Middle School to Greenbriar Drive.
- Bikeway from Sand Hill Road to Pinewood Manor along River Rd.
- Bikeway from Essex Center to Butlers Corners.
- Bikeway along Colchester Road to the Colchester/Essex line.
- Bikeway from Abare Road to Colchester Road along Susie Wilson Road
- Bikeway from Essex Center to Elementary School.
- Bikeway from Essex Center to Jericho/Essex line.

In 1981, a non-motorized transportation plan was prepared by the Planning Commission to be later incorporated in an update of the Town Plan. However, this plan was not included in the recently adopted Municipal Development Plan. The primary reason for not including this in the Plan was due to a desire to reevaluate the type of bikeway that should be constructed - i.e. bike path, bike lane, or bike route. It is also anticipated that new development patterns, updated information on traffic volumes and the presence of the Circumferential Highway will necessitate some changes to the plan envisioned seven years ago. The staff and the Planning Commission are in hopes of preparing a detailed sidewalk/bikeway plan this year.

In general, however, the Town is working toward acquiring sufficient property for a bicycle trail network along major transportation routes - particularly Route 2A, Route 15, Old Stage Road, Route 117 and Susie Wilson Road. The construction of bikeways or sidewalks has been required or easements have been obtained to allow the future construction of these improvements whenever a major development has received approval from the Planning Commission. As a result of this policy, a bike path now runs along Allen Martin Drive in the Saxon Hill Industrial Park with plans for the path to be continued along the frontage of Sand Hill Road as these lots are built upon. There are specific plans for a bike path to be constructed along Essex Way in the Lang Farm Development and along the East-West corridor. The Planning Commission has also recently identified a need for a bikeway along Old Stage Road and Indian Brook Road due to the recent acquisition of Indian Brook Reservoir.

ESSEX JUNCTION

The Village of Essex Junction has planned for a local system of bicycle facilities to augment proposed Class II facilities on key corridors along Routes 2A, 117 and 15 in the village. The proposed system apparent objectives are to provide loops, which bypass Five Corners, access residential neighborhoods with commercial and employment centers as well as with educational facilities. The close proximity of these activity centers and the lack of bus service for school age children creates demand for a bicycle transportation network for the village.

The locally proposed system includes Class II facilities on West Street and West Street Extension as well as on Summit Street and Park Street from Five Corners to the powerhouse dam. A network of routes are proposed to access the Essex Educational Center included in these are a Class I path through the fairgrounds from the Lincoln Street entrance off Route 2A, out
around the racing track to connect with Pearl Street at the western most entrance to the fairgrounds. Access to high school is also considered by a Class I path connecting with Route 15 on Taft Street through to the school then onto Educational Drive and Old Colchester Road to meet up with Route 2A.

Additional Class II routes are proposed on Brickyard Road and Mansfield Avenue to connect with existing Class II facilities on Maple Street which provide access to A.D. Lawton School. A Class I path is also proposed to connect Maple Street (Route 117) with Briar Lane in the general vicinity of the Lawton School. To provide commuter access to I.B.M. and to bypass Five Corners, Class II facilities are proposed on Rivert Street extending down toward I.B.M. with a Class I route angling off northward and connecting with Maple Street at about Maplewood Lane.

MILTON

The town currently has no locally proposed routes.

SHELBURNE

The town has planned for a local system of bicycle facilities. Aside from identifying the need within key corridors - US 7, Spear Street and Dorset Street - Shelburne has proposed developing a logical system of local routes. These routes would provide access to the western part of the town via Bay Road, Harbor Road and Bostwick Road; and to eastern Shelburne, via Webster Road and Marsett Road. These proposed links are shown on the map in Appendix A. In particular, the Bay Road/ Harbor Road links would be consistent with and reinforce the proposed regional network.

SOUTH BURLINGTON

The city has proposed as part of the South Burlington City Center improvement project, construction of a Class I bicycle path on both sides of Dorset Street between Kennedy Drive and US 2. In addition but separate from the City Center project, a Class II route is proposed alongside Kennedy Drive, providing a connection to Dorset Street and Spear Street via a short path along I-189 to connect with a proposed Class I facility on Spear Street. The city further proposes a Class I path following I-189 crossing over Shelburne Road and intersecting with proposed bicycle facilities on the Southern Connector.

WILLISTON

The Town of Williston has expressed a need to set aside open space and recreation land. In a plan entitled "An Open Space Recreation System Plan for the Town of Williston, Vermont" (1985) prepared for the planning commission by Jessie Aronow, a series of scenic recreational routes on South Brownell Road, South Road, Mountain View Road and Butternut Lane were proposed. In
addition, a combination walking and bicycle path along Allen Brook is proposed, and is considered to be the main priority of Williston's town planner.

