



Kihei High School Project Pedestrian and Bicycle Analysis

August 2012

Prepared for:
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Honolulu, HI 96826



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Kihei High School

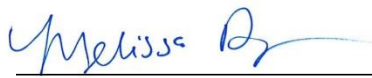
Pedestrian and Bicycle Analysis

County of Maui

August 10, 2012

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KIHEI HIGH SCHOOL PROJECT PEDESTRIAN AND BICYCLE ANALYSIS

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1.0 Introduction

The State of Hawaii, Department of Education (DOE) has proposed to construct a new High School in the Kihei Community of Maui County. There is limited capacity to serve high school students in the Kihei community. There is no DOE public high school in Kihei and most high school students attend Maui High School and Baldwin High School, located about 15 miles to the north in Kahului and Wailuku.

The high school site is proposed opposite to Kulanihakoi Street about one-quarter mile east (mauka) of Piilani Highway (State Highway 31). The project driveway entrance would take access to an extension of Kulanihakoi Street, which currently extends only west from Piilani highway. In addition, it is proposed that the intersection of Kulanihakoi Street and Piilani Highway will be signalized.

A traffic study was prepared in 2011 in conjunction with the Environmental Impact Statement for the proposed High School by Wilson Okamoto Corporation, a firm located in Honolulu that provides traffic engineering and civil engineering services throughout Hawaii. The traffic study focused upon motor vehicle traffic changes expected from construction of the high school. In response to community requests, Wilson Okamoto requested Stantec Consulting Services Inc. (Stantec) to prepare an analysis of potential bicycle and pedestrian circulation needs for the proposed High School. The Stantec team has been preparing bicycle and pedestrian analyses for many years, and the project manager for this project has done recent pedestrian and bicycle analysis in both Santa Monica and Long Beach, California, both of which have received awards and recognition for their pedestrian and bicycle friendliness. Stantec has also been working specifically in the state of Hawaii, and our staff has been working in various locations in the State of Hawaii for over ten years.

1.1 Background

Pedestrian travel is an important, but often overlooked, form of transportation. In fact, virtually all trips begin and end as pedestrian trips. Pedestrian trips are normally served by provision of sidewalks or similar pedestrian facilities alongside of roadways. Ideally, sidewalks would provide for a pleasant and comfortable walking experience, which can be enhanced by a well-maintained level surface, an interesting environment, multiple routes of direct and near-equal distance, intermittent shade, and appropriate provisions for crossing busy roadways.

Bicycling is a form of transportation that has existed for longer than motor vehicle transportation. Bicycling was very popular prior to 1900 and is credited with the initial program that resulted in paving of roadways. Its popularity as functional transportation declined steadily until it was largely viewed as a child's activity or an adult specialty sport by the 1980's, however this popularity has been reversed in the past 20 years. Many communities are now actively looking for ways to better serve bicycle transportation, whether as a utility vehicle, for fitness, or as a

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more economic and environmentally friendly alternative to motor vehicles. It is especially appropriate for trips of up to about three miles, because it can often provide travel times, door-to-door, that are competitive to automobile transportation, especially when auto parking is not convenient.

The community of Kihei has directly experienced this growing bicycle trend. It has established many miles of new bikeways in the past few years, mostly by restriping existing roadways to make room for bicycle lanes, often by prohibiting parking. Stantec also observed some increase in walking, for both exercise and utility purposes, throughout the community.

Sidewalks and roadway crossings are generally the most significant elements of the pedestrian circulation system. An assessment of walkability begins with an analysis of the adequacy of the existing pedestrian circulation system to determine whether it can meet all reasonable needs and whether facilities provide for proper safety and comfort in meeting these needs. Sidewalks generally should be continuous, level, properly maintained, and of adequate width to meet the demand for usage. Superior sidewalk facilities provide a buffer from traffic, through provision of a landscaped area between the roadway curb and the sidewalk, together with the provision for parking to help separate moving traffic from pedestrians. They also provide walking routes between origins and destinations that do not require a significant amount of out-of-direction travel (i.e., travel that takes you out of the shortest route to your destination, such as u-turns or traveling around objects).

Pedestrian facilities generally are not divided into formal classification systems or designations. In contrast, bicycle facilities are divided into classification types that indicate their setting, usage type and determine their design characteristics.

Bicycle lanes are one of several forms of bicycle infrastructure. They are generally the most common and can be incorporated into planning for new roadways or retrofitted onto existing roadways if pavement space can be claimed from travel lanes, paved shoulders, turn lanes, or parking lanes. While other forms of bikeway may be more desirable, bicycle lanes generally constitute the majority of mileage of bikeway infrastructure in communities because of their advantages. One advantage is that they can be provided along many other types of roadways and thus can be located near origins and destinations used by bicyclists. Another important advantage is that they can be swept by street sweepers and by wind sweep from adjacent motor vehicles that tends to keep them clean and clear.

Bicycle paths (trails) are another important form of bicycle facility. These consist of exclusive roadways where motor vehicle traffic is prohibited, although often bicycle paths are shared with pedestrians, skate boarders, roller skaters, and other human powered transportation. They are generally the most expensive form of bicycle facility, since they require dedicated land and are generally constructed solely for use as trails. Bicycle paths rarely compose more than 10% of bikeway mileage in any community with a comprehensive bikeway network. Due to their nature, access is generally limited to intersections with streets and other bikeways. Also they can require

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periodic sweeping to keep them free of debris, especially broken glass which is dreaded by bicyclists.

Bicycle paths are especially appropriate for long corridors that provide a minimum of crossing intersections. Waterfronts, drainage courses, former railroad rights of way, or utility easements are ideally suited. Routes with numerous street crossings are not as desirable, especially if bicyclists must frequently stop for cross traffic, in part because bicyclists lose their momentum and require additional energy to resume speed. For this reason, some bicyclists will avoid using a path with numerous stop intersections, if a nearby roadway is more convenient.

