



THE

BIKEWAY

PLAN

COUNTY OF HAWAII
April, 1979

BIKEWAY PLAN

County of Hawaii

**Planning Department
25 Aupuni Street
Hilo, Hawaii
April, 1979**

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PLANNING DEPARTMENT

25 AUPUNI STREET • HILO, HAWAII 96720

COUNTY OF
HAWAII

HERBERT T. MATAYOSHI
Mayor

SIDNEY M. FUKU
Director

DUANE KANUHA
Deputy Director

November 30, 1979

To: The Citizens of Hawaii County

As alternate means of transportation are sought, the establishment of bikeways deserves serious consideration. While the Bikeway Plan was developed in response to growing concerns for the safety of the bicyclist, it included consideration of other plans and programs. By planning for the best use of bicycles, in conjunction with other modes of transportation, the bikeway system can complete the transportation network. The primary goal of the Bikeway Plan is to guide the development of a safe and useable bikeway system. A system which is both safe and functional will in turn encourage bicycling for recreational and utility/commuter purposes.

The Planning Department, Planning Commission, other governmental agencies, and the general public have generated considerable time and effort in the development of the plan. Public hearings on The Bikeway Plan were held by the Planning Commission on June 23 and 30, 1977, in Hilo and Kona, respectively. The public comments were very valuable and confirmed the irreplaceable principle of citizen participation in the planning process.

As a result of the public's inputs, the Planning Department re-analyzed the initial draft of the plan and presented its final recommendation to the Planning Commission. At its meeting on December 14, 1978, the Commission voted to send a favorable recommendation to the County Council on The Bikeway Plan.

Subsequently, on April 18, 1979, the County Council voted to approve Ordinance No. 435 adopting The Bikeway Plan for the County of Hawaii, State of Hawaii.

We are therefore pleased to transmit for your information The Bikeway Plan for the County of Hawaii.

Sincerely,

SIDNEY FUKU
Planning Director

CHIEF EXECUTIVE

Herbert T. Matayoshi, Mayor

COUNTY COUNCIL

Stephen Yamashiro, Chairman
James Dahlberg
Takashi Domingo
Tomio Fujii
Joseph Garcia
William Kawahara
Merle Lai
Muneo Sameshima
Harvey Tajiri

PLANNING DEPARTMENT

Sidney Fuke, Director
Duane Kanuha, Deputy Director

PLANNING COMMISSION

William Mielcke, Chairman
Shigeru Fujimoto
Lorraine Jitchaku
Haruo Murakami
Walsh Hanley
Bert Nakano
Alfredo Orita
William Paris
Charles Sakamoto

ACKNOWLEDGEMENTS

County of Hawaii

Department of Parks and Recreation
Department of Police
Department of Public Works
Department of Research and Development
Corporation Counsel
Office of the County Clerk
Office of the Legislative Auditor

State of Hawaii

Department of Land and Natural Resources
Department of Planning and Economic Development
Department of Transportation

COUNTY OF HAWAII - STATE OF HAWAII

ORDINANCE NO. 435

AN ORDINANCE ADOPTING THE BIKEWAY PLAN FOR THE COUNTY OF HAWAII,
STATE OF HAWAII.

BE IT ORDAINED BY THE COUNCIL OF THE COUNTY OF HAWAII:

SECTION 1. Legislative Intent

As alternate means of transportation are sought, the establishment of bikeways deserves serious consideration. The need for the establishment of a bikeway system is quite apparent.

At the present time, the County of Hawaii utilizes Chapter 291-C of the Hawaii Revised Statutes (Statewide Traffic Code) for governing the operation of bicycles. This traffic code requires that, "Whenever a usable bicycle lane has been provided on a highway, any person operating a bicycle...shall ride within such bicycle lane..." There is only one highway in the County which incorporates a designated lane for bicycles. Located in Kailua, this lane is the beginning of a system of bikeways in the County. In the interim, cyclists must share the roadways and/or sidewalks. However, this sharing of roadways and sidewalks, together with the increase of motorists and cyclists, present the probability of increased conflicts between motor vehicle, pedestrian and bicycle needs. In anticipation of this problem, the need of a bikeway plan was realized and subsequently developed. The creation of the Bikeway Plan is also linked to the Federal Highway Administration, a major source of bikeway funding, which stresses the need for a master plan in order to receive federal-aid participation on eligible bikeway projects.

While the Bikeway Plan was developed in response to growing concerns for the bicyclist, it included consideration of other plans and programs, including the Bikeplan Hawaii A State of Hawaii Master Plan. The County General Plan, which directs the overall development of the County, was consulted for policy guidance statements. It is with these following policy statements in mind that the Bikeway Plan was formulated.

The relationship of any bikeway system to other transportation system cannot be overlooked, both in terms of conceptual development and implementation. By planning for the best use of bicycles in conjunction with other modes of transportation, the bikeway system can provide an atmosphere of social, economic, environmental and healthful well-being. The bicycle will not replace other modes of transportation but, if planned for properly, can complete the transportation network. The Bikeway Plan will be used to guide the incorporation of bicycles within the total transportation network.

SECTION 2. Adoption of The Bikeway Plan

The draft of The Bikeway Plan, as prepared by the County of Hawaii Planning Department, and as recommended for approval by the Planning Commission on December 14, 1978, is hereby officially adopted as The Bikeway Plan, County of Hawaii, State of Hawaii.

SECTION 3. Severability

If any provision of this ordinance or the application thereof to any person or circumstances is held invalid, such invalidity shall not affect other provisions or applications of the ordinance which can be given effect without the invalid provision or application, and to this end the provisions of this ordinance are declared to be severable.

SECTION 4. This ordinance shall take effect upon its approval.

INTRODUCED BY:

Tomio Fujii
COUNCILMAN, COUNTY OF HAWAII

Hilo, Hawaii

Date of Introduction: April 4, 1979

Date of Adoption: April 18, 1979

Effective Date: April 24, 1979

Voting unanimously for: J. Dahlberg, T. Domingo,
T. Fujii, J. Garcia, M. Lai, M. Sameshima, H. Tajiri,
and S. Yamashiro

Excused absence: W. Kawahara

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INTRODUCTION

As alternate means of transportation are sought, the establishment of bikeways deserves serious consideration. Bicycling as a method of transportation is relatively inexpensive in equipment; quiet and less congesting than motor vehicles; non-polluting; not especially dangerous to pedestrians; and provides healthful exercise and recreation. It provides a way for children and adults to become mobile without dependence on the automobile.

The need for the establishment of a bikeway system is quite apparent. The successful Bike-In on Sunday, May 7, 1972, and various and growing requests, both verbal and written, from groups such as the Hilo Women's Club, the central 4-H organization, various Kumiais and the University students attest to this. At the present time the County of Hawaii utilizes Chapter 291-C HRS, the Statewide Traffic Code, for governing the operation of bicycles. This traffic code requires that, "whenever a usable bicycle lane has been provided on a highway, any person operating a bicycle... shall ride within such bicycle lane,..." There is only one highway in the County of Hawaii which incorporates a designated lane for bicycles. Located in Kailua, this lane is the beginning of a system of bikeways in the County. In the interim, as it has been in the past, cyclists must share the roadways and/or sidewalks. However, this sharing of roadways and sidewalks, together with the increase of motorists and bicyclists, presents the probability of increased conflicts between motor vehicle, pedestrian and bicycle needs. In anticipation of this problem, the need of a bikeway plan was realized and subsequently developed. The primary goal of the Bikeway Plan is to guide the development of a safe and usable bikeway system.

The creation of the Bikeway Plan is also linked to the Federal Highway Administration, a major source of bikeway funding, which stresses the need for a master plan in order to receive federal-aid participation on eligible bikeway projects.

It was necessary to assemble and analyze a variety of information in developing the Bikeway Plan. Various bikeway designs and plans were examined from communities throughout the United States and Europe. Articles commenting on and evaluating the different systems were also examined. A survey was conducted in five different Hilo schools to solicit further comments to several design concepts. Furthermore, an ad hoc citizens advisory committee was established to determine the specific needs of the bicyclists on the island.

While the Bikeway Plan was developed in response to growing concerns for the bicyclist, it included consideration of other plans and programs including BIKEPLAN HAWAII: A STATE OF HAWAII MASTER PLAN. The County General Plan, which directs the overall development of the County was consulted for policy guidance statements. It is with these following policy statements in mind that the Bikeway Plan was formulated.

A policy from the Environmental Quality Element of the General Plan states that:

"The County of Hawaii shall take positive action to further maintain the quality of the environment for residents both in the present and in the future."

The establishment of safe and functional bikeways will encourage the use of the bicycle as a less polluting alternative to the private automobile.

Two goals from the Transportation Element will be implemented with the creation of a bikeway system which encourages bicycling for utility oriented transportation. These are:

"Provide a transportation system whereby people and goods can move efficiently, safely, comfortably and economically."

"Make available a variety of modes of transportation which best meets the needs of the County."

The Recreation Element of the General Plan directs through a goal that the County:

"Provide a wide variety of recreational opportunities for the residents of the County."

Further that,

"A system of trails to places of scenic, historic, natural or recreational interest should be established."

Additionally, the Hilo Community Development Plan (CDP) and the Recreation Master Plan designate routes suitable for bikeways. While they do not provide conceptual guidelines or objectives in the development of a route system for Hilo, the route recommendations from the Hilo CDP were incorporated into the plan. In the future, as bikeway systems for other areas of the island are developed, the recommendations from the community development plans and the Recreation Master Plan should be considered.

In developing the Bikeway Plan the Federal, State, and County jurisdictional responsibilities for schools, parks, and roadways were also given consideration. So, while complimentary the County Bikeway Plan is not totally duplicative.

The relationship of any bikeway system to other transportation systems cannot be overlooked, both in terms of conceptual development and implementation. By planning for the best use of bicycles in conjunction with other modes of transportation--public transportation, walking, auto, boating--the bikeway system can provide an atmosphere of social, economic, environmental and healthful well being. The bicycle will not replace other modes of transportation but, if planned for properly, can complete the transportation network. The Bikeway Plan will be used to guide the

incorporation of bicycles within the total transportation system. To facilitate bicyclists the following concepts or ideas are to be implemented. 1. Facilitate bicycles as an independent mode of transportation. 2. Mode Sharing: Facilitate bicycles to go to and from other transportation modes. 3. Facilitate transporting bicycles to and from outlying recreational and/or commercial areas to be used. 4. Education: Education is an integral part of providing a complete bikeway system. While money is to be spent on planning, design, and constructing bicycle facilities if the bikeway system is to achieve a level of operational safety consideration must also be given to the process of operating a bicycle. Training generally consists of learning to ride a bike as a child with minimum consideration given to safety instruction. Because bad bicycling habits can be acquired by younger children, greater attention must be given to educating the cyclist at an early age.

Boosting bicycle interest has been the emergence of an environmental and energy conservation attitude. In Hawaii County the attitude and interest regarding bicycles peaked in 1974, during the time that the State Legislature was adopting laws in relation to bicycle operation. In that year, 6,118 bicycles were registered (Table 1). The number of registered bicycles, while having decreased throughout the state in recent years (Table 2), is not necessarily reflective of a negative public attitude toward

TABLE 1
HAWAII COUNTY
BICYCLE REGISTRATION

<u>YEAR</u>	<u>BICYCLES REGISTERED</u>
1970	2,489
1971	2,735
1972	3,766
1973	3,947
1974	6,118
1975	4,927
1976	3,781
1977	2,815

TABLE 2

POPULATION AND REGISTERED BICYCLES BY COUNTIES: 1960-1995 (PROJECTED)

	STATE			KAUAI			C&C OF HONOLULU			MAUI			HAWAII		
YEAR	TOTAL ¹ POP.	REG. ² BIKES	RATIO	TOTAL ¹ POP.	REG. ² BIKES	RATIO	TOTAL ¹ POP.	REG. ² BIKES	RATIO	TOTAL ¹ POP.	REG. ² BIKES	RATIO	TOTAL ¹ POP.	REG. ² BIKES	RATIO
1960	641,500	25,880	.040	27,800	— [*]	—	505,200	20,821	.041	42,400	2,832	.067	60,300	2,227	.037
1965	703,800	28,085	.040	28,900	— [*]	—	571,500	22,283	.039	44,500	2,945	.066	61,700	2,857	.046
1970	774,200	34,530	.045	30,000	— [*]	—	633,200	28,749	.045	46,600	3,296	.070	64,400	2,489	.039
1971	798,000	52,485	.066	30,900	2,141	.069	648,700	44,159	.068	48,200	3,450	.072	67,900	2,735	.040
1972	820,900	79,188	.096	31,400	2,729	.087	665,600	68,620	.103	50,600	4,073	.080	68,600	3,766	.055
1973	843,700	91,052	.108	32,100	3,049	.095	685,700	79,177	.155	51,800	4,879	.094	71,600	3,947	.055
1974	854,100	107,826	.126	32,000	4,034	.126	697,400	91,504	.131	52,400	6,170	.117	72,200	6,118	.085
1975	864,900	99,910	.115	31,800	3,693	.116	704,500	85,976	.122	53,900	5,314	.099	74,700	4,927	.066
PROJECTED:															
1980	930,000	107,900	.116	36,700	4,000	.108	749,500	90,700	.121	60,100	5,600	.093	83,800	6,000	.072
1985	1,027,600	132,600	.129	41,300	5,200	.126	818,700	110,500	.140	69,900	8,000	.114	97,700	7,300	.075
1990	1,131,700	160,700	.142	46,100	6,400	.139	891,000	131,900	.148	81,200	10,300	.127	113,400	9,400	.083
1995	1,238,000	192,000	.155	50,700	7,600	.150	965,000	156,300	.162	93,000	12,900	.139	130,000	11,700	.090

Source

¹County Trends in Hawaii since 1960. Statistical Report 116, Oct. 12, 1976. Table 1, Research and Economic Analysis Division, Dept. of Planning & Economic Development²Registered Bicycle Figures to 1975. State of Hawaii Data Book 1976, Table 2.37

bicycling but, toward the time lag between legislative action, such as the establishment of the bikeway fund, and implementation of a bikeway system. Reviving interest in bicycling, and thus increasing bicycle registration, can be encouraged through the development of bicycle-related facilities as outlined in the Bikeway Plan.

Responding to meet the needs of the people in the County of Hawaii, the primary goal of the plan is to guide the development of a safe and useable bikeway system. A system which is both safe and functional will in turn encourage cycling for recreational and utility/commuter purposes.

As the basic demand for bikeways is in the larger urban areas of the island, a pilot implementation program was developed for the Hilo and Kailua areas first. This program is only part of an on-going one which will extend the bikeway system to and within other communities.

BIKEWAY SYSTEM

The following portions of the plan first define bikeway terminology and secondly describe criteria, objectives and the design standards which should serve as guidelines for bikeways within the County.

DEFINITIONS

A. Bicycle Trips

The needs of the cyclists differ according to the purpose for which a trip is taken. For example, a cyclist may during the week use a bicycle going to and from school; or perhaps on the weekends, ride a bicycle for sight-seeing purposes. In the first instance a bikeway which is direct, provides the least amount of stopping and will transport the bicyclist to school in the shortest time, is needed.

In the second instance, a route with either scenic or recreational spots may instead be the choice. Basically, three categories of trips are evident. The categories are as follows:

1. The utility trip -- These are usually trips between two definite or selected destination points. The primary intent for this trip is other than recreation or exercise. These trips include commuting from work to home, from home to school or shopping trips. For this type of trip, bikeways need to be selected in the most directed lines between employment areas, commercial areas and schools.
2. The recreational trip -- These are trips which are usually made outside the neighborhood for enjoyment or exercise. The bicycle may be transported to a park area and ridden there or ridden full circuit. Recreational routes are preferably those along scenic, historic, or cultural points or interest, or within parks. Bikeways established for this purpose may also serve as trails for other recreational interests, such as hiking or jogging.
3. Neighborhood trips -- These are short trips for pleasure, usually with no particular destination point and are mostly taken by children. This type of riding may be served by the existing street network except in highly trafficked areas. For this type trip laws should be developed relating to the operation of bicycles upon roadways.

While the predominant purpose is now recreational, trends indicate increases in all basic kinds of trips once a bikeway system is established.

B. Bikeway

Bikeway "means a bicycle lane, bicycle path, or bicycle route, or any traffic control device, shelter, parking facility, or other support facility to serve bicycles and persons using bicycles."

In an effort to facilitate the different types of bicycle trips, communities throughout the United States and Europe have developed a variety of bikeways. That which has evolved is four generally recognized types of bikeways, each with its inherent advantages and disadvantages. A complete bikeway system will invariably consist of a combination of these four types of bikeways.

1. Bicycle Route -- "Means any highway that is designated to be shared by bicycles and pedestrians or motor vehicles, or both." (Figure 1) The major advantage is that while of the least cost, it encourages the use of certain roads for biking and cautions motorists through signs to expect bikers on those roads. Although the actual safety advantage is questionable, bicycle routes are usually the first step a community takes in response to increased cycling interests. The usual costs include designating streets with signs and paint and the reconstruction of parallel slat storm drains. Important points in assuring the success of bicycle routes are the education of motor vehicle drivers to give ample consideration to bicycle riders, and the selection of routes which directly link major destination points and have ample pavement width.

The Statewide Traffic Code requires that, "Every person riding a bicycle upon a roadway shall be granted all the rights and shall be subject to all of the duties applicable to the driver of a vehicle by this chapter," Procedurally, the bicyclist, "Shall ride as near to the right-hand curb or edge of the roadway as practicable, ...;" and on one-way roadways with, "two or more marked traffic lanes a person operating a bicycle may ride as near to the left-hand curb or edge of such roadway as practicable."

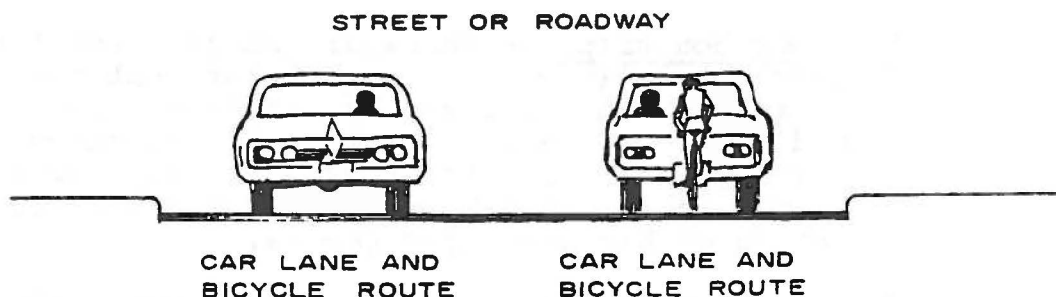


FIG. 1 BICYCLE ROUTE

2. Bicycle Lane -- "Means that portion of any highway which has been set aside for the preferential or exclusive use of bicycles" (Figure 2).

The Statewide Traffic Code requires that, "whenever a usable bicycle lane has been provided on a highway any person operating a bicycle... shall ride within such bicycle lane..." except as provided by law. The designation of a specific space for bicycles along the highway allows motorists to expect bike movement and enables motorists to pass the slower moving bicycles safely. Crossflow through the bike lane is permitted by motorists upon a permanent or authorized temporary driveway; in the process of executing a legal turn, lane change, or parking maneuver, an authorized emergency vehicle performing the functions under Section 291C-26, (H.R.S.); an official Federal, State or County vehicle in the performance of its actual duty; a stalled or broken vehicle; necessary to assist a stalled or broken vehicle; or necessary to yield to an authorized emergency vehicle pursuant to Section 291C-65 (H.R.S.); otherwise provided by law.