WINOOSKI

The city has no proposed bicycle facilities.
PLANNING THE SYSTEM

In order to develop an effective, safe and convenient Regional Bicycle Plan, it seemed essential that a framework system of Class I and II routes be established between communities to allow for adequate county-wide movement. As indicated earlier, the major limitation of the local bicycle planning inventoried in this report has been its focus on movement within individual towns. While this certainly addresses the local needs for short distance trips around a given town, it has left regional connections to be made along existing arterial highways (US 7, US 2, VT 2A, VT 15, VT 116, VT 117 and VT 127) and major connecting roads. In most cases these routes have heavy traffic volumes, narrow shoulders, and frequent curb-cuts. In short, they are mostly inappropriate, unattractive and in some cases hazardous routes for bicycle travel. In a very limited number of instances these routes have adequate shoulders that can serve bicycle travel (bike lanes are marked on VT 127 segment in Colchester and on VT 117 segment in Essex Junction.) However, because these sections are few and isolated, their usefulness for regional movement is very limited. Furthermore, the most dangerous sections also tend to be the most important links in a Regional Bicycle Plan. For the small number of committed individuals who insist on using a bicycle for their local transportation, it means following circuitous, "home-made" routes along back streets, local roads, parking lots and even highway embankments; this minimizes travel along the congested unsafe arterials. For the rest of us, it means getting in our car.

As with arterial vehicular travel, "arterial" bicycle travel is best served by a facility that has a continuous geometry, limits conflicts with turning vehicles at access points (driveways) to adjacent property, minimizes on-grade intersections, and separates "thru" from "local" traffic. Major regional routes are, thus, best served by "Class I" bicycle routes -- paved bikeways that are positively separated from vehicular roadways. Within densely built urban cores or lesser travelled corridors in sparsely travelled areas, Class II facilities marked bicycle lanes may be appropriate. A framework system of Class I bikeways would provide direct, safe and convenient connections throughout the metropolitan region. Such a system, by virtue of its following a separate R.O.W. from that of vehicles, can also be an attractive, scenic route that can serve recreational as well as utility needs.

Latent demand for bicycle travel is an important related concern. Experience in other regions has shown that demand for bicycle travel (especially for shopping, working and school trips) rises dramatically once adequate facilities are provided. A Class I facility, the Burlington bikepath running about 5 miles from the Moran Generating Station to the mouth of the Winooski River bears this out. Since its opening a year ago it has seen extremely heavy use for recreational travel on weekends and
evenings. It also has substantial daily use for work-related travel, connecting the approximately 10,000 residents of the new North End with the Burlington High School and shopping and work destinations downtown. Especially in light of the generally high value Chittenden County residents place on fitness, outdoor activity and environmental quality, it is logical to conclude similar facilities providing attractive, safe and convenient bicycle movement throughout the metropolitan region, would be well-received and used.

In order to achieve the above objectives - direct routes which provide safe travel between communities - the planning team started with the inventory of existing and locally proposed facilities and applied a three-step process for identifying proposed Class I & II additions. First, existing and future commercial and residential activity centers were identified and mapped. (Map 3, Activity Centers) Public open space areas were also identified as potential destinations for the bicycle traveler. Using the activity Center map, the planning team then established desire lines for travel between the activity centers. A desire line is a straight line connecting the origin and destination of a trip; the line does not necessarily correspond to existing roads in the highway network. A desire line map (Map 4, Desire Lines) is comprised of many desire lines, and the width of each line represents the relative magnitude of travel on that line. The location of each line was then compared to the underlying existing street network, in an effort to assess how well the network serves the desire lines for bicycle travel. Then along major corridors, potential routes for separated Class I facilities were evaluated and planned to serve regional bicycle travel in the future. In an economically prospering and growing area such as Chittenden County suitable "slots" in the landscape for this type of facility disappear quickly. In the developed and developing areas of the county, opportunities for continuous, relatively conflict-free routes are generally limited to four types of corridors:

a) Railroad R.O.W.'s
b) Limited or controlled access highways
c) Major streams or rivers
d) Utility R.O.W.'s (to a lesser degree)

At this same time expanding populations increase the demand for such facilities. In undeveloped parts of the county, while routes are not so restricted, demand levels are much lower, especially for work travel. Thus, it is important to carefully assess future needs so as to allow adequate bicycle facilities to be planned and built in conjunction with expected land-use and development.