Signed Bicycle Route is a third important category of bicycle facility. Ideally, a bicycle route will be a relatively lightly used low-speed roadway that is desirable for bicycles. Signs are erected to advise bicyclists that this is the bike route and help to alert motorists to expect the presence of bicycles. In some cases, communities have signed bike routes along more heavily used high speed routes, when no alternative is available, but these tend to be valued only by experienced and courageous bicyclists.

In the past 10 years new technologies have been perfected to allow for different types of bicycle facilities. Two developments may be relevant to this study, sharrow markings used in conjunction with signs indicating Share-the-Road or Bikes Allowed Full Use of Lane (BAFUL) (shown in Figure 1-1), and bicycle boulevards. Sharrow markings indicate that travel lanes are intended for the use of both bicycles and motor vehicles. They include bike lane markings in the motor-vehicle travel way. A sample is shown in Figure 1-2.



**Figure 1-1
BAFUL sign**



Figure 1-2 Sharrow Lane

Sharrows markings and signs can be applied to Bicycle Routes to more clearly identify that motorists should expect and show greater courtesy to bicyclists. Sharrows markings also encourage bicyclists to ride clear of the dangers of opening car doors, the door zone, and indicate that cars may expect bicycles to ride further toward the street than normal.

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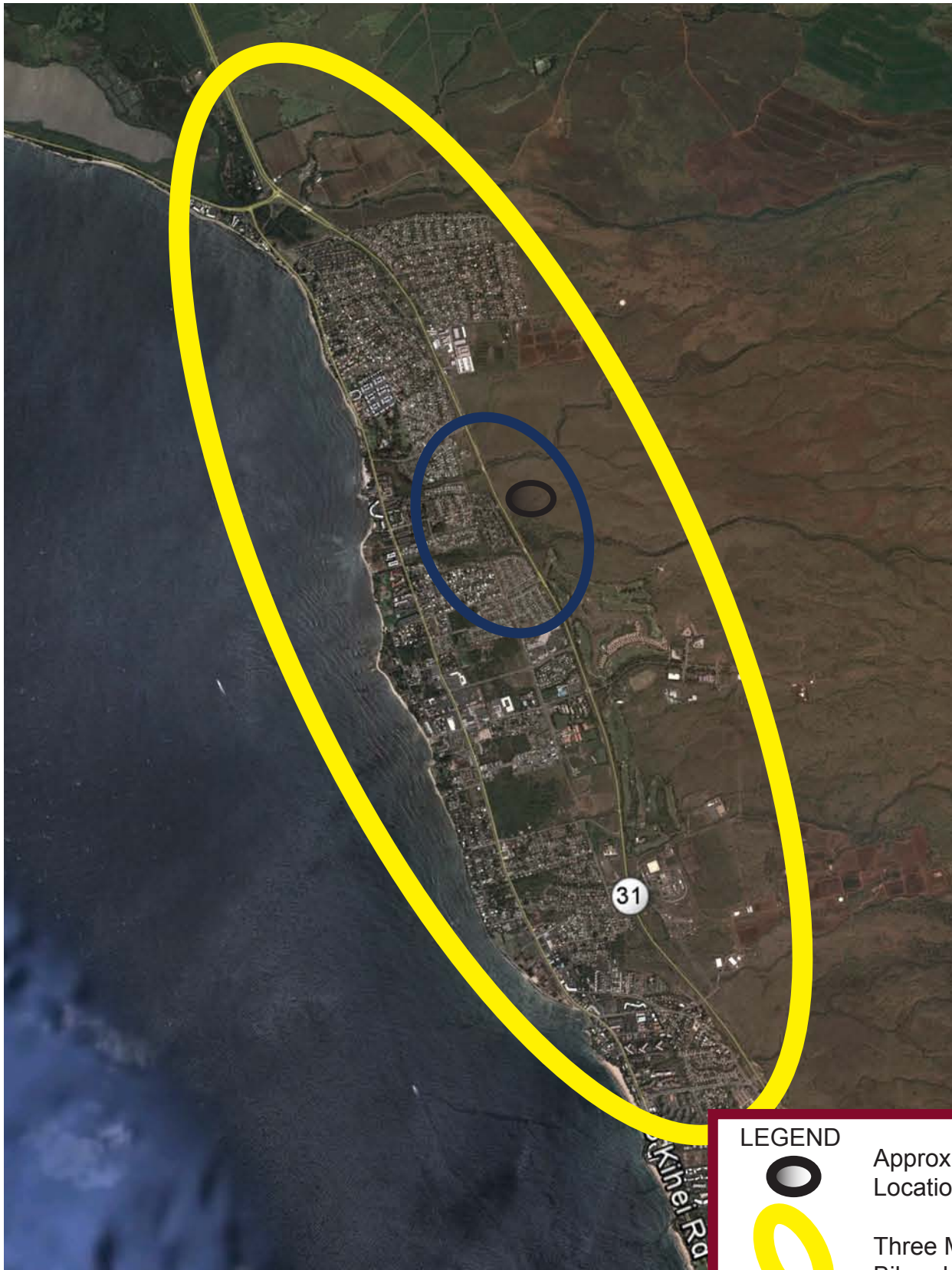
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Bicycle boulevards, also known as neighborhood greenways, are a treatment applied to a street to encourage bicycle travel while discouraging or slowing motor vehicle travel. Bicycle boulevards typically provide traffic devices that are also used for neighborhood traffic calming, such as speed humps, medians, landscaped circles, and other measures that discourage unnecessary traffic and reduce motor vehicle speeds to 15 mph while allowing bicycle speeds uninterrupted at 15 mph. Greenways place greater emphasis on landscape and water runoff management facilities than bicycle boulevards. The net effect is to transform a street into a facility where bicycles have priority while motor vehicles become secondary users. These facilities are largely responsible for increasing ridership in some of the most well-known bicycle communities, such as Portland, Oregon and in many college towns.