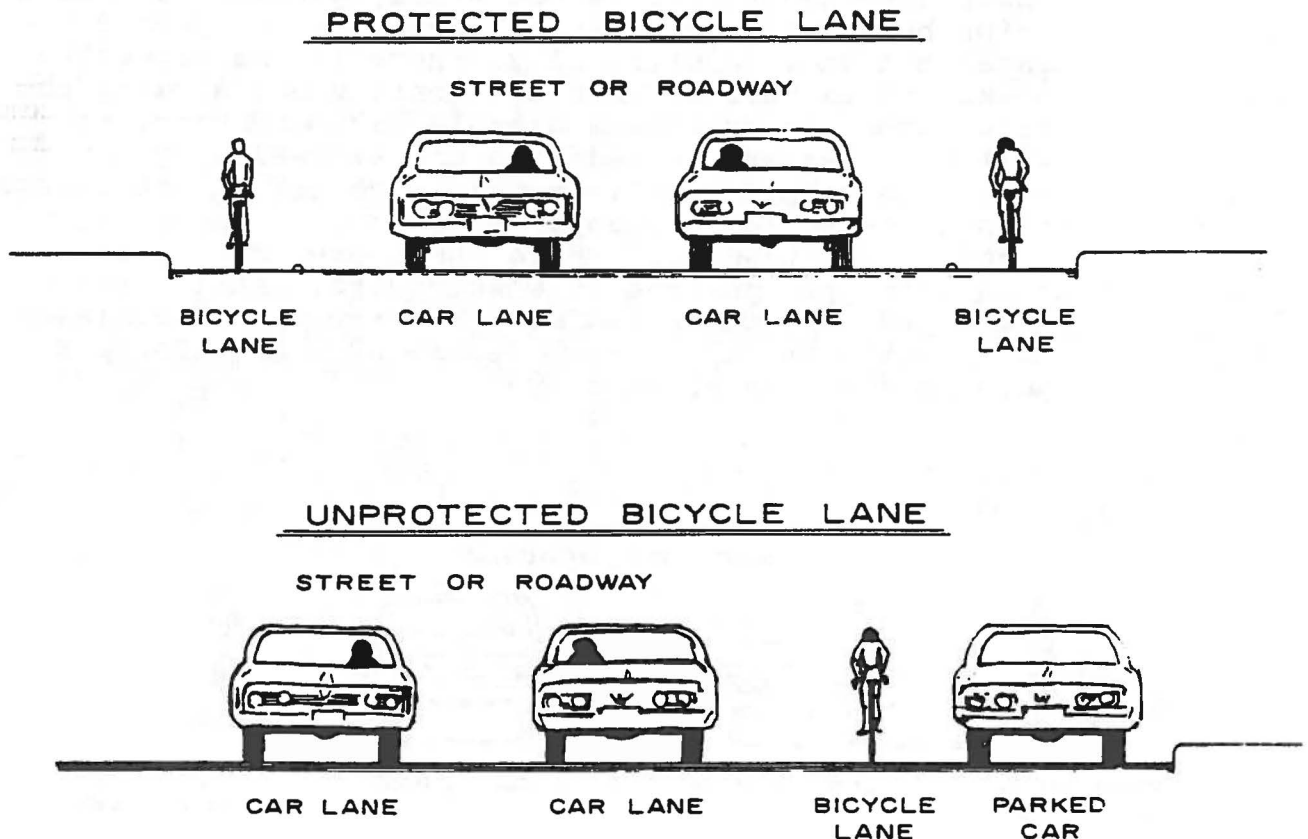


FIG. 2 BICYCLE LANES

Of the two types of bicycle lanes, the curbed (with berm) lane provides greater protection to the bicyclists as the physical barrier, however small, clearly separates the bike space from the auto space, whereas, with a striped lane, caution in speed and proximity of the car must be exercised.

Creation of the bike lane sometimes entails a loss of parking area or the paving of roadway shoulders because existing roadways are not always wide enough to accommodate a bike lane.

When on what is defined as the highway, the bike lane is restricted to one-way operation, being located, "...as near to the right-hand curb or edge of the roadway as practicable..." On one-way streets, bicycle lanes and/or bicycles may be located as near to the left-hand curb or edge of such roadway as practicable.

3. Bicycle/Walk Path -- This is an existing sidewalk that is converted for use by both pedestrian and bicyclists (Figure 3). Although considered safer than the bicycle route alternative, it is not widely popular for utility trips because of poor visibility at driveways and intersections. Additionally, there is the necessity of having to stop at intersections, hence slowing the trip time. To provide a useable bike/walk path, it will be necessary to redesign the sidewalks by constructing ramps (see Figure 11, page 26) at intersections; thus allowing for a smooth transition between the sidewalk and roadway. These ramps are also beneficial to handicapped persons in wheelchairs. Still, where there are long stretches of uninterrupted sidewalks which are lightly travelled by pedestrians, the bike/walk path is a viable alternative.

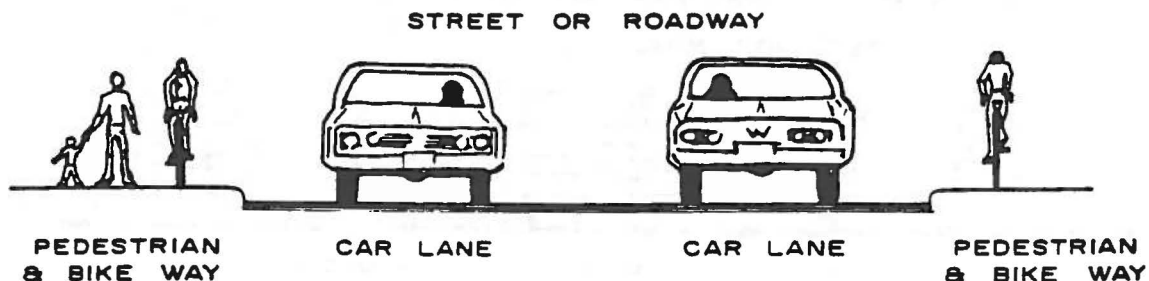


FIG. 3 BIKE / WALK PATHS

4. The Bicycle Path -- "Means any facility set aside for the preferential or exclusive use of bicycles and physically separated from a highway" (see Figure 4). Bike paths are the safest and most desirable type of bikeway but are also the most costly. Conflicts with cars and pedestrians are kept at a minimum. Bicycle paths are sometimes used in parks for recreational bikers or adjacent to high speed roadways for utility trips. This type of bikeway may be constructed as part of new road construction and where existing road right-of-way conditions permit in urban areas.

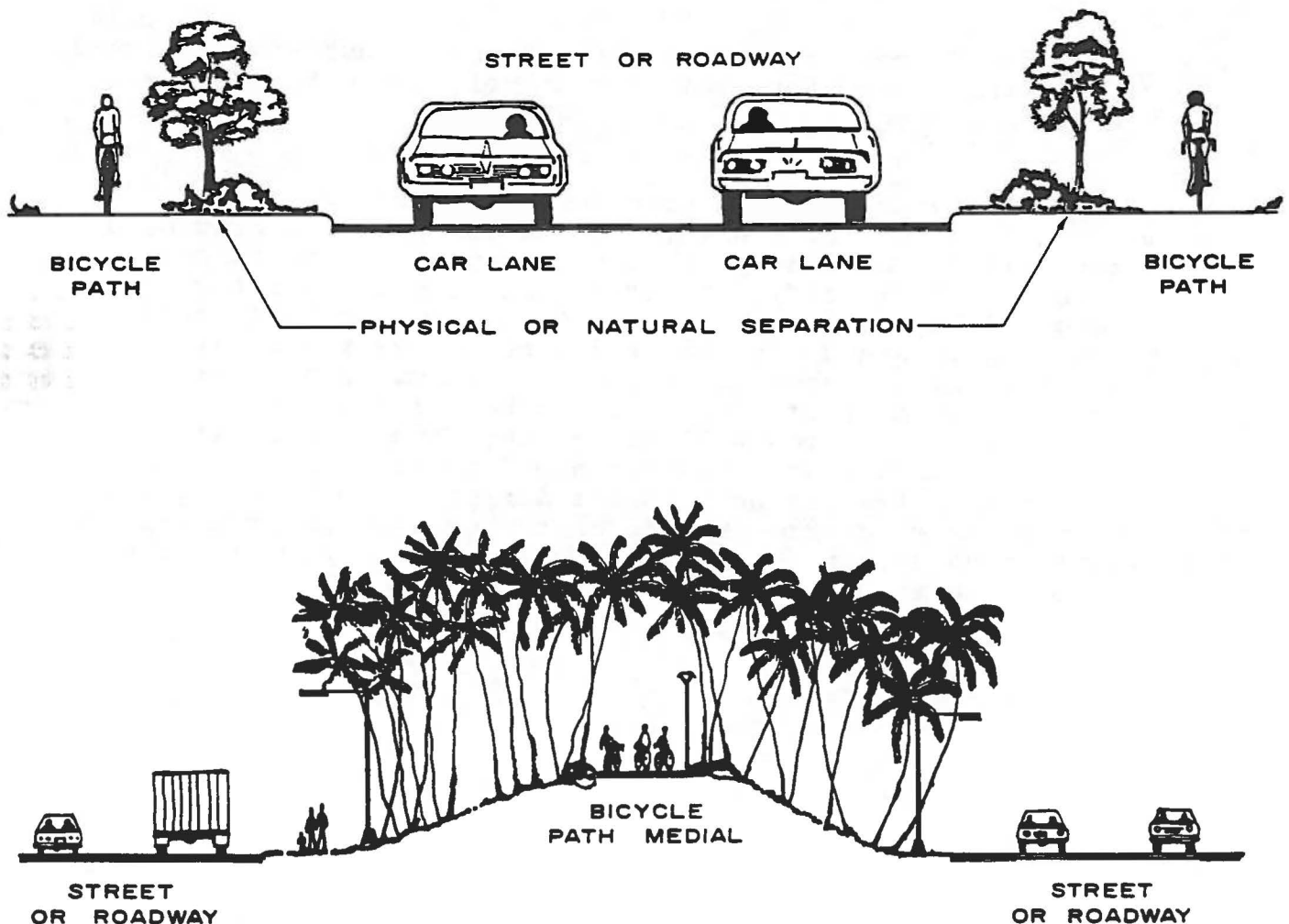


FIG. 4 BICYCLE PATHS

- C. Bicycle -- "Means every device propelled solely by human power upon which any person may ride, having two tandem wheels, sixteen inches in diameter or greater, and including any device generally recognized as a bicycle though equipped with two front or two rear wheels."
- D. Highway -- Means the entire width between the boundary lines of every way publicly maintained when any part thereof is open to the use of the public for purposes of vehicular travel.
- E. Intersection -- Means... the lateral boundary lines of the roadways of two highways which join one another...
- F. Roadway -- Means that portion of a highway improved, designed, or ordinarily used for vehicular travel, exclusive of the berm or shoulder.
- G. "Moped" -- Means a device upon which a person may ride which has two or three wheels in contact with the ground, a motor having a maximum power output capability measured at the motor output shaft, in accordance with the Society of Automotive Engineers standards, of one and one-half horsepower (one thousand, one hundred nineteen watts) or less and, if it is a combustion engine, a maximum piston or rotor displacement of 3.05 cubic inches (fifty cubic centimeters) and which will propel the moped, unassisted, on a level surface at a maximum speed no greater than thirty-five miles per hour; and a direct or automatic power drive system which requires no clutch or gear shift operation by the moped driver after the drive system is engaged with the power unit.

GEOMETRICS

The design guidelines in this section are for independent paths and were developed from the recommendations of several sources including, the American Association of State Highway and Transportation Officials (AASHTO), Department of Transportation Federal Highway Administration, "Bikeways - State of the Art - 1974," and Bikeplan Hawaii. In the case of bike lanes and routes, which are located on existing streets, roadway geometrics should be checked for compatibility with bikeway standards.

Bikeway Surface Widths

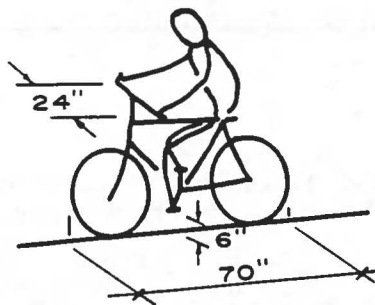
Using bicycle space requirements (Figure 5) minimum and desirable bikeway surface widths have been developed:

<u>Number of Lanes</u>	<u>Minimum Width</u>	<u>Desirable Width</u>
1	3.5 feet	5.0 feet
2	7.0 feet	10.0 feet
3	10.5 feet	15.0 feet
4	14.0 feet	20.0 feet

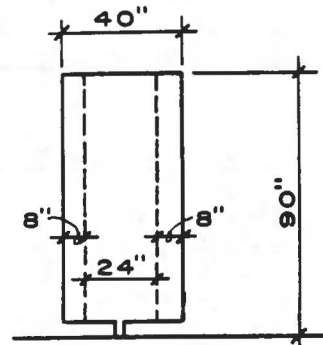
The bikeway surface width for a bike/walk path is provided in Figure 7.

In order to provide sufficient bikeway width for safe and comfortable maneuvering, the following adjustments to bikeway widths are to be used (Figure 6, page 15).

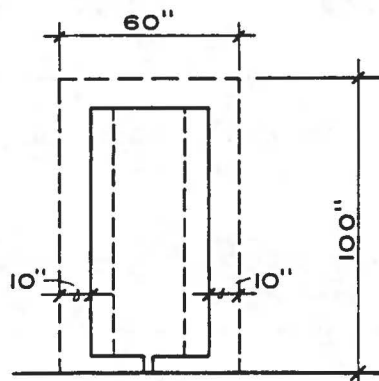
<u>Condition</u>	<u>Additional Width (feet)</u>	
	<u>Minimum</u>	<u>Desirable</u>
Raised curb on one side	.5	1.0
Raised curb on two sides	1.0	2.0
Parked cars adjacent	2.0	3.0



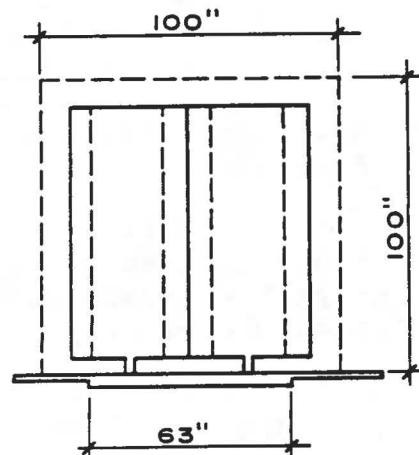
TYPICAL BICYCLE
DIMENSIONS



BICYCLE
OPERATING SPACE



OPERATING SPACE
PLUS MINIMUM
CLEARANCES



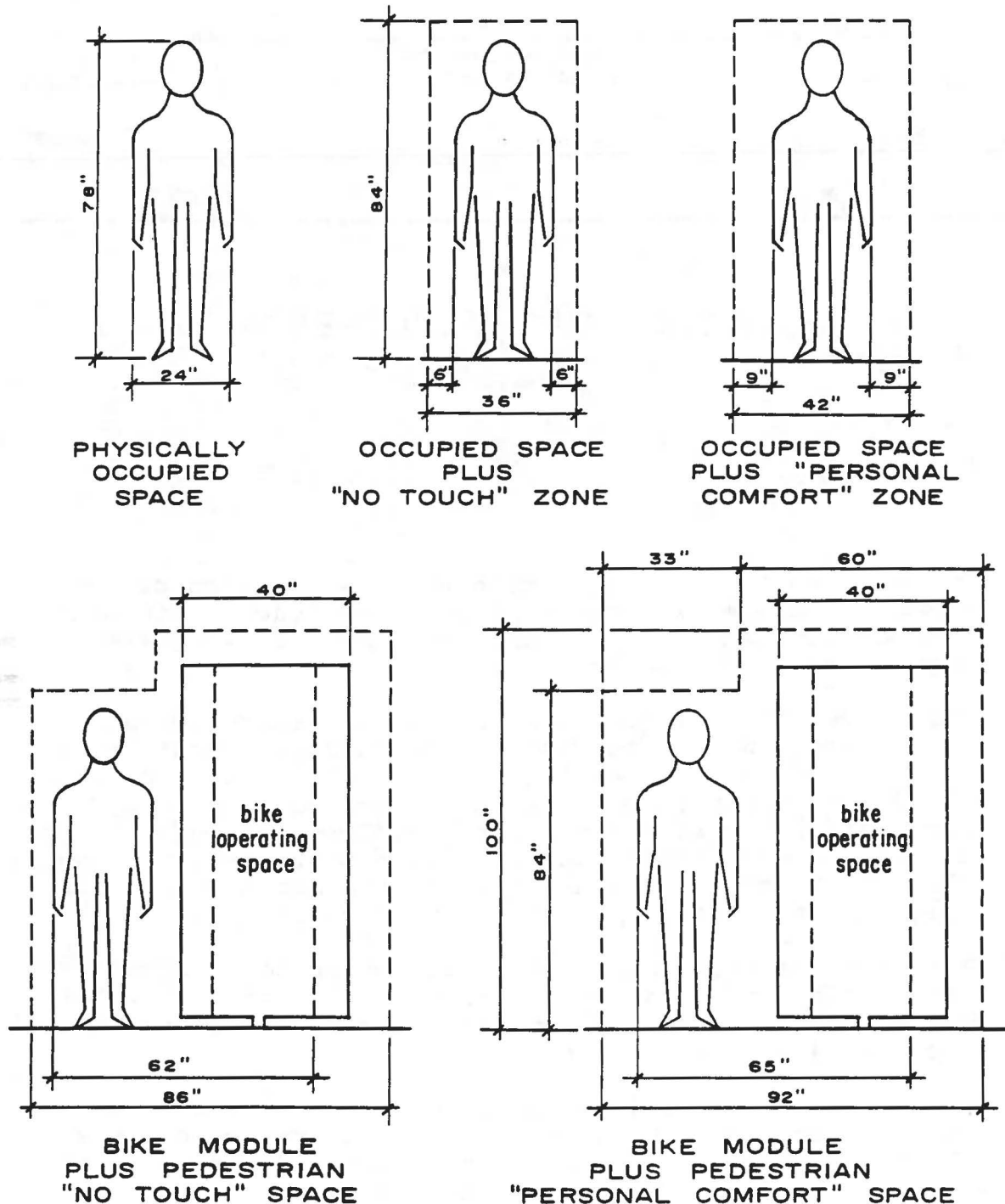
TYPICAL BICYCLE
PATH DIMENSIONS

FROM : BIKEWAYS - STATE OF THE ART - 1974
DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

FIG. 5 BICYCLE SPACE REQUIREMENTS

BICYCLE - PEDESTRIAN SPACE REQUIREMENTS FIG. 7

these guidelines shall be used to assure that adequate space is provided for comfortable movement of both pedestrian and bicyclist on bike/walk paths or bicycle path planned for dual usage.