In the course of this study, it became apparent that there is a limited amount of data available on bicycle use in this metropolitan area. A review of the 1980 U.S. Census Journey-To-Work statistics revealed higher bicycle use in certain
communities (Burlington and Essex) but provided no information on usage by route. A survey of sales at local bicycle shops indicated increasing annual sales, but no conclusions could be drawn on the subsequent use of these bicycles. Observation of existing bicycle facilities (Class I and II) suggest that when safe facilities are provided, there is a substantial use for work, school and recreational travel. Information gathered through conversations with area residents strongly suggests a moderate level of work-related bicycle travel is occurring, particularly from March to November.

Predicting the type and volume of purposeful bicycle trips is extraordinarily difficult; there are few reliable procedures or methodologies for forecasting bicycle trips. However, the factors that influence which mode a traveler will use are known. These include:

- Flexibility of work schedule.
- Average trip length
- Age
- Automobile availability
- Cargo needs
- Street congestion
- Public transportation availability

Using the 1980 Census, as noted above, the highest level of bicycle use for work travel occurs by residents of Burlington, followed by Essex (and Essex Junction), South Burlington. Also from the Census, mean travel time to work, by private vehicle was about 16 minutes. Mean travel time to work by bicycle for the communities listed above was 11 minutes for South Burlington residents, 13.5 for Essex/Essex Junction and 13.9 for Burlington residents. This travel time information can be related to an assumption regarding the maximum travel time (or distance) reasonable for a bicycle trip. Data from other countries with high bicycle use (England and the Netherlands) indicate the average travel time for bicycle trips is around 10 minutes. Unfortunately, a trip length frequency distribution, by community is not available; this would reveal the frequency of automobile travel in the range where bicycles travel would be competitive, at least on a travel time basis. However, the Census data (UTPP.2, File II-4) does indicate a substantial amount of travel to work has a travel time of 10 minutes or less. Some of this travel, then, has the potential to be served by bicycle.

In terms of daily travel, the Census estimates about 1% of work travel is by bicycle. Assuming growth in bicycle travel from 1980 to 1987 at 1/2% per year, and assuming construction of safe direct facilities will divert travelers from other modes, future commuting to work by bicycle could reach a regional level of 3,000 to 8,000 daily trips. Distributing these trips between activity centers (that is, along desire lines) results in the daily route estimates shown on Map 4.
Road, Laurel

Estimted 1997
daily bicycle work
related trips
SHORT TERM RECOMMENDATIONS

Improvements to existing facilities are necessary to provide a safe environment for both bicyclists and motorists. These improvements include periodic maintenance, clearing of debris and vegetation, pavement marking, signage and dedication of rights-of-way. Upgrading existing facilities is important to decrease the liability concerns of the public entity providing the facilities, while providing safe enjoyable opportunities for the bicyclist.

Periodic maintenance such as debris and brush removal from bicycle facilities is essential to assuring that adequate sight distance for both the motorist and bicyclist. For example, the existing Class II route on Riverside Avenue; glass and other road debris force the bicyclist into the motorists' right-of-way. This situation is worsened further by the fact that vegetation obscures signs and restricts motorists sight distance. In cases such as this where traffic volumes are high, frequent signing and better pavement marking are necessary to alert motorists to anticipate the presence of cyclists. A similar situation where better signing and pavement markings could be used is on Blakely and Severance Roads in Colchester. Any additional signage should comply with the guidelines for bicycle facilities signing in the Manual on Uniform Traffic Control Devices (MUTCD).

In addition to improved signing along Blakely and Severance Roads, additional shoulder space of at least 4 feet on each side is necessary. At present, adequate space is provided on Blakely Road up to Lavigne Road, after which less than a one foot shoulder exists for bicyclists use. The same is true for Severance Road. The problem of providing adequate space for the bicyclist plagues many of the existing bicycle routes in Chittenden County. There are several routes including Spear Street in South Burlington and Shelburne which currently see a great deal of use by bicyclists, but very little, if any, space is available for the bicyclists. The same is true for the Burlington Bikeway from Leddy Park to Starr Farm Road. A high concentration of use as a result of its proximity to residential development results in a potentially dangerous situation where bicyclists, runners and other pedestrians share a five (5) foot right-of-way.

LONG TERM RECOMMENDATIONS

This plan - for independent bicycle projects and incidental bicycle projects - emphasizes transportation use, but also acknowledges the recreational value of these facilities. In all cases, the recommended projects will:

1. Enhance the safety of the motorist, bicyclist and/or pedestrian;
2. Be consistent with overall plan in terms of location, design, safety and contiguity; and
3. Conform to AASHTO standards for new bicycle facilities.