The primary approach for a study of potential bicycle usage and impacts is to evaluate the bicycle friendliness of existing infrastructure and to identify whether additional improvements may be suggested. The focus is normally placed within 3 miles of the study site, and especially the manner in which it connects to regional bikeway infrastructure.

Pedestrian activity is much more limited in terms of area of influence and distance. Most people will not want to walk for utility purposes for much more than one-half of a mile. There are also less potential conflict points between pedestrians and vehicles as compared to bicycles, as pedestrians do not need to use the same right of way as vehicles. However, as with bicycles, the primary approach for a study of impacts is to evaluate the pedestrian friendliness of existing infrastructure and to identify whether additional improvements may be suggested. The focus for pedestrians is normally placed within one-half mile of the study site, and especially the manner in which the site connects to existing pedestrian facilities and important pedestrian destinations (such as the proposed school, residential areas or shopping centers).

Figure 1.3 shows an aerial of the project vicinity, along with a 3-mile area, which would serve as the bike-able radius for the proposed school, and a half mile radius, which would be more appropriate for walking. Figure 1.4 shows the immediate project area, along with the roadways described in Section 2.



LEGEND



Approximate Site Location



Three Mile Bike-able Radius



Half Mile Walkable Radius

2.0 Existing Conditions

This report section describes existing conditions in the project vicinity and highlights operational issues based upon visual surveys of the site.

2.1 Roadways

This report and section emphasizes non-motorized transportation. The traffic impact analysis prepared by Wilson Okamoto Corporation should be consulted for questions regarding motor vehicle transportation. All of the descriptions found within are based upon Stantec staff observations.

Kulanihakoi Street is a two-lane residential collector street. It currently exists beginning at a T intersection with Piilani Highway and extends for about one-half mile to South Kihei Road. It is 36 feet wide curb to curb for most of its length, but it is wider between Malulani Street and Piilani Highway. The widened area includes additional travel lanes and also features shoulder stripes that function as bicycle lanes.

There are nearly-continuous sidewalks for the full length of Kulanihakoi Street from Piilani Highway to Kihei Road. There is a significant but short gap in the sidewalk along the south curb of the roadway east of Hakoi Hema Place. This gap is less than 50 feet long but this gap will be along an important walking route to the proposed high school. It will provide the walking connection to the proposed North South bikeway/greenway indicated on the community's bikeway plan which has been recently constructed south of the site, as discussed below.

There are no bicycle facilities on Kulanihakoi Street west (makai) of Malulani Street to its end at South Kihei Road. Bicycle travel, when present would be required to share travel lanes with vehicles where on-street parking is in demand. Parking is allowed along most of the roadway and is intermittently used. There are typically 20-25 vehicles parked along the south curb and 15-20 vehicles parked along the north curb. The vehicles are concentrated in portions of the roadway and there are long stretches with low parking demand.



Figure 2-1
Kulanihakoi Street,
facing west, at
Kenolio Street

Figure 2-2
Kulanihakoi Road,
looking west



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The number of parked vehicles does not change between early and late morning, suggesting that many of the vehicles may be long term parked. The area does not generally appear to have a shortage of parking, so most vehicles are likely parked at the convenience of the owner. Parked vehicles include about 4 long limousines that are for hire which may be owned by a resident in the area. One area of low parking demand is adjacent to a church that likely generates higher parking demand on the street during services.

Bicycle usage for Kulanihakoi Street is not a significant factor at this time. It is typically about 1% of the motor vehicle flow on the street.

Piilani Highway is a 4-lane limited access state highway traveling north/south in the vicinity of the project. This highway begins to the north in Kahului and extends south to Wailea. The posted speed limit is 45 mph, but many vehicles appear to be traveling faster than this speed.

Piilani Highway does not provide access to adjacent properties in the project vicinity. Access is limited to specific intersecting roadways, at approximately one-half mile intervals. It provides for intersections with Kulanihakoi Road, as well as with Kaonoulu Street to the north and to Waipuilani Road to the south. All of these streets form T-intersections with Piilani Highway. None of these three intersections are currently signalized. Further south, the intersection with Piikea Avenue is signalized. Due to the high traffic volumes and speeds on Piilani Highway, it can be difficult to turn left onto Piilani Highway, especially during peak hours at intersections without traffic signals.

Piilani Highway provides 8-foot wide shoulders for most of its length, and these shoulders have been designated as bicycle lanes. While these shoulder bicycle facilities are used by certain types of bicyclists, generally most potential bicyclists are not comfortable riding on the shoulders of high speed roadways. As a result, the bicycle lanes on Piilani Highway are not effective in meeting the needs of potential bicyclists for the proposed high school. Also, the shoulders narrow at two bridge structures across major drainages, providing less than 3 feet of width for bicycle lanes. The available width on these shoulders is less than the minimum required width for bicycle lanes. Spot surveys of usage suggest that the shoulders of Piilani Highway currently serve about 5 riders during peak hours, mostly experienced sport/exercise cyclists who are comfortable riding adjacent to high speed traffic and appreciate the minimum need to stop afforded by the highway.

Piilani Highway does not provide sidewalks or pedestrian facilities. It has not been planned or constructed in anticipation of pedestrian activity. Due to its limited access nature, it is not forecast that there will be a significant demand for pedestrian usage resulting from the high school or any other existing or proposed uses. No pedestrians were observed walking along the highway. There appears to be sufficient right of way to provide pedestrian facilities, but since blocks of controlled access highway are very long, the highway is unlikely to experience heavy pedestrian demand.

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Long limited access roadways like Piilani Highway generally can serve as a barrier to cross traffic travel, in part by discouraging walking traffic between homes or land uses on opposite sides of the highway away from controlled intersections. This is due to the limited access nature of the highway, the distance between intersections, and the difficulty in attempting to cross this type of highway without traffic controls that can stop vehicle traffic.