FROM: BIKEWAYS - STATE OF THE ART - 1974

DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

"no touch" zone - minimum width to allow movement

"personal comfort" zone - comfortable width beyond dimensional requirement

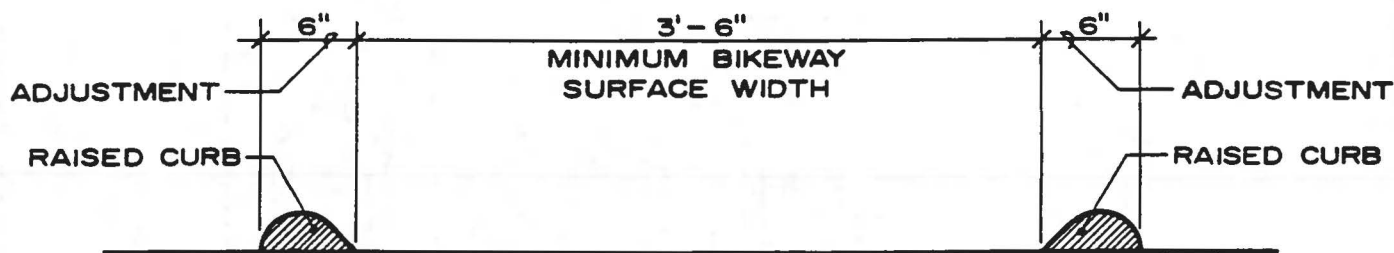


FIG. 6 CURB ADJUSTMENT

The carrying capacity of a bikeway is a function of lane width. In areas of intense bicycle use, such as schools, wide bikeway lanes will ensure that there is adequate bicycle carrying capacity.

With bi-directional bikeways or bikeways shared with pedestrians, uniform pavement width on curves could be a cause of hazard. By leaning to negotiate a turn, bicyclists significantly increase the amount of space they occupy. To compensate for this increase in bicycle space requirements, the bikeway surface should be widened on those curves where a bicyclist could come in conflict with another bicyclist, a pedestrian, motorist or other obstruction.

It is also necessary to provide for overhead clearance and lateral clearance from obstructions such as fences, walls, vegetation and lava outcroppings. Adequate clearances must be provided to prevent conflicts.

Furthermore, it should be noted that three wheeled pedaled vehicles and wheelchairs will also be operating on some or all of the bikeways. As such, additional design elements and adjustments to the various bikeways may be necessary.

Design Speed

The curvature, banking, gradient, and width of bikeways are designed for a selected speed (design speed). The type of bicycle, the gearing mechanism, grade, surface conditions, wind, air resistance, and physical condition of the rider all have an effect on the design speed. The average

bicyclist travels in the range of 7 to 15 miles per hour with the higher speeds occurring on downgrades. The average speed is 10 to 11 miles per hour. Therefore the design speed should be a minimum of 10 miles per hour but normally 15 miles per hour, and on long downgrades it should be 20 miles per hour or more.

Curvature

Table 3, Curvature, is for use in constructing independent bike paths with token or no banking provided. In the case of bicycle lanes and routes, the roadway curvature provided motor vehicles will be more than adequate for bicycles but should be checked for potentially hazardous conditions.

TABLE 3
CURVATURE

<u>Design Speed (mph)</u>	<u>Design Radius (feet)</u>
10	15
15	35
20	70
25	90
30	125

Superelevation or Banking

All vehicles in negotiating a curve encounter a force which tends to push them to the outside of the turn. In the instance of automobiles, to counteract this tendency, super-elevation or banking becomes a design element of the roadway. By banking the roadway an auto's weight then becomes centered to the inside of the curve; thus, counteracting the force to be pushed outside of the curve. Bicyclists are able to lean their weight to the inside of a turn and in such a manner, counteract the force to be pushed outside of the curve.

In light of the foregoing, banking is not recommended on all bikeway curves. However, on curves which occur on downgrades, where the speed of bicyclists will be faster than average, or on curves with short radii, it may be

necessary to incorporate banking.

An alternative to banking is to increase the design radius of a curve, which has the effect of reducing the force to be pushed outside the curve. These are special situations and should be investigated according to local conditions.

Where banking is provided the general banking design value should be 0.05 foot per foot and a minimum of 0.02 foot per foot. Since the bikeway will have the same super-elevation rate as the roadway in the case of bicycle lanes, this rate should be more than adequate but should be checked for potentially hazardous conditions. The recommended general banking design for bikeways can be compared with Table 4, Superelevation for Roadway Pavement.

TABLE 4
MINIMUM LENGTH FOR SUPERELEVATION
RUNOFF FOR 2-LANE PAVEMENTS

Superelevation Rate	L-Length of runoff in feet for design speed, MPH, of:				
	20	30	40	50	60
Foot per Foot					
.02	50	100	125	150	175
.04	50	100	125	150	175
.06	50	110	125	150	175
.08	50	145	170	190	215
.10	50	180	210	240	270
.12	50	215	250	290	325

Note: Superelevation runoff is the length of highway needed to accomplish the change in cross slope from a normal crown section to a fully superelevated section. Minimum lengths of runoff are shown in Table 4.

Source: American Association of State Highways Officials

Grades

Absolute Maximum:	10%
Avoid:	5% for lengths greater than 300 feet
	2% for lengths greater than 1500 feet
Desirable:	5% for lengths not greater than 100 feet
	2% for lengths not greater than 500 feet

Recommended grades for bikeways can be compared with Table 5, Maximum Grades for Highways. A reduction in grade allows an increase in the length of an inclined bikeway. Thus, a 10% grade can be allowed only over very short sections. However, the energy required to use a bikeway will affect its usage and therefore grades should be kept at a minimum. Methods to minimize grades are added curvature or increased travel distance. Roadways which do not meet the grade standards for bicycles should be avoided.

TABLE 5
MAXIMUM GRADES FOR HIGHWAYS

Type of Terrain	Design Speed MPH				
	20	30	40	50	60
Flat	7	7	7	6	5
Rolling	10	9	8	7	6
Mountainous	12	10	10	9	

Note: For highways with ADTs below 250 grades of relatively short lengths may be increased to 150 per cent of the value shown.

Source: American Association of State Highway Officials

Sight Distance

The roadway alignment generally provides adequate stopping sight distances for bicycle (Table 6) lanes, but should be checked as there are exceptions. The design values may be computed in the same manner as highways: eye height of 3.75 feet and object height of 6 inches. For crest conditions the length of vertical curve is about the same.

TABLE 6

DESIGN STOPPING SIGHT DISTANCES FOR BICYCLES

Design Speed	Stopping Sight Distances for Downhill Gradients of:			
	0%	5%	10%	15%
<u>mph</u>	<u>feet</u>	<u>feet</u>	<u>feet</u>	<u>feet</u>
10	50	50	60	70
15	85	90	100	130
20	130	140	160	200
25	175	200	230	300
30	230	260	310	400

WARRANTS/CRITERIA

The type and location of bikeways depend upon, in addition to the purpose for the trip and the bicycle/pedestrian space requirements, existing road and traffic conditions. Existing travel conditions on Hawaii County roadways are shown in Figures 8 and 9. The volumes of weekly bicycle travel and trip purpose, based on responses to the Bikeplan Hawaii Survey, as well as vehicular volumes and service levels of the roadways are depicted. Ideally, the bicycle path is considered the most desirable type of bikeway (Figure 10). However, it cannot always be provided because of cost considerations and lack of sufficient road right-of-way along existing streets. Nor is it always necessary where traffic conditions are light. In those instances, other alternative bikeways may be selected.

The choice of bikeway type for particular streets within the County of Hawaii should follow criteria or warrants as they are sometimes called. Warrants describe the existing road and traffic conditions beyond which significant hazard is present for the cyclist or where bicycle movements disrupt the normal flow of traffic.

The warrants for the County (Table 7) have been derived from bikeway designs and experiences of other communities throughout the United States and Europe. Although no nationwide standard has yet been accepted or found to be most effective, the warrants nevertheless provide a rationale for the selection of bikeway types. Because these warrants have yet to be field validated, a continuing monitoring program should be established to evaluate their effectiveness and safety value.

TABLE 7

MINIMUM CRITERIA FOR BIKEWAY TYPE

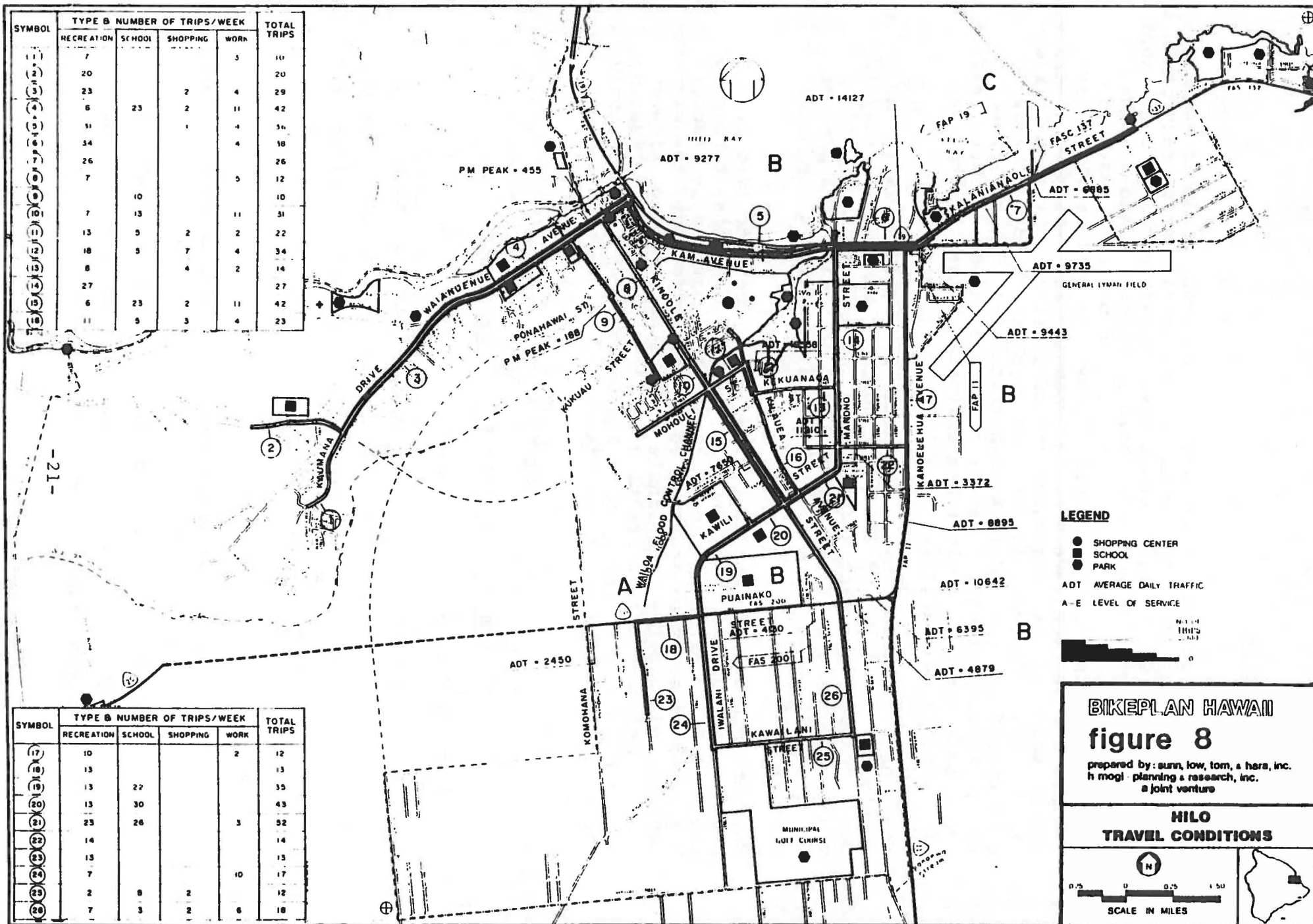
Bicycle Path minimum criteria

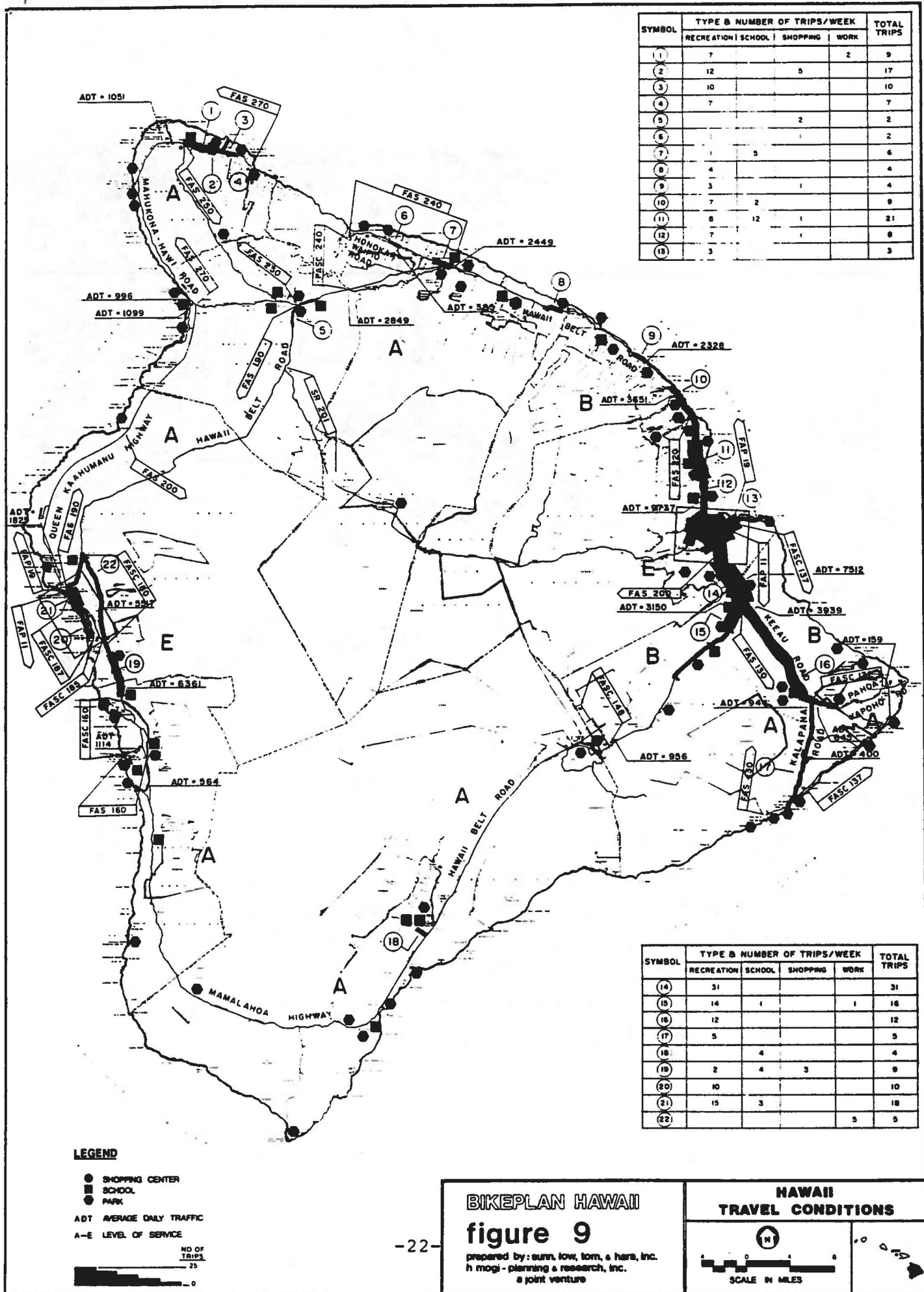
more than 1000 Average Daily Traffic in outside lane
bicycle volume very high approximately 200 trips per day
availability of space for development (shoulder, easement)
85% of automobile traffic speed greater than 40 mph

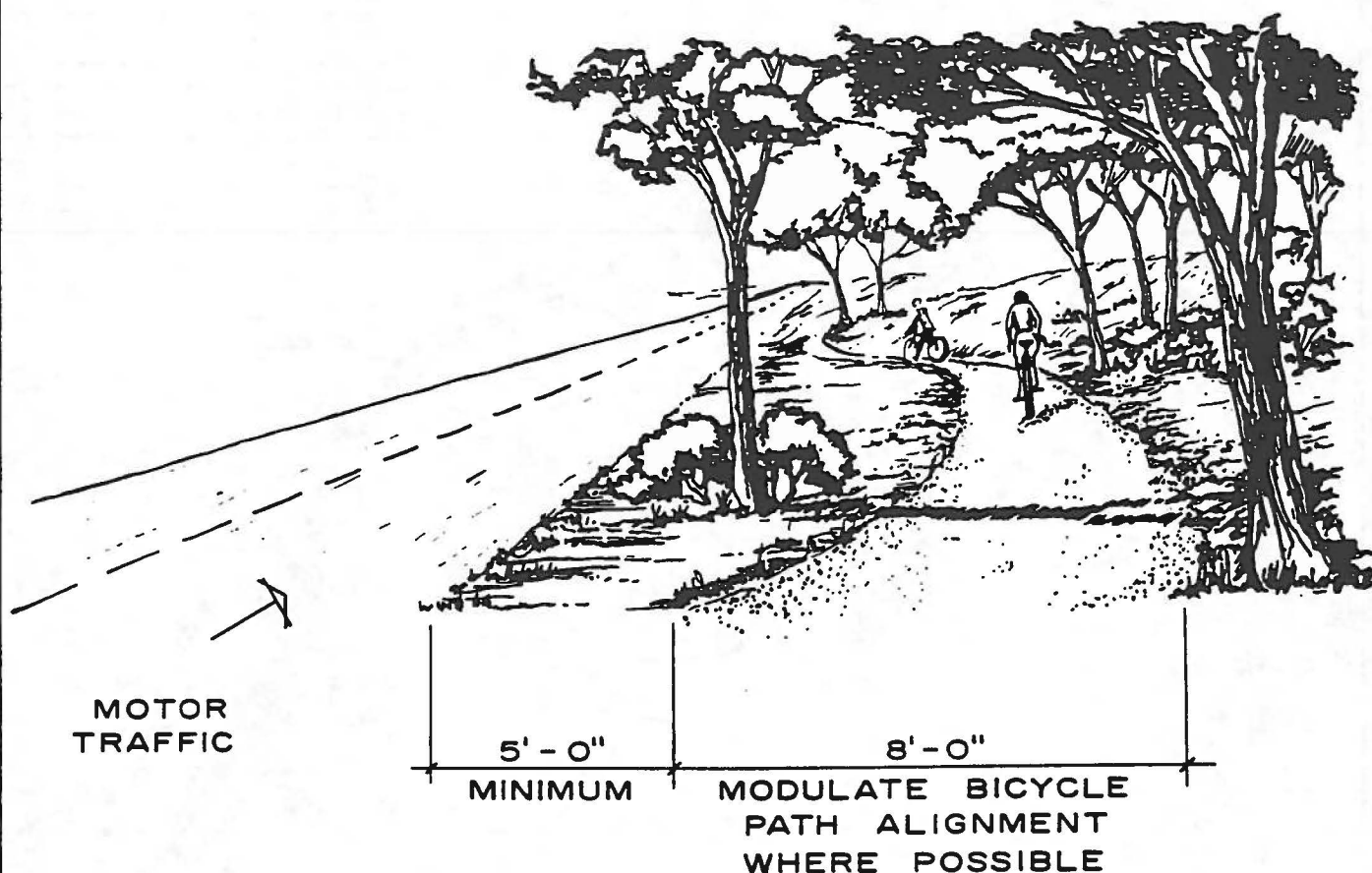
Bicycle Lane minimum criteria

more than 1000 Average Daily Traffic in outside lane
bicycle volume high
85% of automobile traffic speed less than 40 mph
adequate outside lane dimension or shoulder space
minimum road pavement width 25 feet

(continued on page 24)







this type of bikeway should be constructed as part of new development and wherever possible in developed areas of the county. where this prototype cannot be used, one of the alternate bikeway designs presented in the bikeway master plan may be substituted. abrupt or short radius curves should be avoided.