The following pages outline specific recommendations for upgrading and expanding the region's bicycle facilities. The matrices on pages 25 and 26 present the results of a route by route evaluation, using criteria discussed earlier in the report.

1. Circumferential Highway

A major recommendation of this report concerns the Chittenden County Circumferential Highway (CCCH). This plan proposes incorporating a bicycle facility into the design of the CCCH at the following segments:

- From US 2 in Williston to VT 2A/Susie Wilson Road in Essex.
- From Colchester High School to the Heineberg Bridge.

This assumes that current plans to provide bicycle facilities along Blakely, Severance and Kellogg Roads are implemented. These roads parallel the CCCH and provide good connections to existing and proposed activity centers.

2. Shelburne Road (US 7)

This plan recommends a Class I facility in the Shelburne Road corridor. The uniformly low scores for US 7 segments (see matrix) suggest that separate facilities may be warranted. The high volumes and frequency of driveways makes this road currently undesirable for a Class II shared use facility. However, US 7 is planned for widening and the Town of Shelburne has been in frequent contact with the VAOT regarding design elements, including location of a bicycle facility.

3. VT 15/127

This plan builds on the locally proposed plan for VT 15 by recommending Class II extensions from Essex to Westford and Jericho. To the west, the recommendation is to use a separate right-of-way paralleling VT 15 to US 2 & 7 in Winooski. This route would serve commuter trips, as well as provide access to Winooski Valley Park District facilities and the Fort Ethan Allen area. From Winooski, the recommendation is to use a right-of-way adjacent to the railroad to Intervale Road. From there, it would go northwest on Intervale Road, following the course of the Winooski River, connecting with the existing Class I facility along the northern connector.

4. Dorset Street - Spear Street connection

In developing this plan, it became apparent that portions of US 2 were highly unsuitable for bicycle travel. In an effort to identify an alternate route, this plan recommends a connection between Dorset and Spear Streets, spanning I-89, near University Mall.
5. Main Street (US 2)
The proposed widening of Main Street in Burlington should incorporate a Class II design to provide access to the Burlington CBD and the UVM campus.

6. Kimball Avenue - Shunpike Road
With the extension of Shunpike Road through Williston to VT 2A, a corridor parallel to US 2 will be established. Class II lanes should be provided on this new road.

7. VT 127
The emerging Prim Road - Lakeshore Drive activity center should be served by a Class II facility.

8. US 7 (Winooski - Colchester)
This segment is problematic in that severe grades are present in the Sunderland Brook area. In addition, the US 7 corridor north of I-89 Interchange 16 is proposed for substantial development. Moreover, US 2 & 7 continues to Milton and Sandbar State Park, two important activity centers. A Class II facility is proposed for this corridor.

9. Spear Street
This route is a lower volume alternative to US 7. As such, it should be developed as a Class II facility with bike lanes on both sides.

10. Burlington Bike Path
a. Northern extension to Airport Parkway, Colchester.

The extension of the Burlington bikepath over the Winooski River on a pedestrian/bicycle bridge is recommended. This logical connection between Burlington and Colchester would provide access to Delta Park extending through residential streets and terminating at Airport Park in Colchester. Although construction of a bridge over the Winooski would no doubt be expensive, the use of existing pylons that remain from the old railroad bridge, would help minimize the cost while providing a direct scenic route along the lake between Burlington and Colchester.

b. Barge Canal to Oakledge Park

This recommendation reinforces Burlington's proposal to link these two areas. Such a route would provide a scenic corridor along the lakefront while creating a direct connection on the bike path from Burlington's northern boundary to its southernmost border. This then will provide a connection to the US 7/Southern Connector corridor.
c. Southern Connector: Home Avenue to Route 7

As now planned, a Class I bike path is to be built in 1988 following the route of the Southern Connector from Home Avenue to Queen City Park Road. This will greatly enhance the ability of bicyclists to proceed to and from Queen City Park (a City of South Burlington public park). A logical and much needed extension would be a similarly designed corridor following the route of the connector between Route 7 (in the Sears shopping center area) to Pine Street. This would enable cyclists and in fact, pedestrians, to access Queen City Park and Pine Street from Route 7 and also vice versa for people wishing to reach the shopping centers from the neighborhoods split off by the Connector. A future bridge connecting the two Southern Connector bicycle links would also be a vital component in looping the entire system.

11. Grove Street - Patchen Road loop
A Class II connection between the Riverside-Colchester Avenue area with South Burlington that extends onto Hinesburg Road (VT 116) towards Hinesburg. Such a route would provide access to Jayceee Park in South Burlington and Schmanska Park in Burlington while servicing surrounding residential areas. This route could be included in current Patchen Road improvement projects.