Figure 2-3 Piilani Highway at Pikea Avenue

The Kihei Greenway is a partially constructed bike path that is located varying from about 600 to 1000 feet west of Piilani Highway in the project vicinity. The State of Hawaii Bike Plan indicates that the Kihei Greenway is planned as a linear park, running through the middle of Kihei, with 12-foot wide asphalt paved paths. It was recently constructed to high standards from Waipuilani Road south to Lipoa Street. Improvements include a wide two-way bike path, landscaped heavily with architectural lighting, water fountains, and park benches. It also crosses Piikea Avenue at a newly constructed modern roundabout, offering the potential for bicyclists to be able to cross Piikea without stopping, if traffic gaps are timely. This Kihei High School



Figure 2-4 Kihei Greenway

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bikeway is planned for potential extension north and south. The southerly extension is planned through a regional park site to where it will connect with a local street, Welakanao Road, which extends further to the south.

Although this improved bikeway/greenway does not extend at this time north beyond Waipuilani Road, a right of way exists to Kulanihakoi Street, as shown in Figure 2-5. The right of way is owned by the Hawaii State Department of Transportation (HDOT), per signage posted near Kulanihakoi. An unimproved gravel walkway already exists along this alignment, despite “No Trespassing” signs that are posted by HDOT at the north end. The unimproved path is quite suitable for walking and is also observed to be used by bicyclists using mountain bikes and beach cruisers with sturdy tires. It is less desirable for thin tired sport bikes due to the presence of broken glass. With the recent opening of the bikeway, usage of this unimproved route is likely increasing. Current spot usage was observed at approximately 10-20 walkers and 5-10 bicyclists during the AM peak hour, an hour when this type of activity is highest in Kihei. The unimproved path crosses a major drainage and is likely not passable during heavy rains, however locals have placed plywood boards across the drainage course, indicating its current popularity.



Figure 2-5
Kihei path south
of Kulanihakoi
Street



Figure 2-6
Kihei path north
of Kulanihakoi
Street

The bikeway also could potentially be extended north from Kulanihakoi Street, and is shown as a potential extension in the State of Hawaii bicycle plan, known as Bike Plan Hawaii. The right of way exists, but the unimproved path is more primitive, as shown in Figure 2-6. A trail is visible, but no users were observed during spot surveys. If extended north past Kenolio Street, it must cross another major drainage course. But it will align with another local street that will facilitate bicycle travel further into neighborhoods to the north.

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Liloa Drive is roadway running adjacent to and east of the new greenway/bikeway. It provides mostly three lanes for vehicular traffic, including one lane per direction and a two-way left turn lane, or turn pockets. It runs from Waipuilani Road to Halekuai Street. At the intersection with Piikea Avenue there was recently a roundabout installed to control traffic. There is not currently a



Figure 2-7 Roundabout at Liloa Drive and Piikea Avenue

high demand for bicycle use on this facility, due to the proximity of the greenway bikeway. The sidewalk network in this area is complete and usable. No significant pedestrian issues were observed.

South Kihei Road is a two-lane arterial traveling along the Kihei coastline, providing access to beaches, shopping centers, vacation residences, and other uses. It is the traditional main street for the community. It was bypassed by the construction of the Piilani Highway, but still serves as a very important regional and community thoroughfare.

South Kihei Road provides sidewalks intermittently through the community, but there are significant gaps in the continuous network. Relevant gaps near the site include the west side of the roadway north and south of the intersection with Kulanihakoi Street. Further south, there is a long gap on the east side near Hoonani Street. The sidewalk network is more continuous in the areas further to the south that are more heavily commercialized. But the incomplete network of sidewalks often requires pedestrians to cross from the east side to the west side of the roadway at uncontrolled locations. This does not create an attractive walkable environment.

South Kihei Road provides bicycle lanes for about 90% of its length from the north edge of the community to Wailea. There are a few gaps where pavement width was not sufficient to provide bicycle lanes in addition to travel lanes, parking, and turn lanes. One such gap is relevant to this study, on the southbound side from Kulanihakoi Road to Waipuilani Road. Other gaps are located near important intersections where the bicycle lanes must give way to right turn lanes.

Bicycle usage on Kihei Road is significant, 10-20 bicycles per hour in each direction for most of the day. Bicyclists observed include residents and tourists, and a significant number of women. This suggests that many persons find the route comfortable and attractive for bicycling, since the presence of woman cyclists normally indicates a comfortable and desirable route. While it would be desirable for the Kihei bike lane system to have no gaps, it is largely meeting the needs of the growing Kihei bicycling population. It is also worthy of note that many businesses located along Kihei Road rent bicycles, and bicycling is featured as an attraction for tourism.

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2.2 Kihei Bicycle Planning

Several plans govern the planning of bicycle and pedestrian facilities in the State of Hawaii and on Maui. The State of Hawaii completed its Bike Plan Hawaii in 2003 as a tool to integrate bicycle facilities into the State's transportation network. The County of Maui Long Range Planning Division has published a Regional Transportation Map which includes existing and proposed bike paths. The South Maui Region Parks & Open Space Master Plan, prepared in 2006 by Chris Hart and Partners, provides a vision for open space corridors and an integrated system of bicycle and pedestrian paths. In this plan, the North Kihei map shows Kaonoulu Gulch and Waipuilani Gulch as secondary off-road connections in the vicinity of the project site. Piilani Highway and the North South Collector Road are shown as Primary Open Space Corridors for bicycle and pedestrian users.

Kihei has been developing a bikeway network aggressively in the past few years. The State of Hawaii completed a bicycle master plan for the area in 2003, that identified a network of desirable facilities. This was called Bike Plan Hawaii and is shown in Figure 3-1. Many of these bicycle facilities now exist on the ground, but they are not reflected on internet aerial photography that is only a few years old. The community is rapidly moving toward implementation of 90% of its planned bikeway infrastructure, and bicyclists can be readily observed on many roadways in the community.