FIG. 10 BICYCLE PATH PROTOTYPE

Bicycle/Walk Path minimum criteria

low pedestrian levels
bicycle volume moderate
adequate and available sidewalk space
minimum sidewalk width (one way bike traffic) 76 in.

Bicycle Route minimum criteria

less than 1000 Average Daily Traffic in outside lane
bicycle volume moderate
85% of automobile traffic speed 25 mph or less
standards for other 3 bikeway types cannot be met

In the evaluation and selection of future bikeways, the following objectives should also be considered.

A. Utility Trip:

1. Provide bikeways linking major destination points such as between residential areas, shopping centers, schools and employment centers. Or, if safety standards can be met, select routes which will serve the most intensely used commuter destinations.
2. Provide bikeways that are integrated with other transportation systems, such as the bus system. Consider also, other supportive facilities such as bike racks at bus stops and bike carriers on busses.
3. Select routes that are direct and that minimize stops and cross-traffic.
4. In areas where safety standards cannot be met, avoid construction of bi-directional bikeways.
5. In areas of high rainfall where no other shelters are available, provide rain shelters along bike routes at appropriate intervals.

B. Recreational Trip:

1. Provide bikeways along scenic roads or areas with historical and cultural spots of interest.
2. Consider installation of bike trails in the planning of park projects, especially where they may be shared with hikers or joggers.

3. Provide waysides and rest stops along bike routes to take advantage of scenic spots.

INTERSECTIONS

The greatest number of conflicts between motorists, bicyclists and pedestrians will occur at the intersection of roadways and/or bikeways. Existing traffic laws which regulate the operation of bicycles upon a roadway are not adequate in applicability to intersections for a safe system of bikeways to be implemented. Presently, bicyclists are required to follow the same turning and crossing procedures as motor vehicle drivers. Chapter 291C-142 (H.R.S.), of the Statewide Traffic Code, specifies that, "Every person riding a bicycle on a roadway shall be granted all of the rights and shall be subject to all of the duties applicable to the driver of a vehicle by this chapter, ...except as to those provisions of this chapter which by their nature can have no application." As such, the bicyclist must compete equally with the motorist for the use of the roadway and intersection.

In light of the foregoing, a number of bikeway intersection designs aimed at minimizing conflicts between pedestrians, bicyclists and motorists are being suggested. The safest and most effective way of preventing these conflicts is a grade separation for the bikeway. Where possible at heavily used intersections, grade separation, should be provided. At intersections not having bikeways and at less hazardous bikeway intersections, these types of structures may not always be warranted and laws regulating bicycle procedures and operation would suffice.

For bike/walk paths, ramps (Figure 11) should be constructed at intersections; thus, providing bicycles and wheelchairs with a smooth transition between the sidewalk and street. The bicyclist may ride across the street with the green light or cross as a pedestrian in the crosswalk.

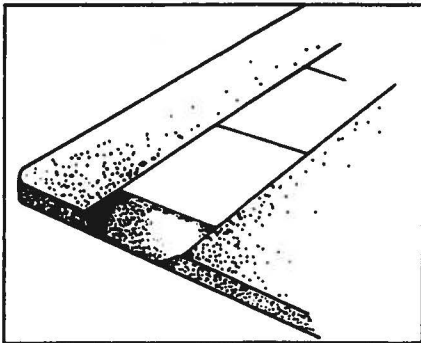
At mid-block (Figure 12) intersections of bike path and roadway, a bicycle crossing should be provided. This would be similar to a pedestrian crosswalk with signs warning motorists of a bicycle crossing. The automobile normally has the right-of-way; thus stop or yield signs for bicyclists should be provided. Ramps (Figure 11) should also be provided when utilization or existing ramps is not possible.

At bicycle lane intersections, bike lanes should be ended at the pedestrian crosswalks (Figure 13). Upon yielding to pedestrians, the bicyclist may either get off his bicycle and cross as a pedestrian in the crosswalk or else ride across the intersection with the green light.

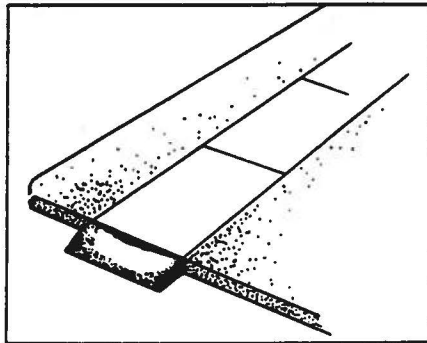
Left turning cyclists at this type of signalized intersection have two options depending on the color of the signal (Figures 13 and 14). By educating the cyclist of the two options, it would not be necessary to wait through two traffic signals to execute a left turn.

For a single bicycle lane with the right-of-way crossing a roadway intersection, the bicycle lane may simply be continued (Figure 15). Signs should be provided on the crossroads warning pedestrians, motorists and bicyclists alike of the presence of a bicycle crossing.

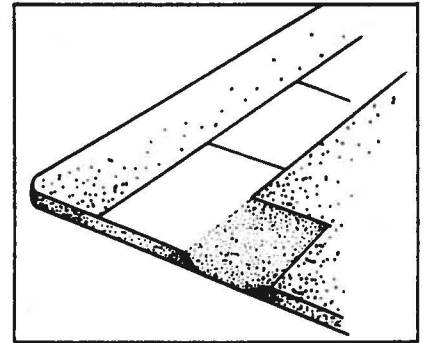
FIG. 11 RAMPS



CURB CUT *



ASPHALT RAMP



OFFSET CURB CUT

*** RECOMMENDED**

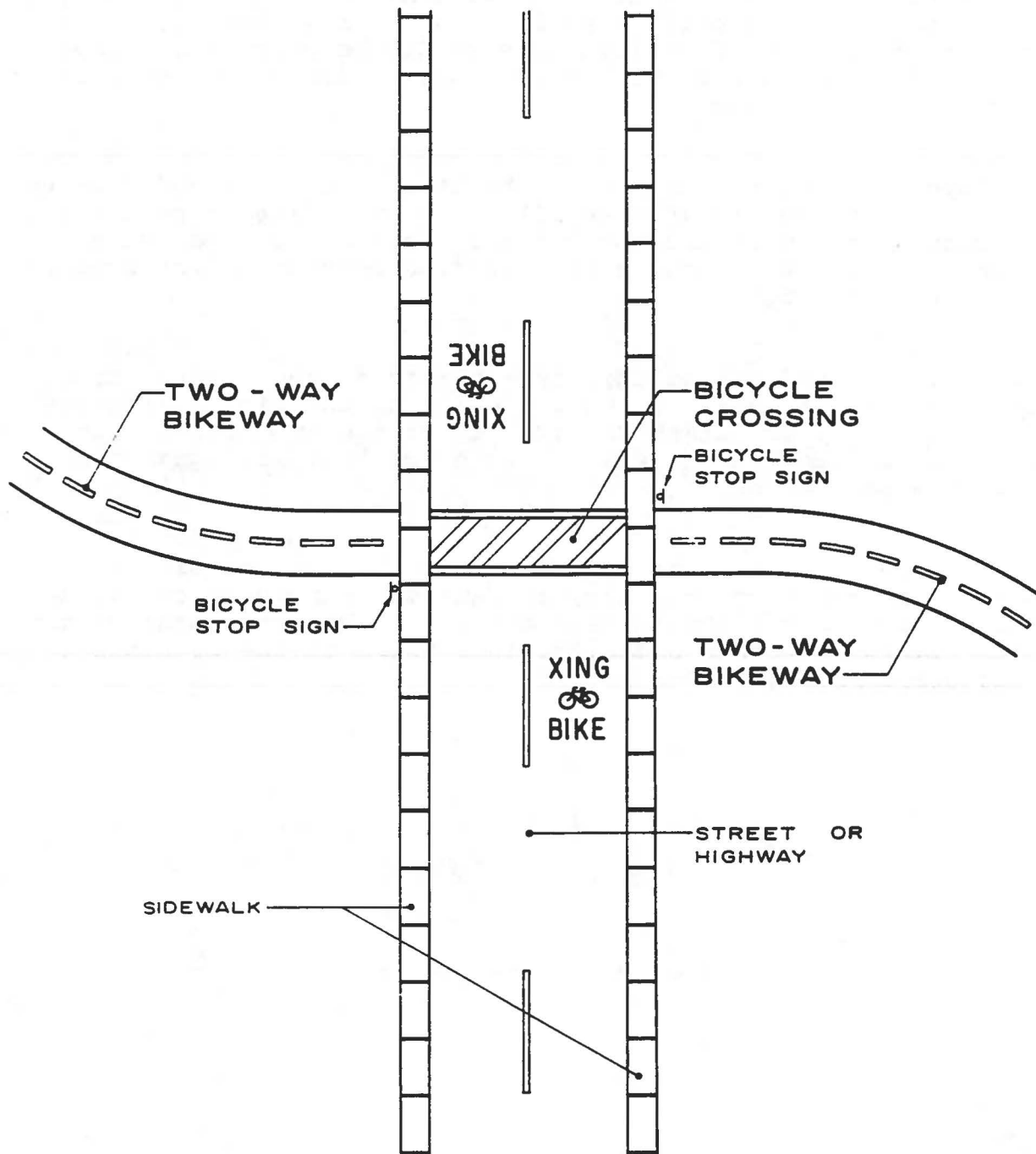


FIG. 12 BICYCLE CROSSING
MID - BLOCK

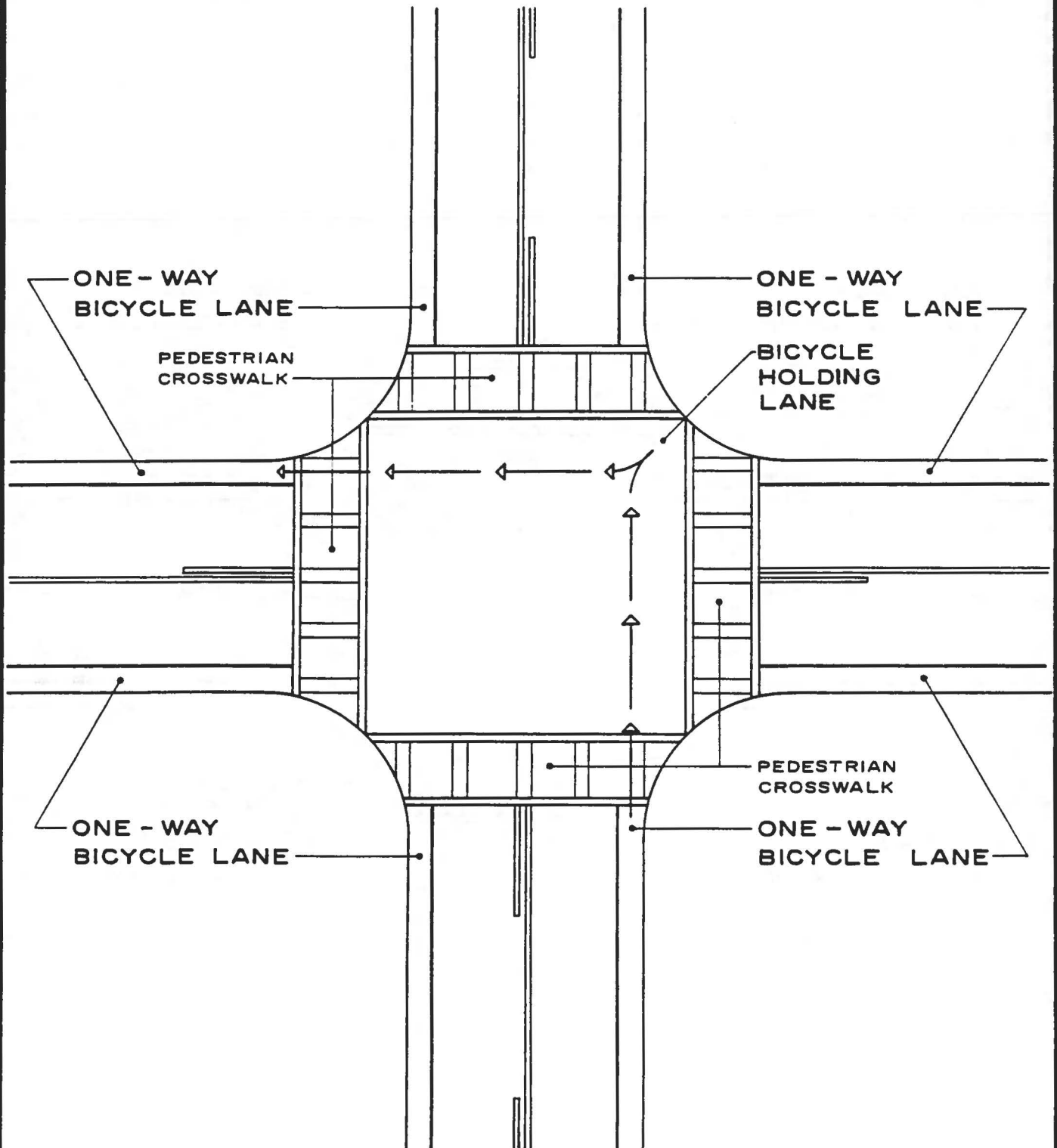


FIG. 13 GREEN LIGHT LEFT-TURN PROCEDURE

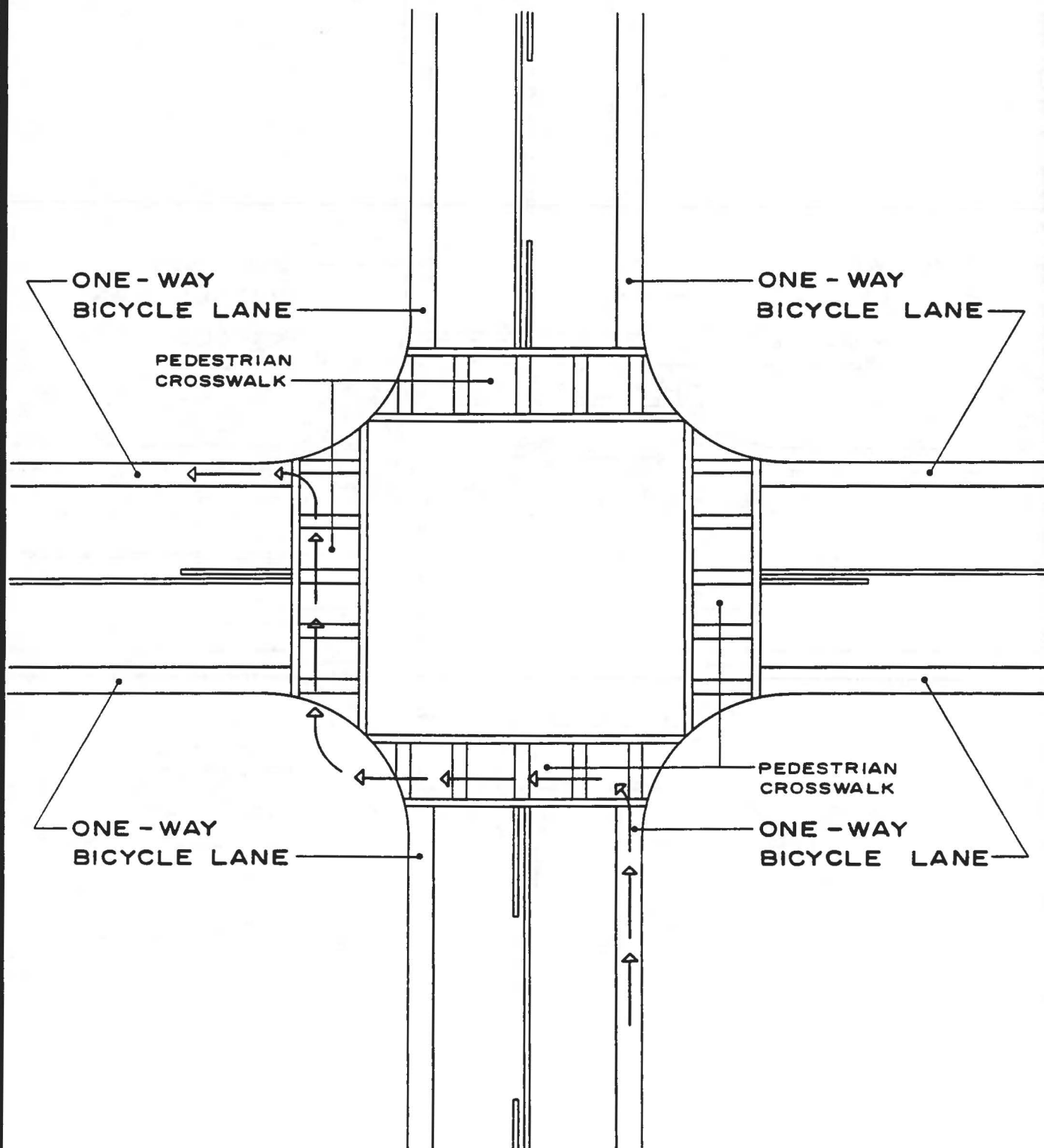


FIG. 14 RED LIGHT LEFT-TURN PROCEDURE

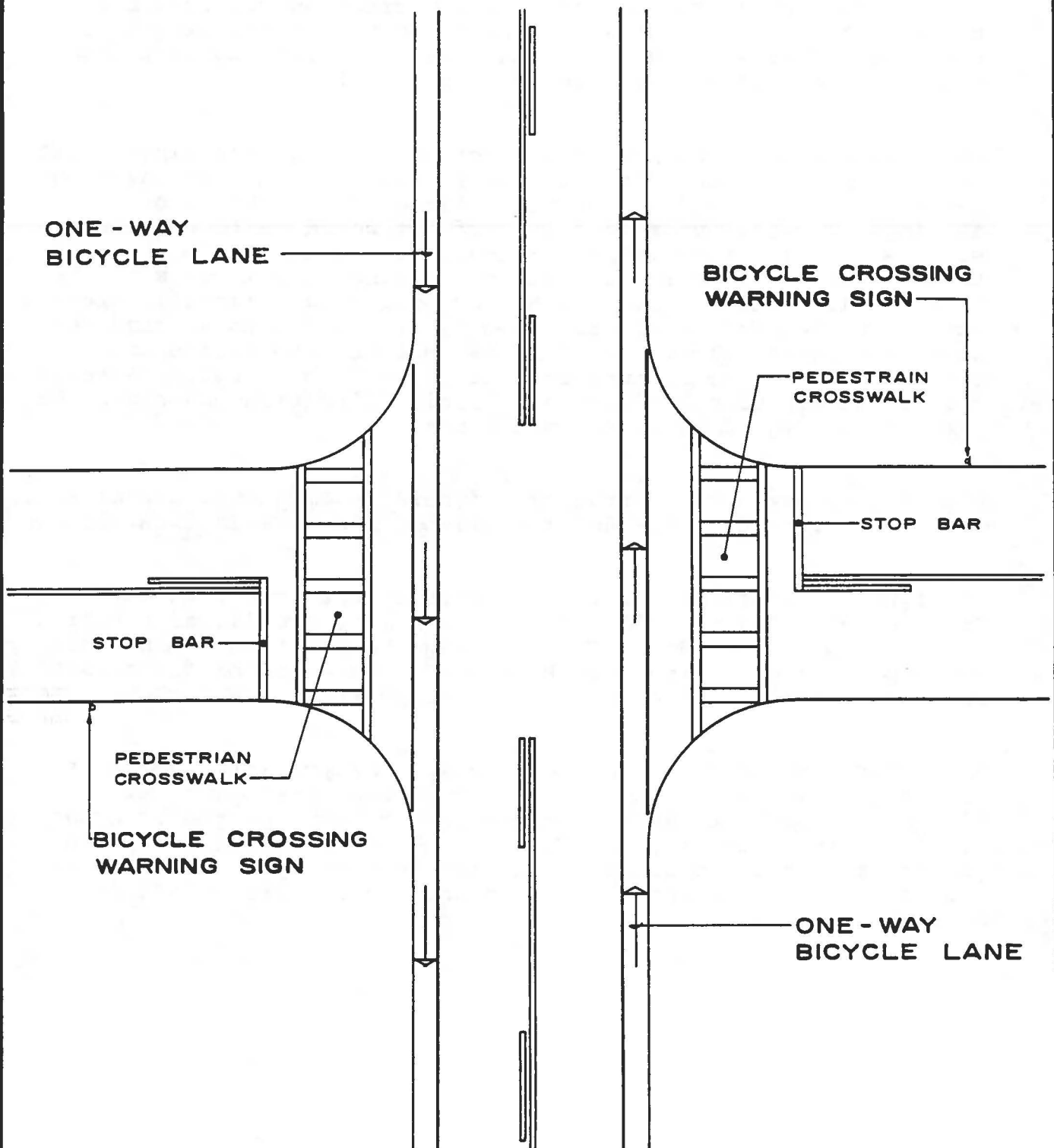


FIG. 15 BICYCLE LANE CROSSING

Left turning cyclists at this type intersection may continue through the intersection in the bike lane, then either get off the bike and cross as a pedestrian, or upon yielding to cross traffic, ride across the roadway (Figure 16).