12. Dorset Street - Hinesburg Road (VT 116)
To avoid US 2, a Class I route is suggested on Corporate Circle.

13. Swift extension to South Brownell Road
This would provide another east-west connection between South Burlington and Williston. This route would be consistent with Williston's plan for facilities on South Brownell, also providing a connection to proposed facilities on Shunpike Road and Kimball Avenue.
## TABLE 1

### ROUTE EVALUATION MATRIX

<table>
<thead>
<tr>
<th>Routes</th>
<th>Attractiveness</th>
<th>Grades</th>
<th>Security</th>
<th>Directness</th>
<th>Continuity</th>
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**Explanation of Scoring**
1 - Poor
2 - Fair
3 - Good

* Average Daily Traffic (ADT)

1 - > 5000
2 - 3000-5000
3 - 500-2999

**Includes lane drops, free right-turn lanes and freeway interchange ramps.**
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<th>TABLE 1</th>
<th>ROUTE EVALUATION MATRIX</th>
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<td><strong>Total Score</strong></td>
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REGIONAL BICYCLE FACILITIES SYSTEM

Existing Routes and all Proposed Additions

Map 6

1" = 1.75 Miles
FINANCING AND CONSTRUCTING THE SYSTEM

The long-term recommendations presented in this report are, in many cases, quite ambitious. The project development process — preliminary engineering, right-of-way acquisition — and construction activity are a function of three key elements: a sound long-range plan, a commitment by appointed and elected officials and adequate funds. It is important, therefore, that this long-range regional bicycle facilities plan receive public support, including funding.

On federal-aid highway projects, bicycle facility construction is an eligible cost, if the project is principally for transportation rather than recreational use. The recommendations in this plan expressly provide for utilitarian travel as well as recreational travel. Consequently, federal assistance should be available for any project in this plan that occurs on a federal-aid highway.

Other, non-federal options need to be pursued. Many bicyclists seem to support an annual registration fee, with revenues dedicated to bicycle path maintenance and construction. Additional state revenues should be sought in conjunction with VSA Title 19, Chapter 23 Bicycle Routes. In particular, Section 2302 (d) requires the VAOT to establish a bicycle fund, amounts from which shall be spent by the secretary for the "establishment, maintenance and improvement of bicycle routes, lanes and paths."

The bicycle path funding programs used in other states, such as Massachusetts and Oregon should be examined for applicability. The Massachusetts program uses a transportation bond issue to be used specifically for the construction of bicycle paths for commuters. The program uses a 75% state/25% local match, unless the facility is regional in nature; regional paths receive 100% state funding.

The Oregon Bicycle Program mandates that no less than 1% of state gas tax receipts each year will be spent on bicycle facilities. Several facets of the funding program are complex, involving local exemptions and special reserve funds.

A last approach could include a local option tax, perhaps added to the state gasoline tax, with revenues dedicated to bicycle path construction.

CONCLUSION

This regional bicycle plan inventories existing paths and presents long-term recommendations for improvements and additions. As such, it can serve as a useful guide for planning, designing and constructing a regional bicycle system.
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GLOSSARY

Arterial - A class of high volume street serving a major movement of traffic not served by a freeway.

Bicycle facilities - A general term denoting improvements and provisions made by public agencies to accommodate or encourage bicycling, including parking facilities, maps, bikeways, and shared roadways not specifically designated for bicycle use.

Bicycle Path (Class I) - A bikeway physically separated from motorized vehicular traffic by an open space or barriers, and either within the highway right-of-way or within an independent right-of-way.

Bicycle Lane (Class II) - A portion of the roadway which has been designated by striping signing and pavement markings for the preferential or exclusive use of bicyclists.

Bicycle Route (Class III) - A segment of a system of bikeways designated by the jurisdiction having authority with appropriate directional and informational markers, with or without a specific bicycle route number.

Bikeway - Any road, path, or way which in some manner is specifically designated as being open to bicycle travel, regardless of whether such facilities are shared with other modes of transportation or for exclusive use of bicyclists.

Collector - A moderate volume road serving two functions:
1) collecting traffic to and from local roads and arterials;
2) providing access to abutting properties.

Desire lines - A straight line connecting the origin and destination of a trip.

Grade separated - The crossing of two highways, walkways or a highway and a railroad at different levels.

Local street - A low volume street intended only to provide access to abutting properties.
BIBLIOGRAPHY


APPENDIX A

LOCAL BICYCLE PLAN MAPS