Bike Plan Hawaii shows the planned extensions of the Kihei Greenway bikeway to the north and south, but bike path facilities of this type often require an aggressive search for funding. Also, sometimes residents with properties that back up to proposed corridors will express concern over improvement of bicycle facilities, due to security concerns. While they will frequently cite potential losses in property values, studies generally show that properties adjacent to properly maintained bike paths an actually rise in value compared to nearby properties.

Bike Plan Hawaii does not show bicycle facilities along Kulanihakoi Street. It also proposes no bike trail facilities running east/west along any of the various major watercourses (gulches, streams, etc.). The plan does not reflect the proposed high school site, yet community high schools are normally a consideration in bicycle master plans. The siting of the high school may suggest that it is appropriate to modify the plan to better serve the high school site.

The goal of a bicycle master plan is normally to plan for and take actions to achieve increases in bicycling. Plans typically set goals for a set proportion of all trips (10-20%) less than three miles long to be done by bicycle, at least for the near term. Since as many as half of all trips in a community such as Kihei can be less than three miles, there is a great potential to provide a bicycling alternative for many auto trips in the community. Bicycling typically represents less than 1% of trips in a typical community, while bicycle friendly communities can achieve commuter usage from 5% to 50% bicycling usage. Portland, Oregon, currently sees 6% bicycling and Minneapolis, Minnesota, gets near 4%, with up to 50% occurring in college towns with expensive or limited parking. At levels greater than 5%, bicycles become very common and motorists anticipate or expect to see bicycles everywhere. This helps reduce crash problems, because

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motorists develop better habits, and bicycle infrastructure coupled with increasing numbers tends to reduce frequency of traffic violations.

Other portions of bicycle infrastructure (infrastructure being any facility: parking, shops, services, routes, trails, signs, etc.) are also growing in Kihei, but spot surveys indicate that bicycle parking may be limited. Few bicycle racks or parking areas were observed at private businesses, and many bicycles were observed to be locked to posts, street lights, bus stop furniture or any other convenient place. In contrast, many communities are now considering a requirement to provide bicycle parking to complement 10% of the automobile parking requirement, often with an accompanying reduction in auto parking.

2.3 Kihei Pedestrian Planning

There is no single formal plan that addresses and focuses upon existing conditions, needs, and a process for improving pedestrian circulation in Kihei. Standard plans for the roadways generally call for provision of sidewalks on both sides of all new facilities, but there is no comprehensive plan for retrofitting of facilities that were not constructed to provide pedestrian facilities.

Community groups in Kihei (namely the Kihei Community Association), have been working with nationally prominent walking and bicycling expert Dan Burden, Executive Director and Co-founder of the WALC Institute. As a result, the community is interested in taking steps toward increasing its walkability and bikeability. Mr. Burden has counseled the community on various potential steps and made specific recommendations, but these activities have not yet resulted in a comprehensive adopted specific plan for improving walking on a community-wide basis.

A comprehensive pedestrian plan for the community would likely identify South Kihei Road as a significant deficiency and assign a high priority for improvement. It would also likely identify that provision of sidewalks continuously on both sides of the roadway will be difficult due to land use patterns, constrictions at existing bridges, trees and plants, and community concerns over the impact of provision of sidewalks. Such a plan would also determine that the frequency of controlled pedestrian crossings or enhanced crossings is not sufficient for optimum mobility. Blocks are too long between controlled intersections, and some of the uncontrolled crossing locations already have bus stops.

A cost estimate to provide all appropriate missing facilities would also be presented and potential funding sources would be identified. Based upon the length of missing sidewalk along South Kihei Road, the cost estimate to achieve walkability goals along South Kihei Road could exceed \$1 million.

A comprehensive pedestrian plan for other roadways in Kihei would provide guidelines for provision of optimum pedestrian facilities, such as sidewalk and parkway design details, amenities, standards for pedestrian circulation across parking areas to commercial businesses, and other principles. Sidewalk and intersection improvements would likely be identified, especially for older portions of the community that are near commercial services.

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3.0 Future Traffic Conditions

Walking is normally a significant form of travel to high schools, especially from residences with high school students within one half mile of the school. Walking is likely to be the most popular travel mode to the proposed Kihei High School for residences within this distance. Many students will walk even further than this distance if conditions are appropriate, but bicycling, automobile, or other modes will become more significant.

Bicycling can be an attractive form of transportation and competitive with auto travel times for up to 3 miles, especially when automobile parking is inconvenient. It is especially attractive for high school students, because auto ownership costs are significant. Also traditional cultural and psychological barriers to cycling are changing. It is reasonable to forecast that initially up to 10% of high school student trips could be made by bicycle in Kihei, especially to locations within three miles of the proposed school site. Opening year usage in the range of 50-80 cyclists could occur traveling inbound during the morning and outbound after classes and activities end. As the community moves further toward encouragement of walking and bicycling, this number could increase substantially.