Left turns at most bikeway intersections will be the single most conflicting situation for the bicyclists. At the more hazardous signalized intersections another alternative to reduce or eliminate bicycle/motor vehicle conflict would be to have red signals for all other vehicles; thus, giving the bicyclist time to traverse the intersection without having to compete with the auto. This could be accomplished by providing a manually pressed button on the traffic signal support, similar to those used for pedestrian crosswalks. It would be necessary to locate the button close to the bikeway so that it would be directly accessible to the bicyclist. This is a special situation and should be examined in regard to local conditions.

With all bikeway types, traffic controls (i.e. signs, signals, stencils), should be adapted for bicycle use at each intersection.

In light of the foregoing, it is suggested that the Statewide Traffic Code, Chapter 291C (H.R.S.) and most specifically Part I, General Provisions; Part VIII, Turning and Starting and Signals on Stopping and Turning; and Part XIII, Operation of Bicycles and Play Vehicles, be amended in applicability to bicycles.

In summary, minimizing conflicts between bicyclists, motorists, and pedestrians will come about through the development of bikeway design alternatives, educating the general public about laws pertaining to bicycles, and by amending regulations which govern the operation and position of bicycles upon the roadway and upon other portions of the highway, whether they include bikeways or not.

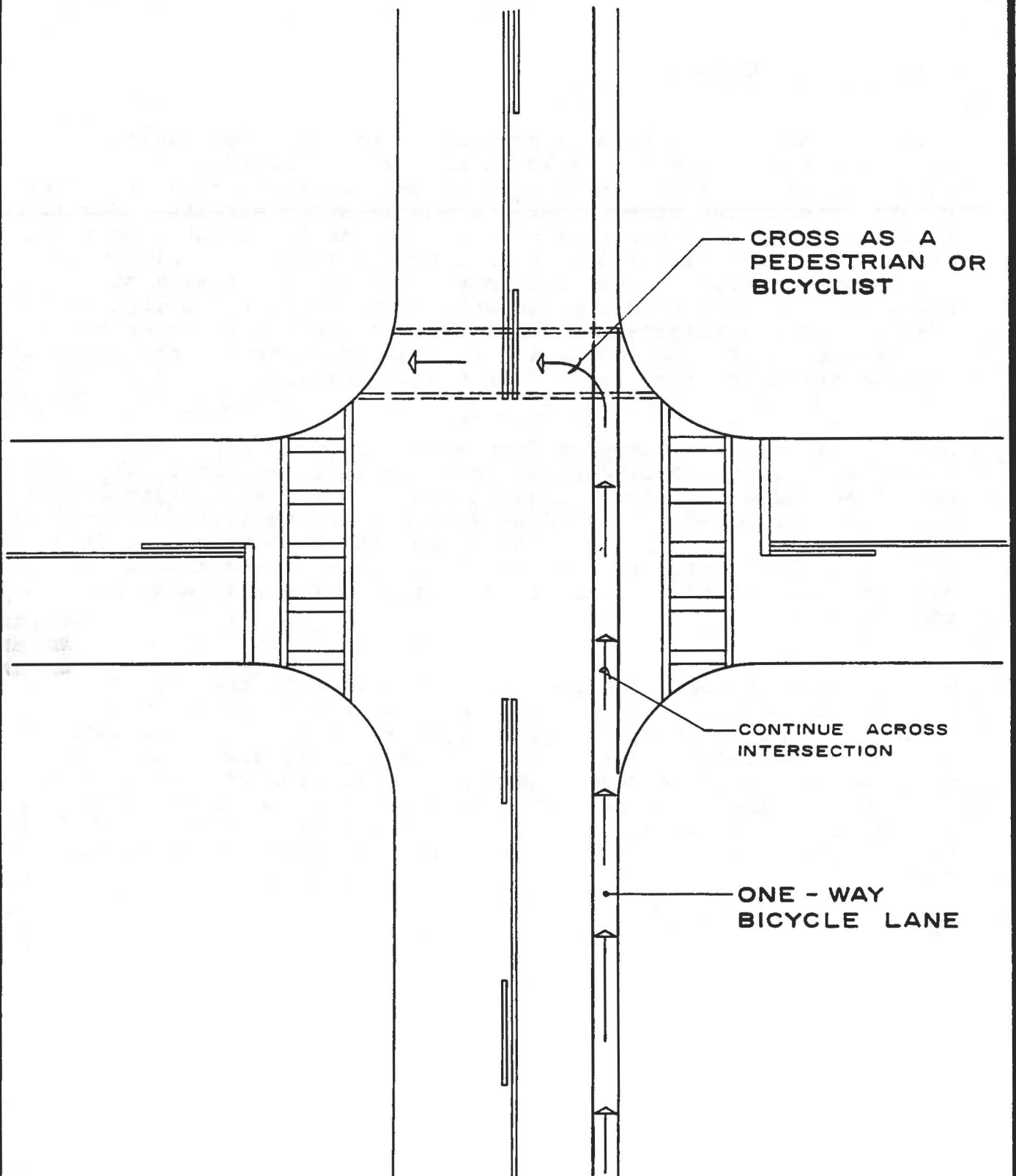


FIG. 16 LEFT TURNS

BIKEWAY ALIGNMENTS

Ideally, the bicycle path is considered the most desirable type of bikeway (see Figure 10 on page 24). However, it cannot always be provided because of cost considerations and lack of sufficient road rights-of-way along existing streets. Nor is it always necessary where traffic conditions are light. As such, initially street rights-of-way will be the means of implementing the bikeway system in Hawaii County. Providing a system of bikeways will come from improvements to these existing rights-of-way. More specifically, this will require the structuring and re-design of the roadway and roadway shoulder and the upgrading and re-designing of sidewalks for bicycle use.

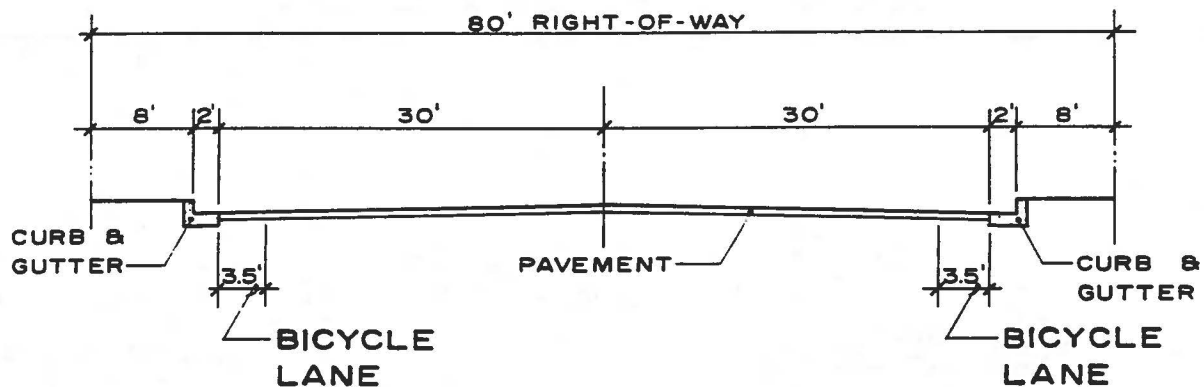
Bikeway alignments within various street rights-of-way are illustrated on the following pages (Figures 17 - 17.3). To establish the alternative alignments upon a roadway (Figures 17.4 and 17.5), will require amending sections of the Traffic Code which states, in part, that, "No person shall operate or ride a bicycle within a bicycle lane in any direction except that permitted of vehicular traffic traveling on the same side of the highway."

Bikeways must be well-designed and maintained if they are to facilitate the bicyclist. Important features in assuring the success of those bikeways located upon streets is to make sure that the longitudinal joint separations are not hazardous. For drainage reasons, bikeways should not be located within the curb and gutter. Also, joints parallel to or less than forty-five degrees to direction of bicycle flow should be avoided for they may be cause of hazard by inducing unexpected directional change.

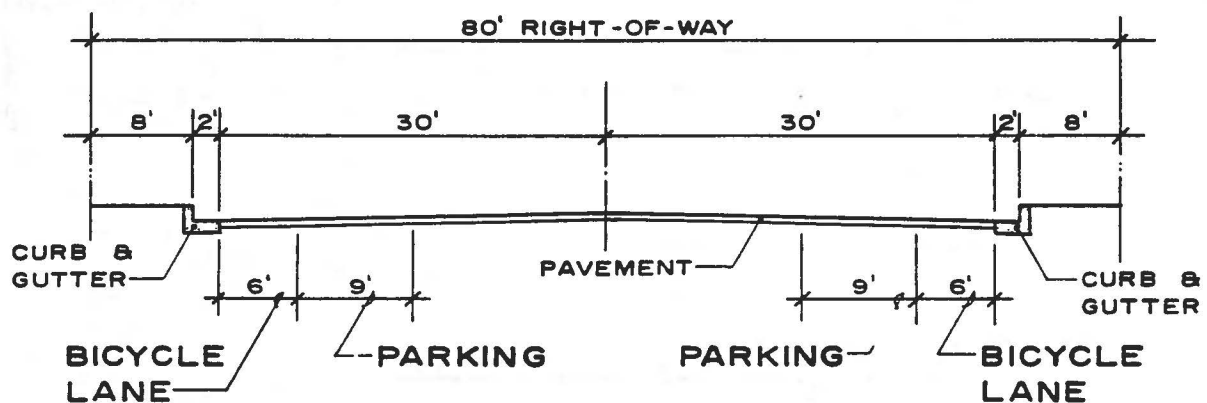
FIG. 17
STANDARD WIDTHS

SECONDARY ARTERIALS

WITH SIDEWALK



WITH SIDEWALK AND PARKING



WITHOUT SIDEWALK (NO PARKING)

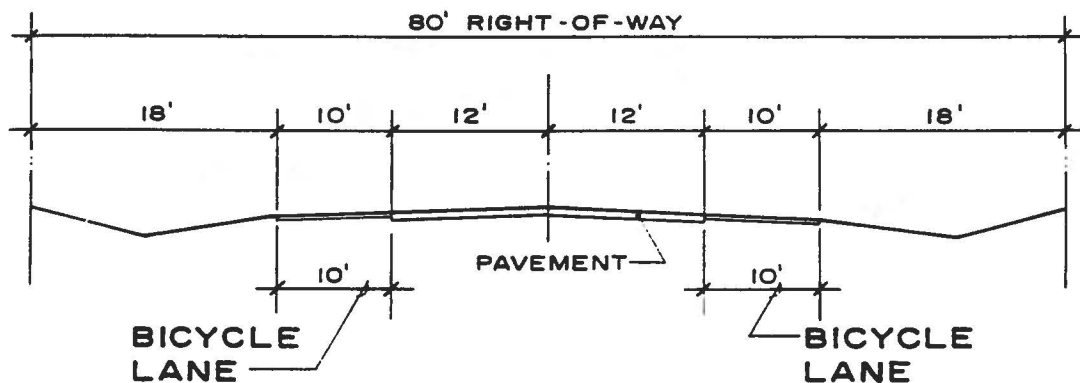
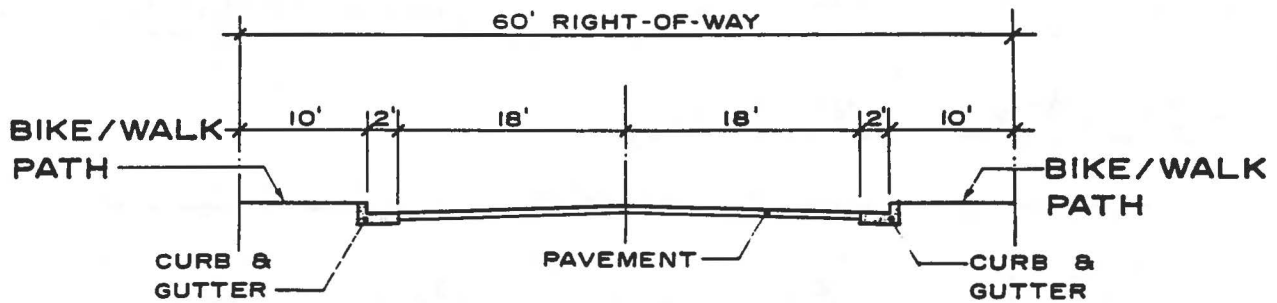


FIG. 17.1

COLLECTOR STREETS

WITH SIDEWALK



WITHOUT SIDEWALK (NO PARKING)

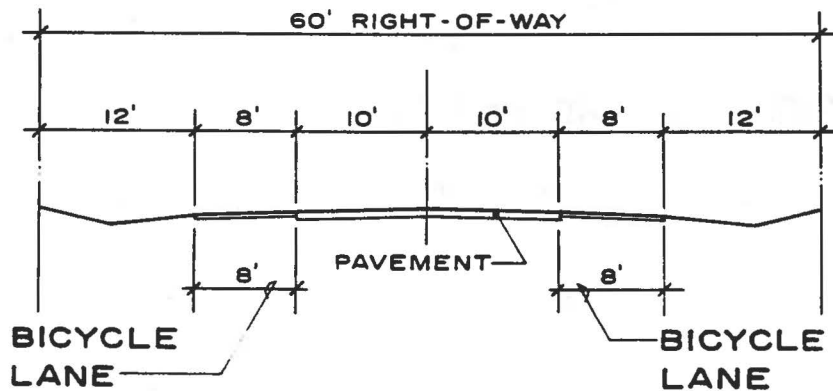
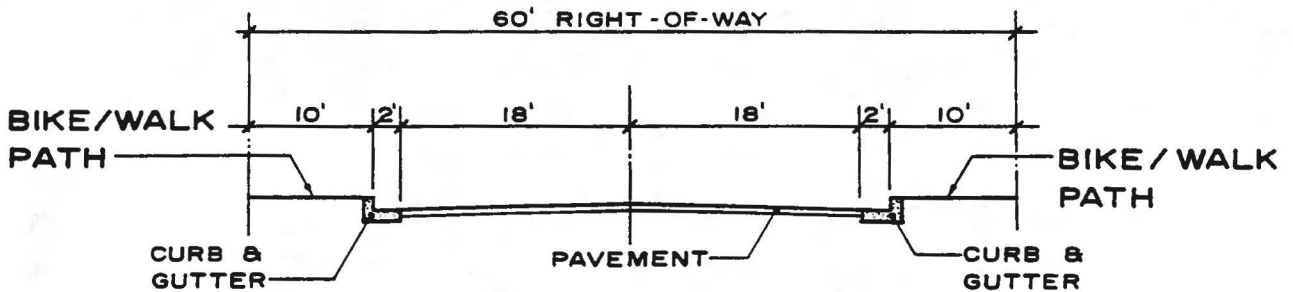


FIG. 17.2

BUSINESS AND INDUSTRIAL STREETS

WITH SIDEWALK



WITHOUT SIDEWALK (NO PARKING)

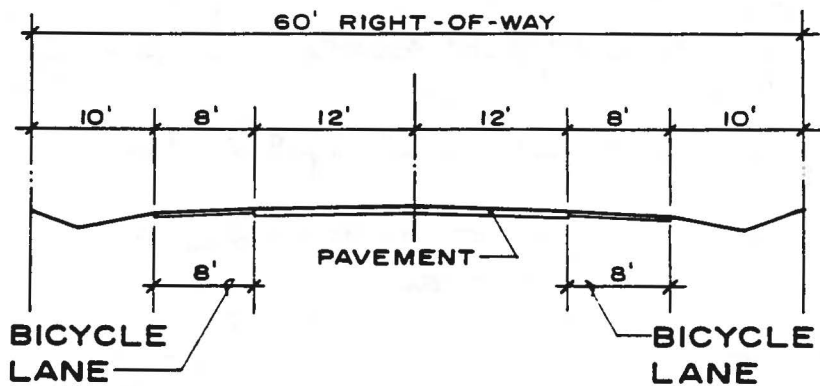
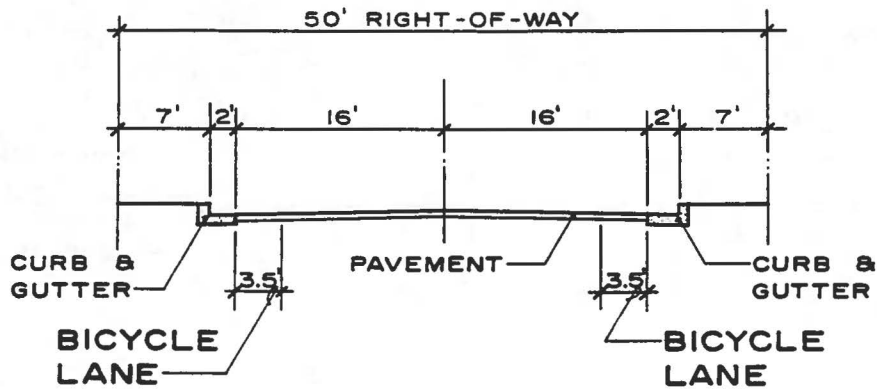


FIG. 17.3

MINOR STREETS AND CUL-DE-SACS

WITH SIDEWALK (NO PARKING)