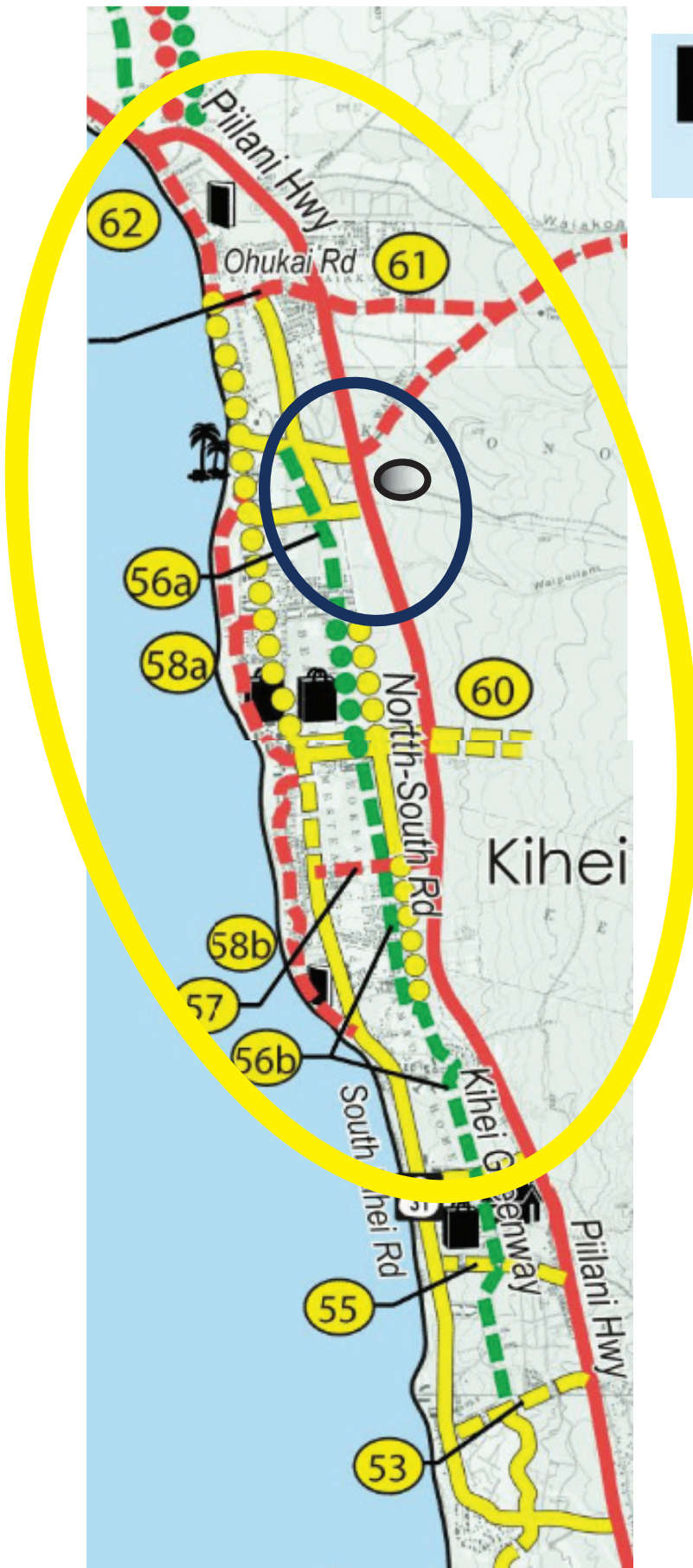
Figure 1.1 showed a three mile radius around the school site. Much of Kihei falls within the three mile circle. This should not mean that nobody will ride a bicycle further, but analysis of infrastructure needs should be focused within the 3 mile circle.

Figure 3.1 shows the proposed network in the Hawaii Bicycle Plan. It shows some of the important existing routes that bicyclists may choose to reach the campus. It shows bicyclists accessing the campus via the planned extension of the Kulanihakoī Street. This extension is expected to have bicycle lanes provided as part of its initial construction. Also a traffic signal is expected for the Piilani intersection at Kulanihakoī Street. This would allow bicyclists to cross the highway readily.

Piilani Highway is not expected to experience significant usage. A few high school students or employees may be courageous and experienced cyclists, comfortable and skilled in riding on high speed roadways. But most potential users will find conditions along Piilani Highway to be discouraging. As a result, it is expected that most cyclists will cross Piilani Highway using the proposed traffic signal and continue along Kulanihakoī Street.

The immediate neighborhoods served by Kulanihakoī Street will become origins for some bicycle traffic, but most cyclists are expected to continue along Kulanihakoī Street to Kihei Road, where they can use the existing bicycle lanes to travel north and south. These bicyclists will find the traffic levels of Kulanihakoī Street to be within a comfortable range, but the presence of parked cars will make the route less attractive.




Bike Plan *Hawaii*



taken from:
Bike Plan Hawaii (2004)
<http://hawaii.gov/dot/highway/bike>

LEGEND

Bikeway Type		
Existing	Path	Bike Lane
Underway	Path	Bike Lane
Proposed	Path	Bike Lane
Route Proposal Number		6

-  Approximate Site Location
-  Up to three mile Bike-able Radius
-  Half Mile Walkable Radius



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Kihei High School Pedestrian and Bicycle Analysis

Figure 3.1

Kihei Area Bicycle Routes
(from Hawaii Bikeway Master Plan)

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Future Traffic Conditions

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The unimproved path from Kulanihakoi Street south to Waipuilani will be used by some school bicyclists and pedestrians, but it will likely not be the favored route for more distant travel that is better served in the short range by Kihei Road. In the future, when the greenway bike trail is completed, it will become a more preferred route, providing an attractive alternative to Kihei Road for access to most existing neighborhoods. But in its current condition, it will only attract hardy cyclists heading to residences and shopping areas near the improved limits of the facility.

In the absence of the complete greenway path, bicyclists will be required to ride along the segments of Kihei Road that do not have bicycle lanes. The section south of Kulanihakoi Street is most significant. Fortunately, in the future this segment can be bypassed by the completion of the greenway path.

Walking will be most popular between the site and the neighborhoods along Kulanihakoi Street. There may also be limited walking along the unimproved greenway alignment, especially toward the improved section to the south. The sidewalk gap noted on Kulanihakoi Street will be significant for walkers, as an estimated 30-50 students or staff may walk through the unimproved area to access the greenway route or continue along Kulanihakoi Street.

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3.1 Future Area Development

There is a large amount of development planned for the future in the project area. The Island of Maui Regional Transportation Network Map shows a proposed transit station near the intersection of Kulanihako Street and Piilani Highway. This could account for a large increase in the walking and cycling needs in the area, in addition to additional vehicular users.