WITHOUT SIDEWALK

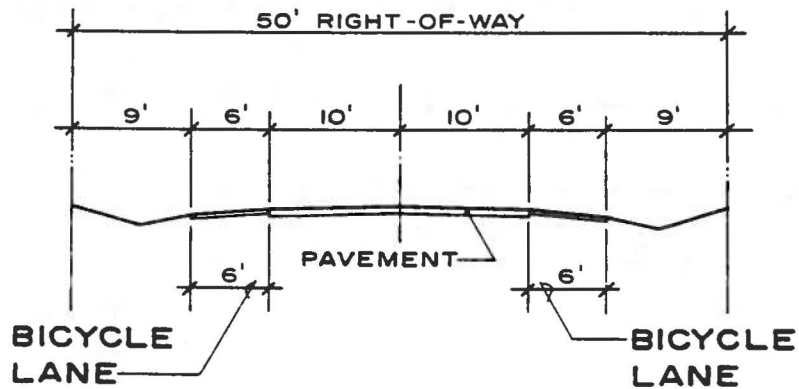
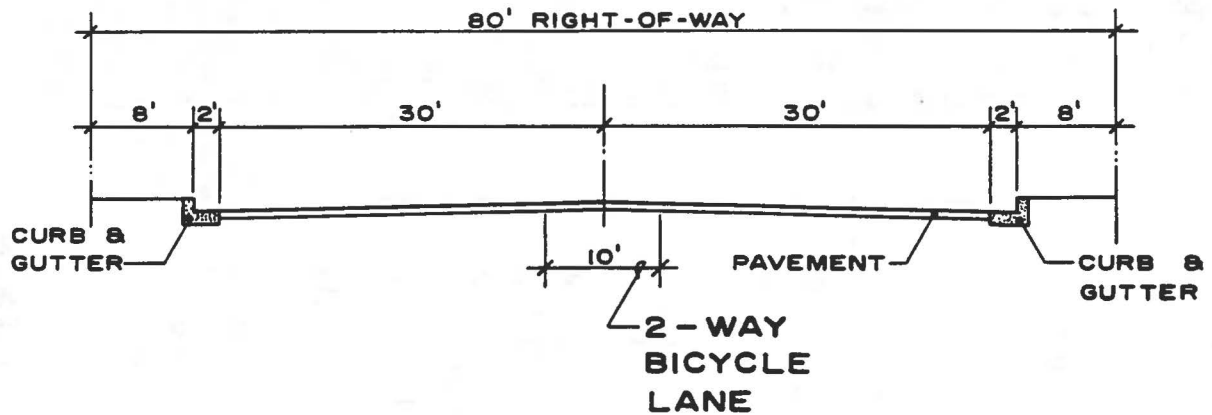


FIG. 17.4

ALTERNATIVE ALIGNMENTS
80' RIGHT-OF-WAY

WITH SIDEWALK
BI-DIRECTIONAL LANE
CENTER OF THE ROAD



WITH SIDEWALK AND PARKING
BI-DIRECTIONAL LANE
SIDE OF THE ROAD

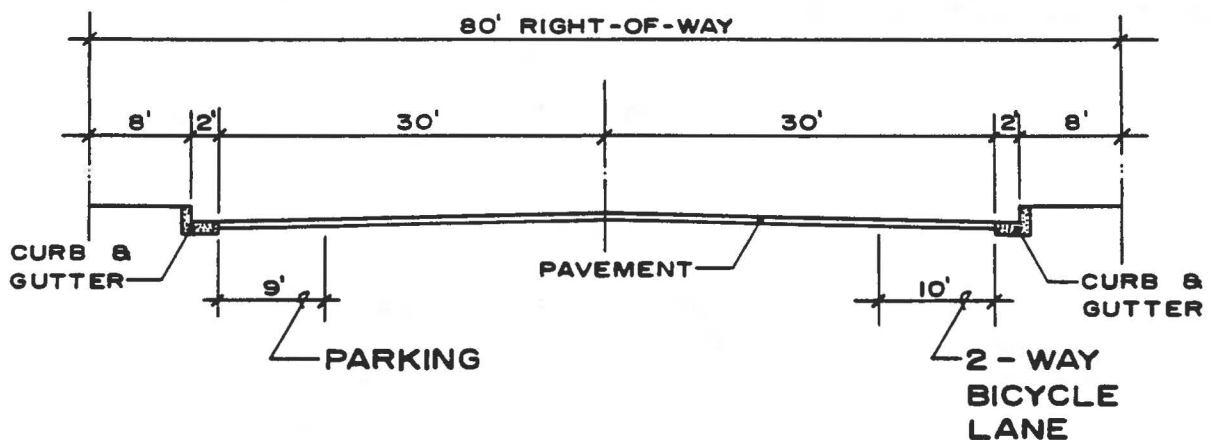
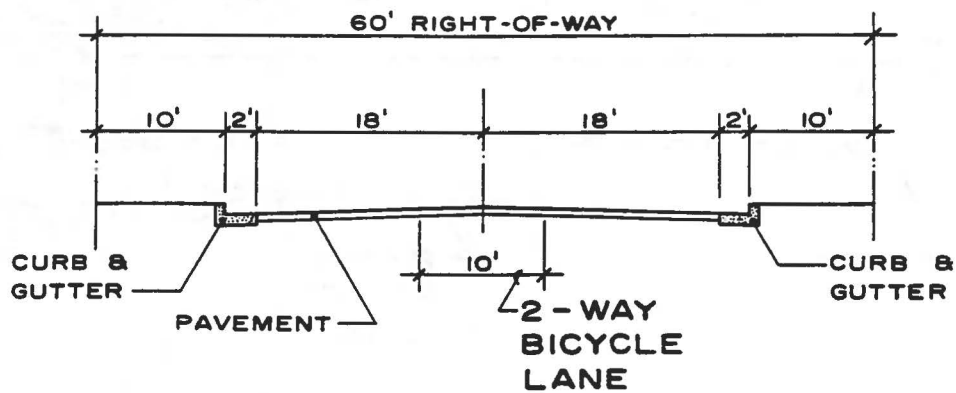


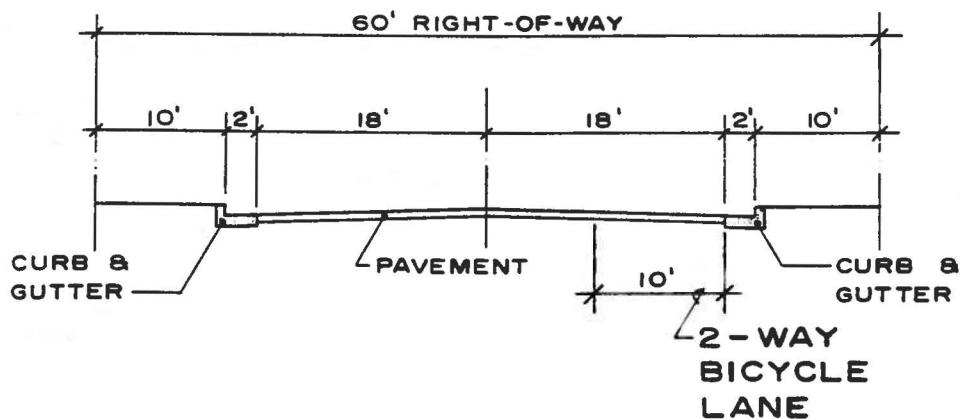
FIG. 17.5

ALTERNATIVE ALIGNMENTS
60' RIGHT - OF - WAY

WITH SIDEWALK
BI-DIRECTIONAL LANE
CENTER OF THE ROAD



WITH SIDEWALK
BI-DIRECTIONAL LANE
SIDE OF THE ROAD



BIKEWAY STRUCTURE

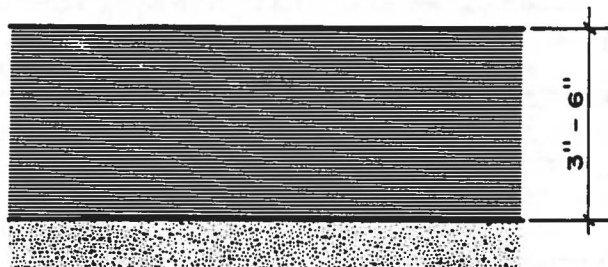
Two structural requirements for a bikeway are: first, that it must be able to support the wheel loads of bicycles, riders, and other vehicles which may cross or use the bikeway. Secondly, it is equally essential that a riding surface which is as smooth as possible be maintained as bicycles do not have adequate absorbing systems and give a very stiff ride as they travel on tires inflated to about 80 pounds per square inch. Specific problem areas which should be minimized are expansion and pavement joints, patching, chuck holes, and the use of existing concrete sidewalks where upheaval has occurred. Additionally, where bike lanes are established on existing roadways or streets, grating and gutter joints should be situated in such a manner that the cyclist does not skid.

Surfaces of loose gravel will also induce skidding and should be avoided. This is often true with bicycle paths which are especially created for recreational trips.

The specific design for structural sections will vary according to soils, climate, materials, and construction practices of the locality. However, a general guide is provided on the following page (Figure 18).

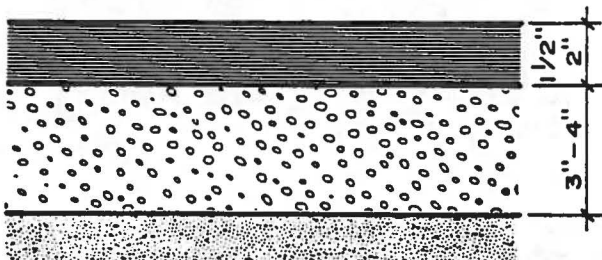
FIG. 18

TYPICAL PAVEMENT STRUCTURAL SECTIONS FOR BICYCLE TRAILS



ASPHALTIC CONCRETE
(FULL DEPTH)

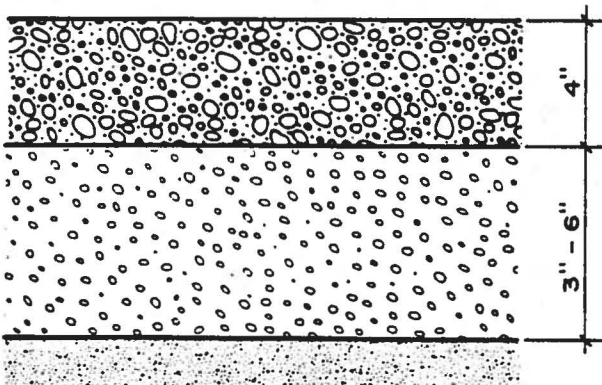
COMPACTED SUBGRADE



ASPHALTIC CONCRETE

AGGREGATE OR
STABILIZED BASE

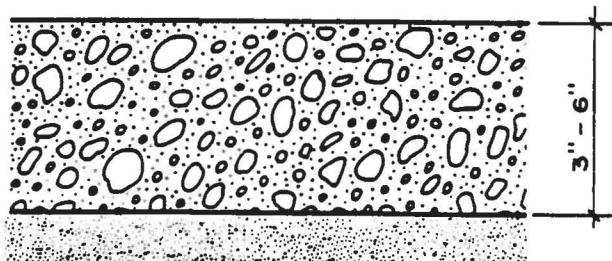
COMPACTED SUBGRADE



PORTLAND CEMENT
CONCRETE SURFACE

AGGREGATE OR
STABILIZED BASE

COMPACTED SUBGRADE



STABILIZED AGGREGATE
(SOIL AND AGGREGATE
MIXED AND COMPACTED)

COMPACTED SUBGRADE

MOTORIZED BICYCLES

With the introduction of bikeways to Hawaii County comes the necessity to address motorized bicycles or "mopeds" a relatively new form of transportation in the United States. Bikeplan Hawaii: A State of Hawaii Master Plan, recommends that consideration be given to prohibiting mopeds on all bike lanes and paths or excluding them from the definition of a bicycle or both. However, several States have rewritten the definition for mopeds and there are now thirty three States with legislation that list mopeds separately from motorcycles and virtually in the same class as bicycles. It would seem that to restrict the development of this new form of transportation before its potential is realized, is to overlook its possibilities as an energy saver, recreational vehicle and alternate mode of transportation. As such, this section will depict those rights-of-way which are presently available for moped use given the applicable County, State and Federal governmental regulations.

The operation of bicycles and motorized bicycles in Hawaii County is regulated by Chapter 291C (H.R.S.). The Hawaii State Legislature recently redefined the term "bicycle" to include motorized bicycles, "provided the power capability of the motor shall not exceed one and one half horsepower" Act 187-75, (S.L.H.). The Federal Highway Administration (FHWA) after reviewing Hawaii's Act 187-75, advised the State Department of Transportation in January 1976, that "Federal-aid participation must be limited to those bikeway projects where all motorized vehicles (excepting maintenance vehicles) will be banned... bikeways are being advanced as a means to separate motorized and non-motorized means of travel and whether we are looking at automobiles, motorcycles, or mopeds, we are still looking at a motorized vehicle and they are not compatible with bicycles and/or pedestrians." This regulation motivated the Hawaii State Legislature to adopt several laws in relation to bicycles.

Act 175-78 (S.L.H.) amended Section 291C by adding a definition for mopeds, page 12, and by adding a separate part entitled, Special Rules for Mopeds which includes the following sections:

"Section 291C Driving mopeds on roadways. (a) Every person driving a moped upon a roadway shall ride as near to the right side of the roadway as practicable, exercising due care when passing a standing vehicle or one proceeding in the same direction.

(b) Persons driving mopeds upon a roadway shall drive in single file.

(c) No person shall drive a moped on any sidewalk or area intended for use as a sidewalk, nor shall any person drive a

moped on any path or other area intended for the exclusive use of pedestrian.'

"Section 291C Driving mopeds on bicycle lanes and paths.

(a) Wherever bicycle lanes are provided on the roadway, moped drivers shall use such bicycle lanes.

(b) The director of transportation by rule and the counties by ordinance may with respect to bicycle paths under their respective jurisdictions restrict or prohibit the use of such bicycle paths by mopeds. Signs clearly visible to an ordinarily observant person indicating the restriction or prohibition shall be placed along bicycle paths so designated and every moped driver shall obey the directions thereof."

COSTS

The length of the proposed Hawaii County bikeway system is approximately 44 miles. The type and location of specific bikeways is provided in appendix, Bikeways for Hilo and Kailua. From Bikeplan Hawaii, the derived unit cost per mile for most types of bikeways was calculated and is as follows:

Bike route (urban)	\$ 2,000
Bike route (rural)	1,000
Bike lane (shoulder paving)	57,000
Bike lane (on existing shoulder)	8,600
Bike path	35,000

Using these construction cost figures, roughly \$280,000 is needed for County bikeways within Phase I.

It should be noted that Bikeplan Hawaii does not provide construction cost estimates for a bike/walk path. As such, to compute the cost of Phase I, the cost per mile of (urban) bike route, \$2,000, was also used for the bike/walk path.

Construction cost estimates are based on 1977 cost factors and do not include escalation factors or additional rights-of-way acquisition costs, utility relocation costs inherent to city street widening, or major structural costs for bridge widening due to the prohibitive nature of these costs.

The comprehensiveness of the Hawaii County bikeway system prevents its total construction at the present time. Lack of data, funding and public acceptance regarding the safety and usage of individual bikeways and the bikeway system on the whole makes it extremely difficult to evaluate bikeways objectively. Therefore, bikeways within Phase I should serve as a demonstration phase during which evaluation can take place. In such a manner, the needed knowledge and experience for application to future bikeway construction may be gained.

IMPLEMENTATION RECOMMENDATIONS

The Future

Previous sections of the plan have dealt with the conceptual and design aspects of a bikeway system. In order to implement such a system, a number of other activities must also be done.

1. Bicycle traffic regulations are governed by general provisions of the Hawaii County Code, Chapter 6, Article 13 and the Statewide Traffic Code (Chapter 291C, Hawaii Revised Statutes). However, detailed codes must also be developed to clarify the relationship of a bicyclist to the motor vehicle and the pedestrian under varying conditions. These should include right-of-way rules, procedures upon roadways, bikeways, and at intersections, and the required equipment for every bicycle.

A draft bill for an amendment to the Statewide Traffic Code (H.R.S.) should be developed.

2. Educational programs both for bicyclists and the public at large must be conducted. Through driver education and licensing programs, motor vehicle operators can be made aware of the rights of cyclists. Additionally, several other alternatives should be encouraged. These include sponsorship of bicycle safety programs by civic and community organizations and utilization of various media to increase public awareness of bicycle safety.
3. An important part of the success of the bikeway system is the maintenance of a clean, smooth riding surface. The Department of Public Works should reflect within their operating budget bikeway maintenance considerations.
4. A pilot project has been developed for Hilo and Kailua and is attached as an Appendix. This plan may be adopted by the County Council.
5. Should the Bikeway Plan be adopted, and as it is being implemented, a continual monitoring program should be established to evaluate the effectiveness and safety of the routes and types of bikeways.

6. The Departments of Public Works and Parks and Recreation should conduct a study of program for additional sources of funding both in terms of incorporating bikeway considerations within Capital Improvement roadway and park projects and separate sources.
7. A list of bicycle regulations should be assembled and distributed to all bicyclists with registration of their bicycles.
8. A study should be conducted to determine the impacts of eliminating on-street parking along those streets designated for bikeways.
9. A program should be initiated to replace parallel slat drainage grates which are hazardous to bicycling.

APPENDIX

BIKEWAYS FOR HILO AND KAILUA

The Hawaii State Master Plan for Bikeways, the draft Kona Community Development Plan (CDP) and the Hilo Community Development Plan (CDP) designate bikeways for Hilo and Kailua. The bikeways for Hilo and Kailua developed here basically follow the recommendations of these plans.

The first step was to develop a preliminary bikeway network for Hilo and Kailua in accordance with the goals, objectives, and standards of The Bikeway Plan. Heavily used bicycle routes and major destination points such as recreational areas, shopping centers, schools, and employment areas were determined. Future developments such as neighborhood parks as planned for in the (CDP) were also included. Bikeways were planned from residential areas to these destination points along the most direct routes. The result was a complete bikeway network that delineated desirable routes.

Information was then gathered on traffic volume, street and sidewalk conditions, construction costs, and causes of bicycle accidents. These presented constraints that were used to modify the preliminary bikeway network. For example, if the road right-of-way was not wide enough to allow construction of a bikeway, an alternate route had to be chosen. The modified plan also specifies the type of bikeway needed: bike/walk path, bicycle route, bicycle lane, or bicycle path.

A plan of implementation was decided upon with major consideration given to coordination with other projects in the Hawaii County Capital Improvement Program. For example, if a road was planned to be resurfaced and was designated for a future bikeway, the bikeway could be constructed at the time of the resurfacing. In this way, the plans of the Department of Water Supply and Department of Public Works would be incorporated into the bikeway plans.

The implementation program of the Hilo and Kailua bikeways is divided into major phases. The first phase of Bikeways for Hilo is further divided into six parts each to be implemented within consecutive one year periods. The timing of implementation may be accelerated in the event that more funds are available.

BIKEWAYS FOR HILO

PHASE I - This phase connects most of the recreational and shopping areas, concentrating on central Hilo. It allows access to the beach area, the University, Community College, Kaiko'o Mall, Downtown, Hilo Shopping Center, Wailoa State Park, and Hoolulu Park.

Part 1

Manono Street - A bicycle lane is recommended for both sides of Manono Street between Piilani and Leilani Streets. There are sidewalks on both sides of Manono Street from Piilani Street to Kamehameha Avenue, and these should be converted to bike/walk paths. The remaining section from Leilani Street to East Kawili Street will be designated as a bicycle route to complete the bikeway.

Kamehameha Avenue - A bike/walk path for the makai side and a combination bicycle lane and bike/walk path for the mauka side are planned. The makai side will continue to allow parking for access to the park area adjacent to Kamehameha Avenue. The mauka side requires removal of parking up to Honiron, where parking will be retained for employees.

Downtown - New one-way circulation of the downtown plan was implemented on August 10, 1975. Bicycle routes should be designated along the one-way streets of Keawe and Kinoole in accordance with the new circulation.

Puueo - Wainaku Street sidewalks should be converted to bike/walk paths to allow access to the town for residents in the Puueo area.

Part 2

West Kawili Street - This street is heavily used by the University students, especially those living in Ash Housing. The shoulders should be widened for bicycle lanes on both sides of the street, and may be shared with pedestrians.

Kawili between Kinoole and Kilauea - The realignment of this street coordinated by the Public Works Department has been completed. The bicycle lanes planned for the shoulders of the road should be constructed.

East Kawili Street - This is the last segment connecting the Community College with the University and the rest of the bikeway network, and will be designated as a bicycle route.

Kapiolani Street - Bicycle routes are proposed between Lanikaula Street and Kawili Street to accommodate student traffic.

Part 3

This part largely connects Waiakea and the University with Downtown.

Kinoole Street - This street is being resurfaced and widened by the Public Works Department. A bicycle lane is being recommended for the section from Kawili Street to the railroad right-of-way.

Railroad Right-of-Way - (Abandoned, owned by the State)
This is proposed to be used as a mini-park and bicycle path connecting Kinoole Street and Kilauea Avenue.

Kilauea Avenue - The lightly travelled sidewalk on the makai side of the street should be used as a bi-directional bike/walk path from Ponahawai Street to the railroad right-of-way.

Pauahi Street - Sidewalks on both sides should be converted to bike/walk paths to connect Kilauea Avenue and Kamehameha Avenue and to service the Kaiko'o area.

Ponahawai Street - The sidewalks on both sides of the street are being recommended as bike/walk paths to connect Kinoole Street with Kamehameha Avenue.

Part 4

Mohouli Street - This street has been resurfaced by the Department of Public Works. A proposed bicycle lane may be shared with pedestrians to be used by residents in the area.

Parts 4 and 5

Kalaniana'ole Street - A combination of bicycle route, lane, and bike/walk paths is proposed to accommodate bicycling to swimming spots, picnic areas, or for recreational riding. Should funding permit, the bikeway could extend the entire length of Kalaniana'ole Street instead of just part way.

Kamehameha Avenue and Silva Street - Will be widened to become the major roadway to reach the Keaukaha area. Thus, the portion of Kalaniana'ole Street between these two streets will be less travelled by cars and will be suitable for a bicycle route.

Part 6

Banyan Drive - A two-way bicycle path to be used exclusively for bikes is planned on the outside of one of the existing sidewalks. Lihiwai Street (around Liliuokalani Park) should be restricted to one-way traffic and the other lane used by bicyclists and/or pedestrians.

PHASE II - This phase largely connect the major residential areas to the city system devised in Phase I. Six schools, three parks, and the library will be reachable by the bicycle system in addition to the destination points included in Phase I. This phase also proposes an intensive system of bikeways through Wailoa Park for recreational riding. The implementation of Phase II is dependent on funding and the need for systems for other areas in the County which may postpone this phase.

PHASE III - The main purpose of this phase is to connect the new Waiakea High School and zoo to the rest of the system. The implementation depends on the time of construction of these two developments and completion of Phase II. Planned within Phase III are short paths along the Flood Drainage Canal from the University; and bicycle lanes through the school district of Waiakea High, Intermediate, and Elementary. A new neighborhood park is proposed

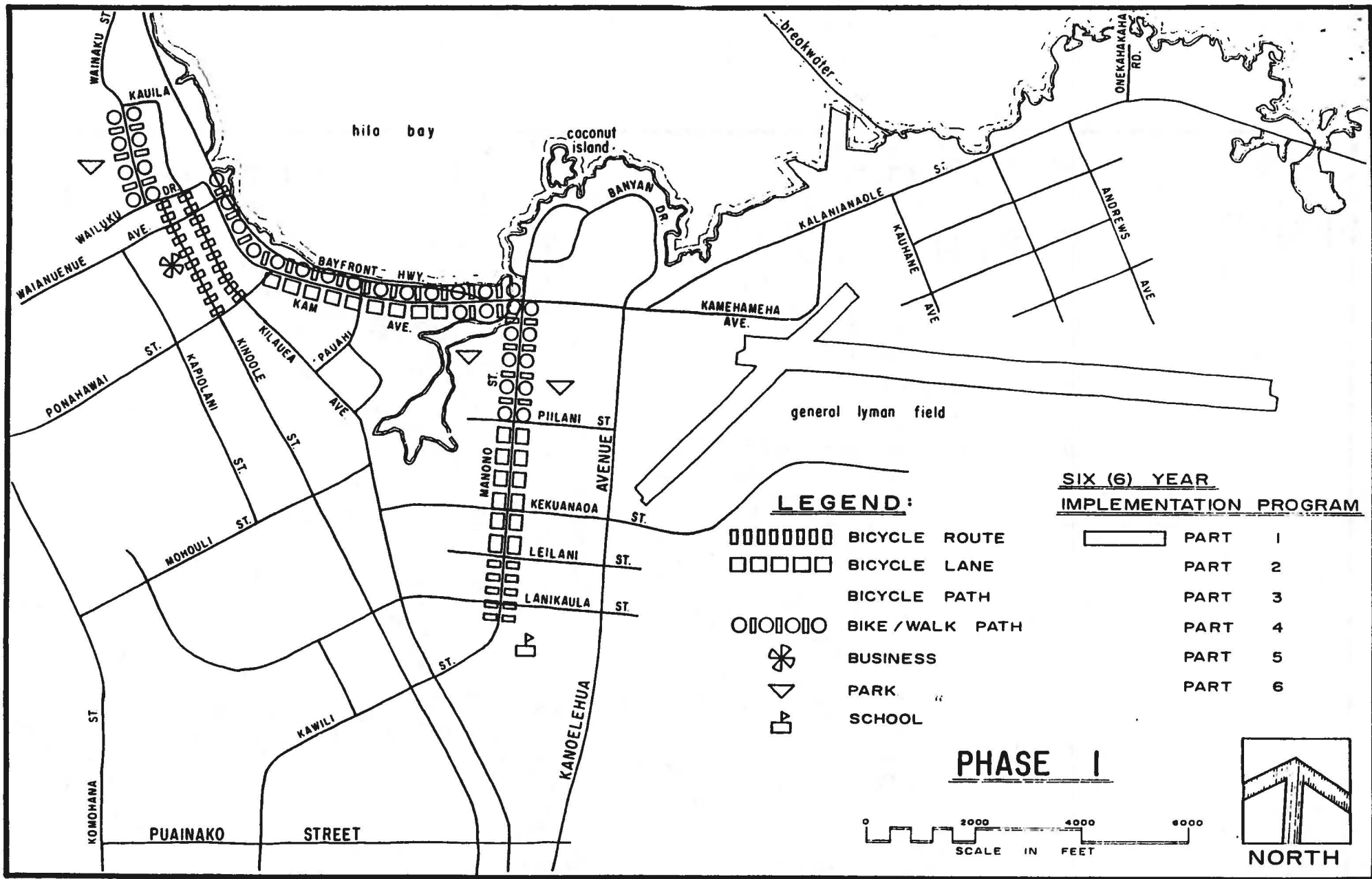
for the Waiakea Uka district. A bicycle lane is being proposed to connect this park to the existing Waiakea Uka Gym and to the Bikeway system. The Hilo CDP proposes a path along the Bayfront for bicycles and pedestrians, this is also included in Phase III.

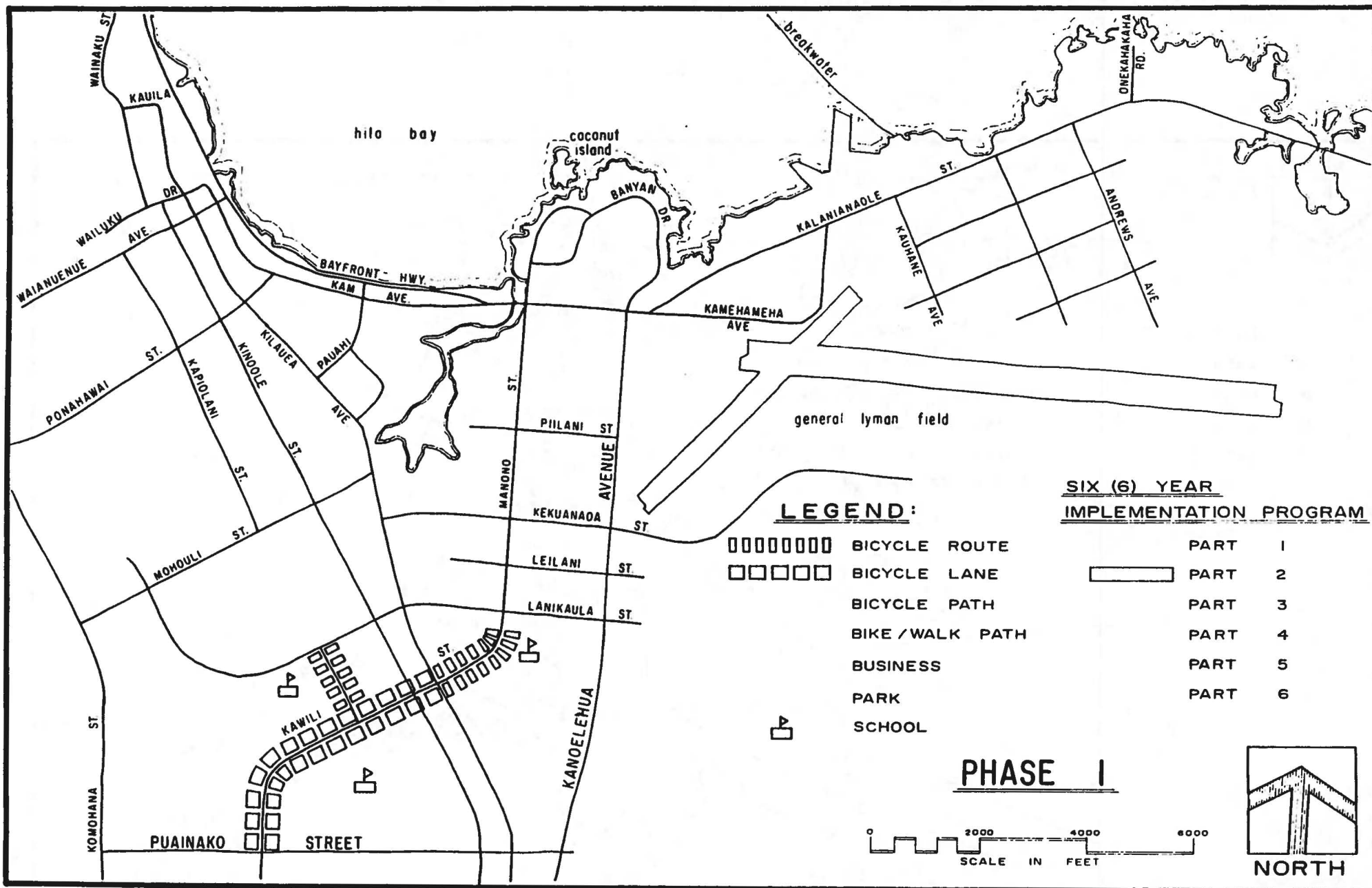
BIKEWAYS FOR KAILUA

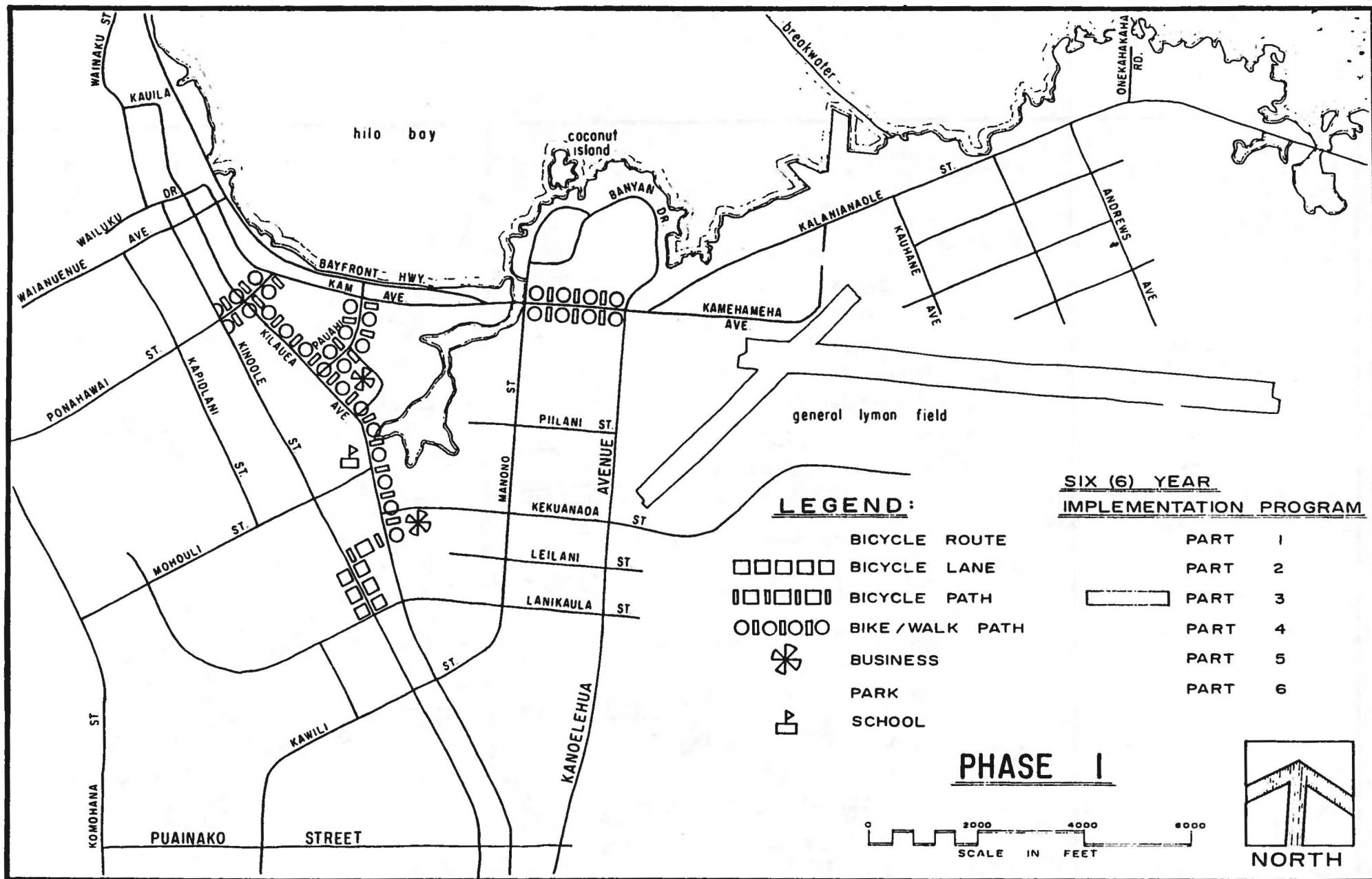
PHASE I - This phase connects with the existing bike lane and also provides access to Kailua and the beach areas.

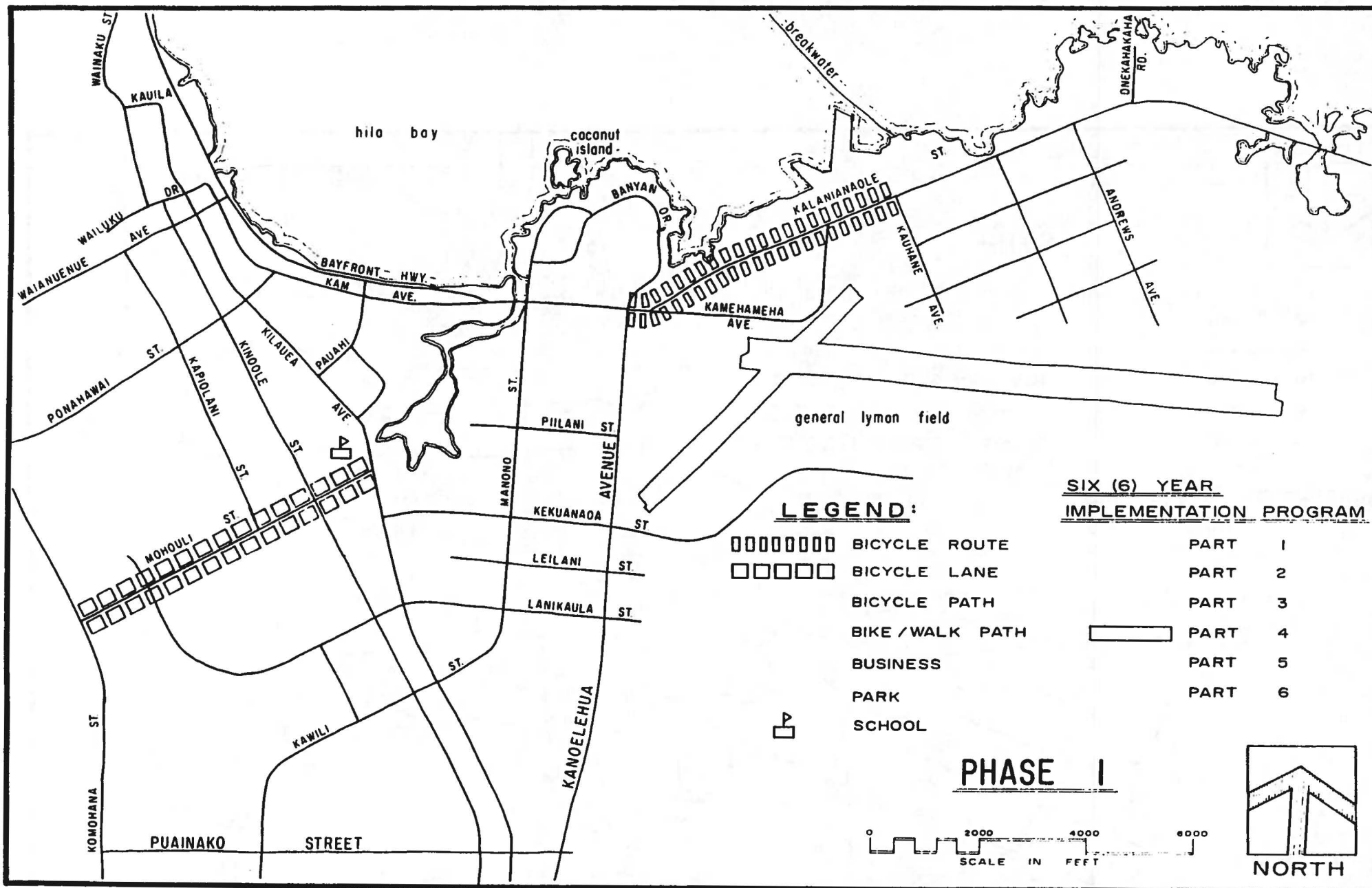
Alii Drive - A bike route is recommended along Alii Drive between Kamehameha III Road and the Kuakini Highway and Palani Road junction.