The County of Maui Long Range Planning Division also expects numerous potential developments throughout the area, including large developments on the eastern side of Piilani Highway. This development is shown from approximately two miles north of the project site to beyond the Kihei area. The proposed development plans show over 9,000 single family homes, 4,700 multi-family homes, and 1,400 timeshare and/or resort units being added to the project area. All of these may add substantial traffic, including vehicular, and pedestrian and bicycle traffic, to the project area.

Figure 3-2 shows the proposed Regional Transportation Network Map, prepared by the Long Range Planning Division of the County of Maui. It shows the proposed transit lines, along with the proposed regional network additions.

Roadway cross sections for arterial roadways serving new development are expected to provide bicycle lanes. These will assure convenient access to the High School site from future developments inland (mauka) of Piilani Highway.

Regional plans for new communities and roadways west of Piilani Highway do not show a significant network of bikeways. Also a network of recreational trails may also be appropriate for consideration in this area. These networks would be planned to complement the highway network and may also be planned to be compatible with waterway corridors that will likely serve as greenbelts for the planned growth areas.



Regional Transportation Network Map

Island of Maui

Prepared By:
Long Range Planning Division
Department of Planning
County of Maui
250 South High Street
Wailuku, Hawaii 96793

Map 6-2



LEGEND

- Primary Road
- Secondary Road
- Stream
- Cultural Resources Stream
- Bike Path
- Proposed**
- Transit Station
- Transit Corridor
- Lahaina Bypass
- Road or Highway
- Bike Path
- Upcountry Greenways Plan
- Maui Island Plan Greenway



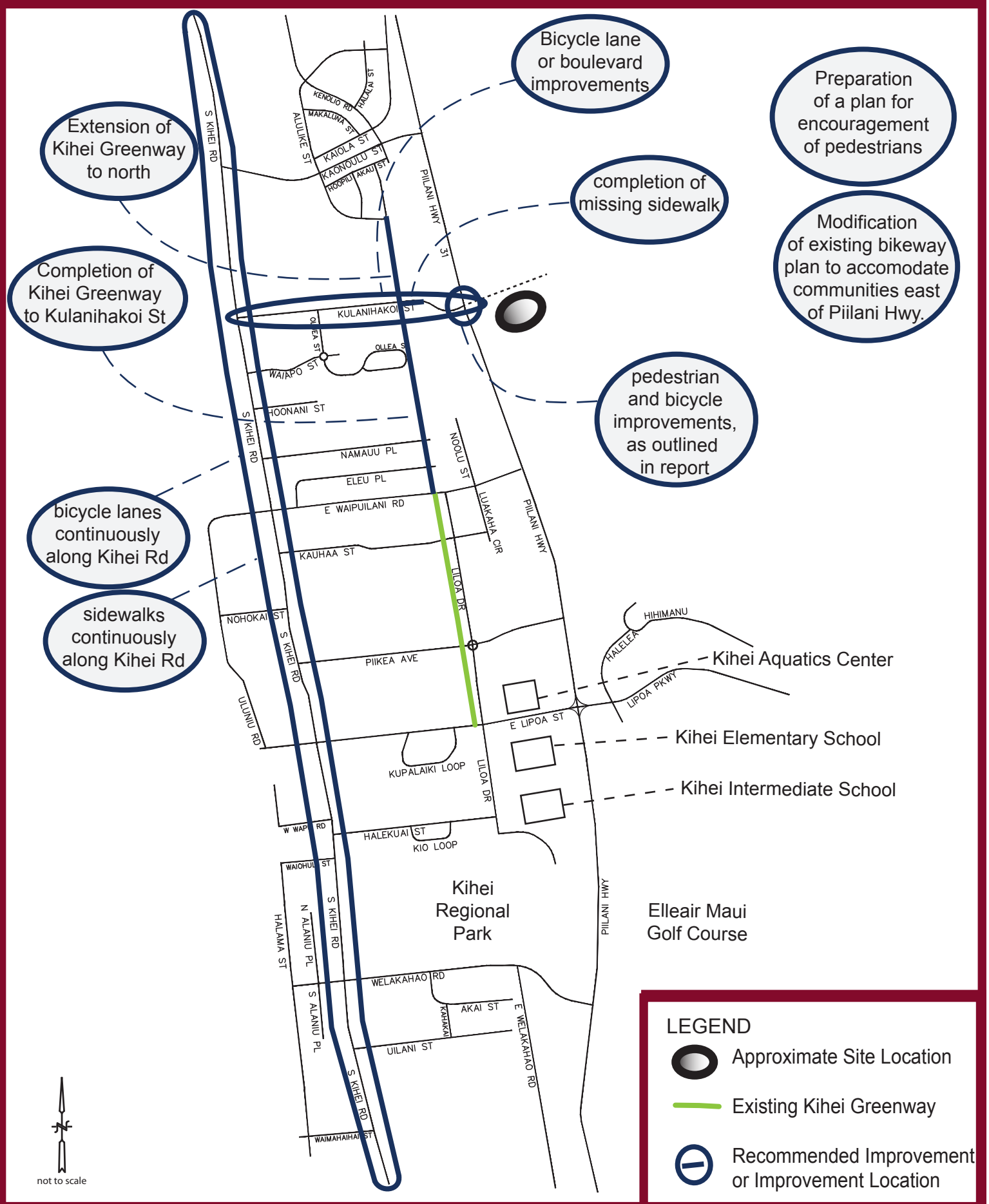
Stantec

4.0 Recommendations

The following improvements would be desirable for walking and bicycling infrastructure for the High School. The subsequent discussion includes recommendations and suggested responsibilities:

- Bicycle lane or bicycle boulevard improvements for Kulanihakoi Street from Piilani Highway to Kihei Road
- Construction of sidewalk on Kulanihakoi in the short gap east of the proposed Kihei Greenway Trail
- Completion of the Kihei Greenway Bicycle Trail from Kulanihakoi Street south to connect with the existing trail
- Completion of the Kihei Greenway Bicycle Trail from Kulanihakoi Street north to connect with the northern portions of the community
- Provision of bicycle lanes continuously along Kihei Road throughout the community
- Preparation of a plan for pedestrian enhancements to encourage walking throughout Kihei
- Modification of bikeway plans to suggest facilities appropriate for planned communities east of Piilani Highway.
- Provision of sidewalks continuously along Kihei Road throughout the community.
- Design features for the proposed intersection and traffic signal at Kulanihakoi Street and Piilani Highway to provide optimum service and the highest level of protection for bicycles and pedestrians (additional detail provided below)
- High quality and direct access from the school to the pedestrians and bikeway networks (additional detail provided below)
- Bicycle friendly improvements on the school campus (additional detail provided below)

The improvements are also shown graphically on Figure 4.1.