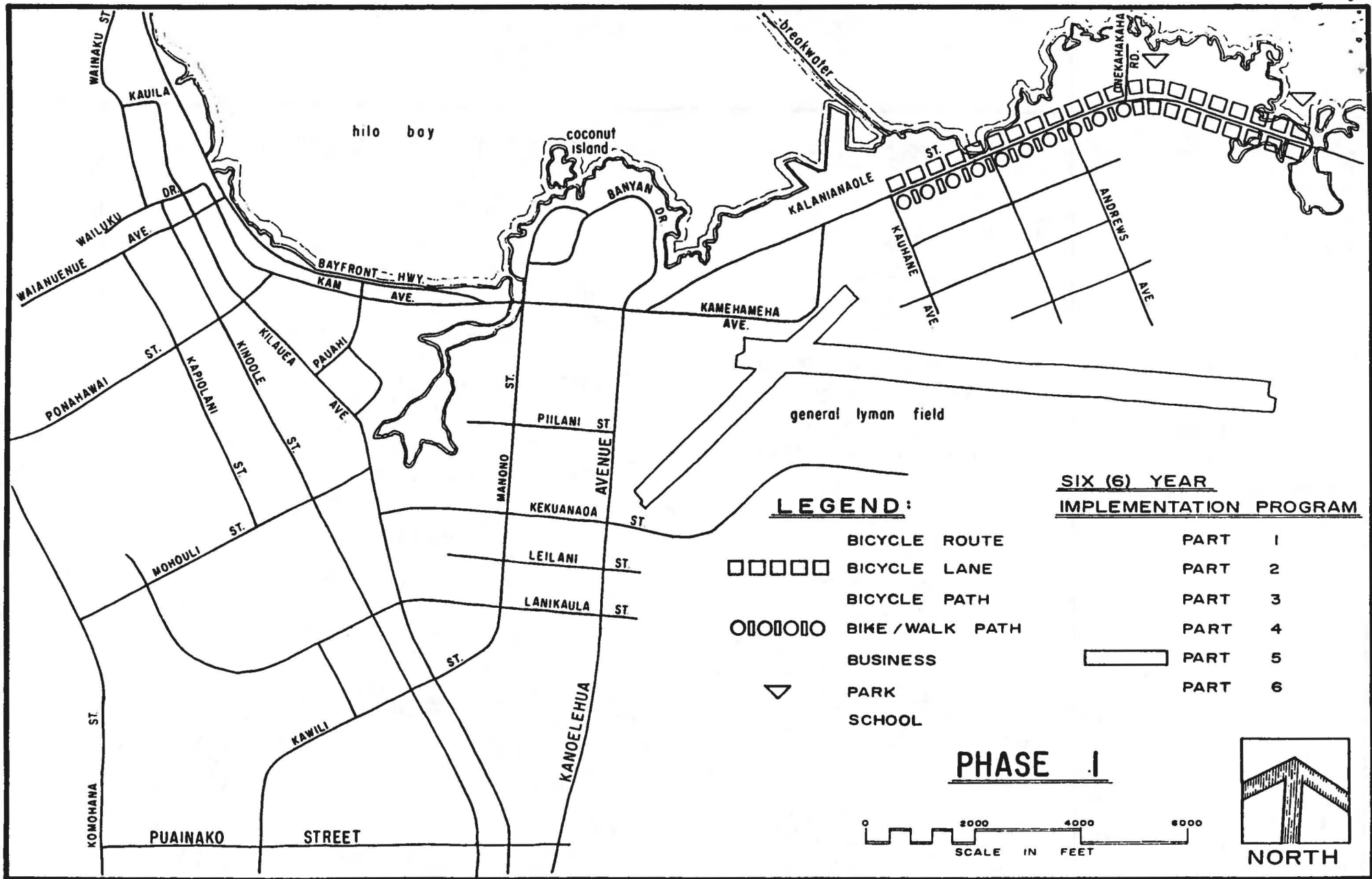
Kuakini Highway - A bike lane, approximately 2 miles long, is recommended for each side of Kuakini Highway beginning at the Kuakini Highway and Palani Road junction heading South.

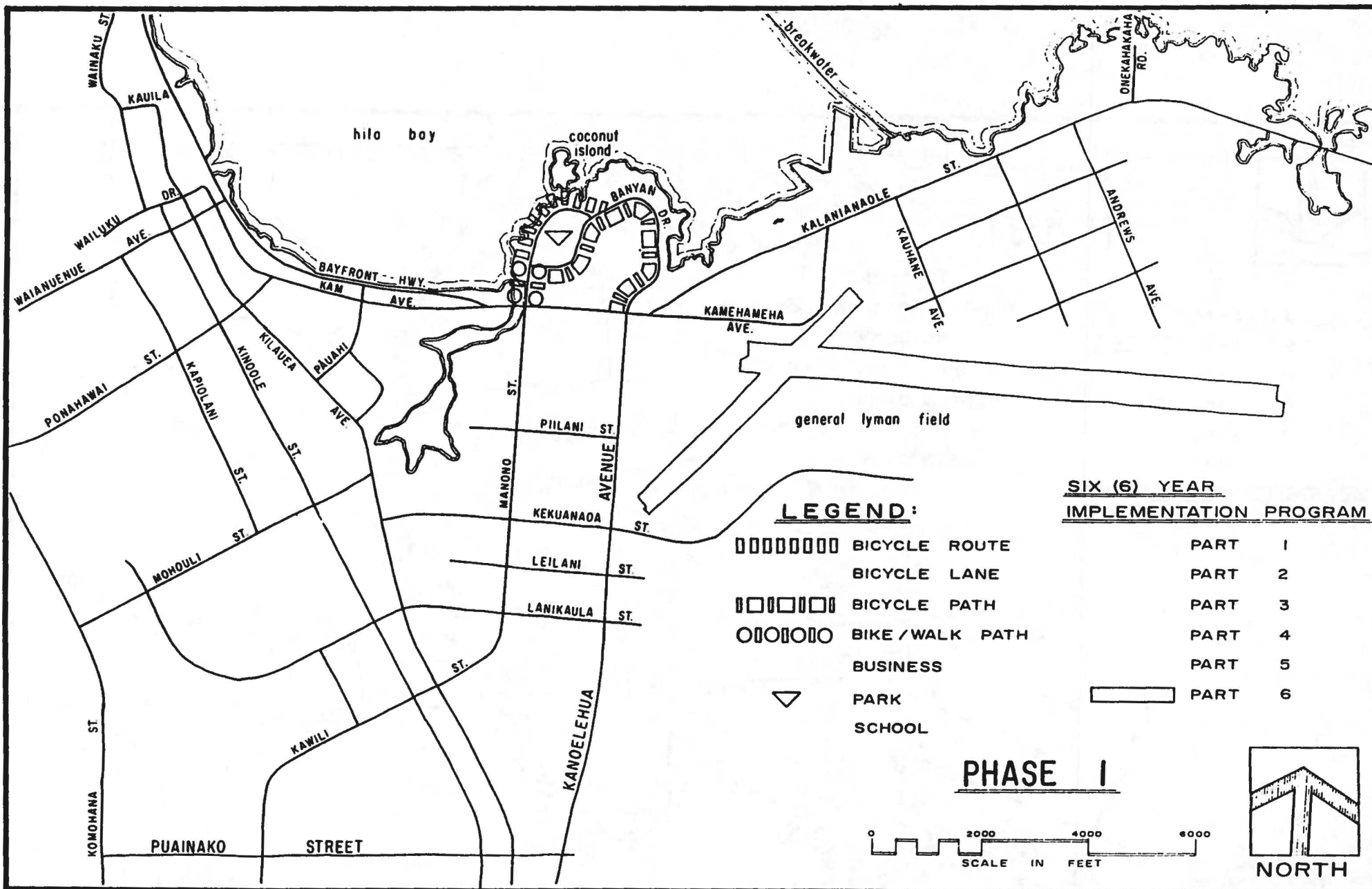








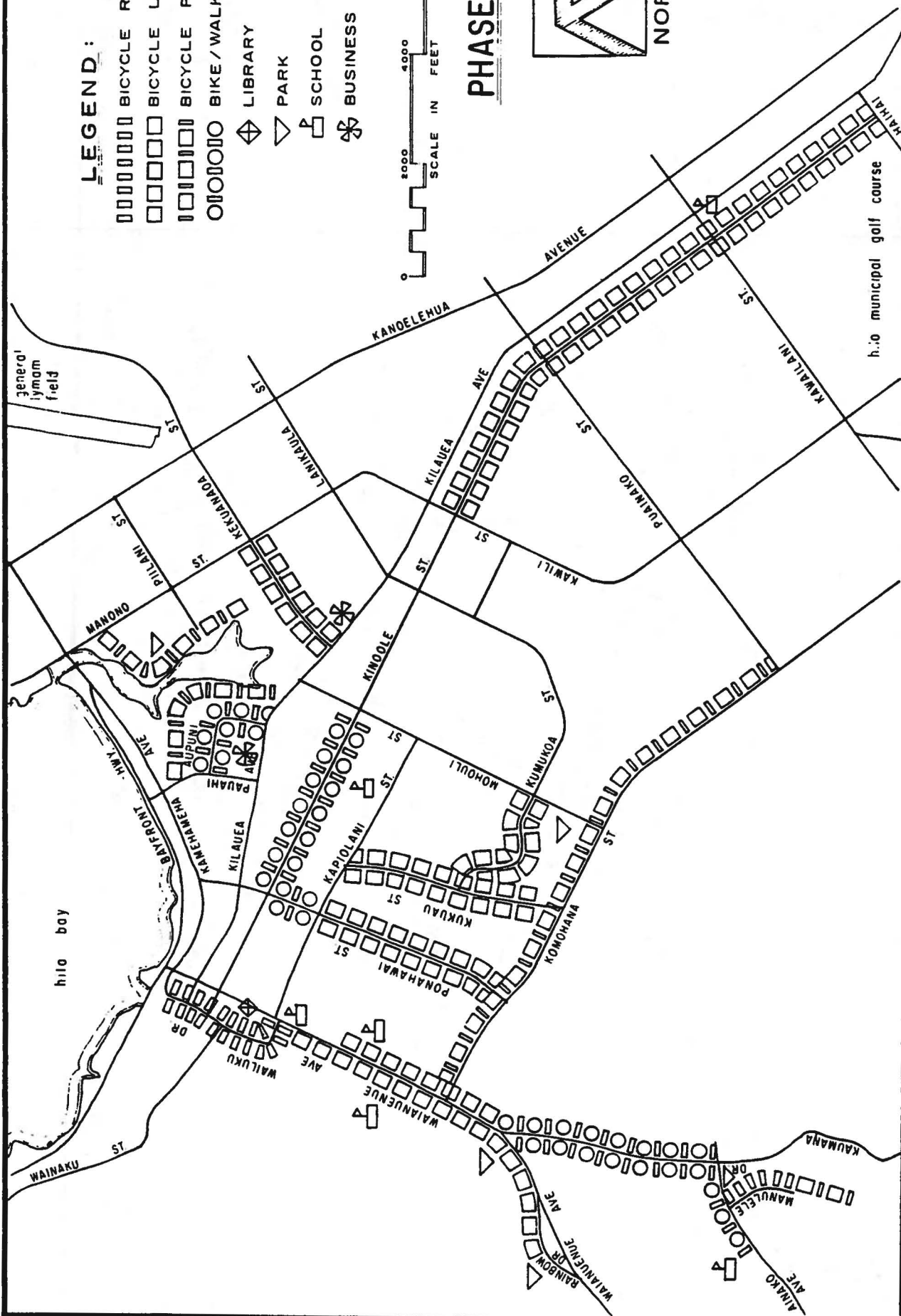
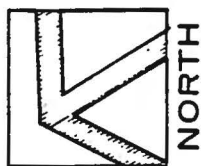


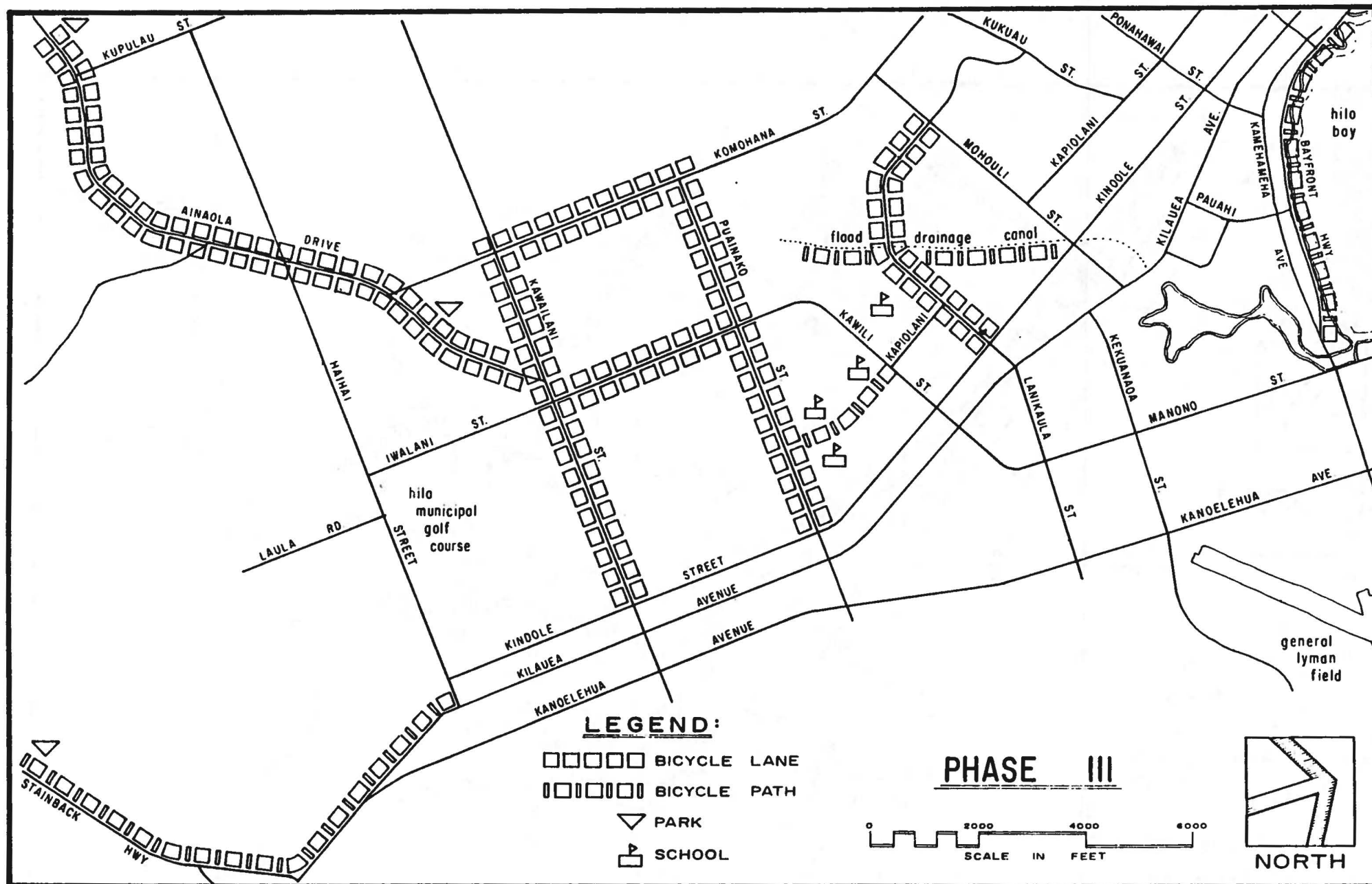


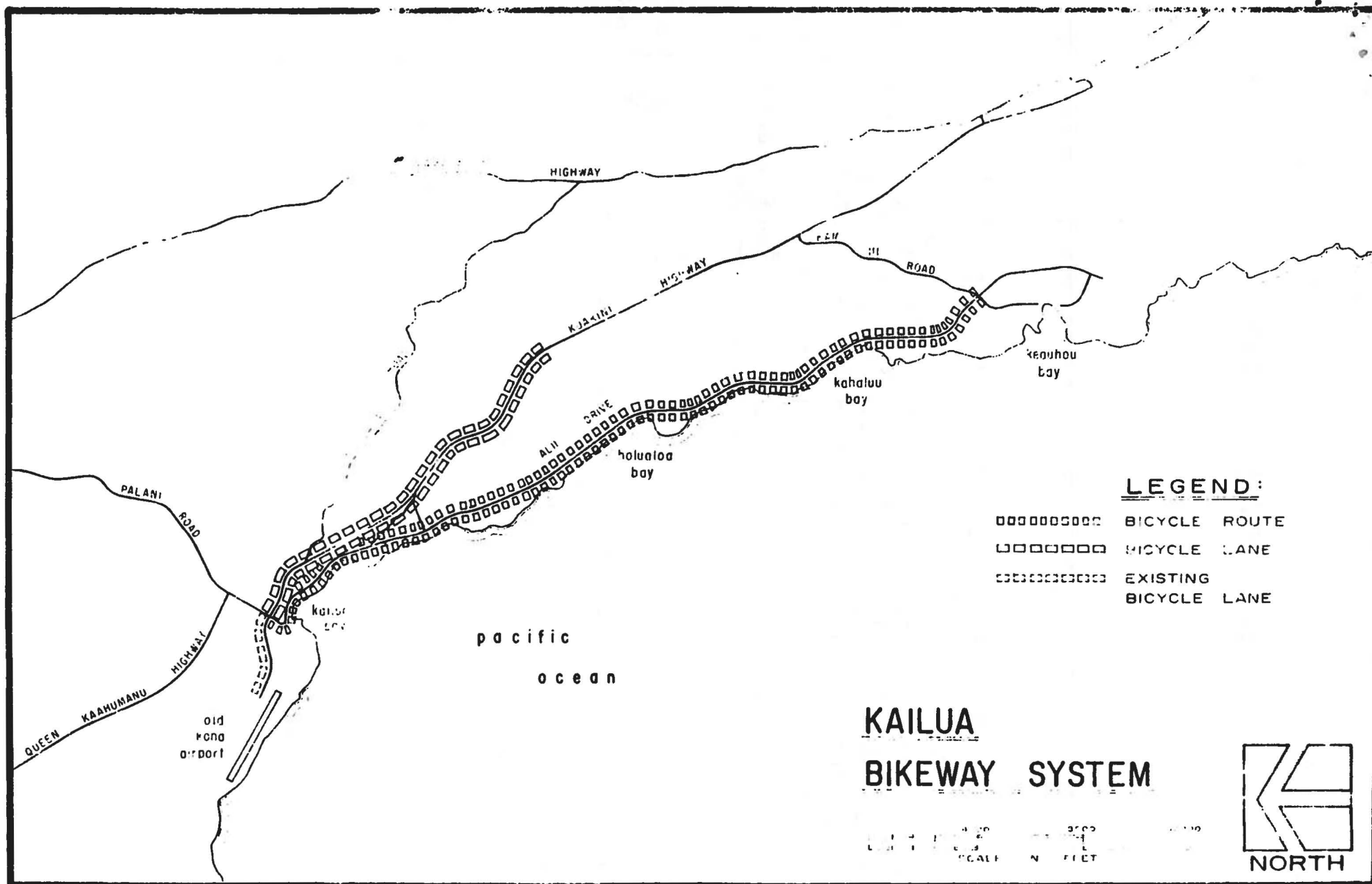
 BICYCLE ROUTE
 BICYCLE LANE
 BICYCLE PATH
 BIKE / WALK PATH
 LIBRARY
 PARK
 SCHOOL
 BUSINESS



PHASE II







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