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4.1 Kulanihakoi Street Improvements

4.1.1 Intersection of Kulanihakoi Street and Piilani Highway

The Traffic Impact Analysis Report (TIAR) previously completed for the project recommended a traffic signal at the Kulanihakoi/Piilani intersection to meet traffic demands for the school and address intersection safety issues.

Kulanihakoi Street may experience increased traffic demands with the school project due to school related traffic and due to the proposed traffic signal at Piilani Highway. Because the intersection is not currently signalized, it is lightly used to turn left onto Piilani Highway today. In comparison, intersections with signalized accesses experience higher flows. The potential for traffic increases is considered undesirable by most residents, while the provision of a traffic signal will likely be appreciated by those same residents.

Provision of left turn phasing for Kulanihakoi Street also provides a safety benefit, since the left turns would normally be served right after the high speed through phases of Piilani Highway. Left turn signal phasing reduces the potential of a high speed vehicle running the fresh red and colliding with pedestrian or bicyclist. While this collision potential is considered remote, the precaution is justified on the basis of a heavily used high school crossing.

Concerns have been heard that traffic signals may not provide the highest level of safety for pedestrians desiring to cross Piilani Highway to access the school site. Grade separation via tunnels or overpasses has been suggested. Professional experience with grade separations does not suggest that they are superior treatments to traffic signals. Pedestrians will avoid bridges due to the effort to climb three flights of stairs to an elevation high enough to bridge across the highway and to return to street grade on the other side. Also such a bridge needs to be handicap accessible, requiring very long ramps or elevators to serve wheelchair users. Use of such a facility is virtually always disappointing. Tunnels have fewer construction issues, but they can result in security issues related to darkness and require maintenance to prevent accumulation of broken glass and litter. They are often closed, due to security and maintenance issues following construction. A more appropriate grade separation treatment may be the development of a greenbelt bikeway and recreational trail that would follow the watercourse that passes under Piilani Highway south of the intersection. This would be a facility appropriate for consideration in communitywide planning.

Although there can be no guarantee that a pedestrian involved collision would never occur, the provision of a traffic signal is considered an adequate counter-measure. It is not appropriate to call for provision of traffic signals to address pedestrian issues at some locations while dismissing them at other locations. There are numerous locations in Hawaii where similar conditions have been addressed as proposed.

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Nationally, roundabouts are being considered as a potentially safer form of intersection traffic controls than traffic signals, but Hawaii does not have great experience with multi-lane roundabouts, as would be required for this intersection. The issue of roundabout vs. traffic signal is more suited to be considered by the State Department of Transportation (DOT) as a policy issue, not as a site specific improvement. If the DOT felt that a roundabout treatment was superior to a traffic signal at the subject site, in conjunction with development of the high school it would be an appropriate substitute improvement. But a requirement to provide a roundabout without DOT concurrence is not appropriate, and DOT has not been contacted for their opinion at this time.

The right turn lane treatments common along Piilani Highway should also be evaluated carefully. It would be preferable for the right turns to be controlled by the traffic signal, with right turn lanes that are provided separately and to the right of the suggested through bicycle lanes. Figure 4.2 shows the suggested channelization. This treatment is also suggested for the existing leg of Kulanihakoi Street which will require change when the signal is constructed.

4.1.2 Sidewalk Access and Improvements

The sidewalk gap along Kulanihakoi Street near the site of the Kihei Greenway will be a substantial obstruction to pedestrian traffic walking from the school to the greenway. The school is expected to generate significant pedestrian traffic along this sidewalk gap, greatly increasing the need for this improvement. This improvement should also be completed in conjunction with the school.

4.1.3 Bicycle Access and Improvements

Kulanihakoi Street will also experience significant demand for school related pedestrians and bicyclists. It would be desirable to provide improvements that facilitate school usage, while discouraging undesirable traffic increases. Bicycle lanes already exist for the block nearest Piilani Highway. They could be provided for the rest of the segment, but this would require loss of parking. Alternatively, the roadway would be appropriate for designation as a bicycle route featuring bike route signs, Share the Road or Bikes Allowed Full Use of Lane (BAFUL) signs, and sharrows markings. But these measures will not be optimal for managing automobile traffic and potential increases. A bicycle boulevard treatment may be appropriate. Low cost bicycle boulevards can be provided through placement of traffic control devices such as speed humps that now exist on Waipuilani and other roadways in the community. Due to the potential impact to Kulanihakoi Street resulting from added high school traffic and signalization, these improvements should be completed in conjunction with development of the proposed school.

The planned extension of Kulanihakoi Street should be designed carefully with the expectation that it could be used by many bicyclists. The bicycle lanes should be at least 6 feet wide from curb to stripe, wider than most lanes found in Kihei today. The downhill lane will experience significant speeds by bicyclists. The uphill lane will experience more swerving as cyclists pedal up the hill. The additional width will be an amenity. Also the seam between the gutter and the

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pavement should be carefully treated to minimize the potential for pinching the bicycle wheels. Some communities have used asphalt paving over concrete to the curb face to maximize the effective width for bicycling, since most bicyclists do not like to ride on the narrow gutter. Other communities are exploring the use of colored pavement or a rolled curb at the boundary between the bikeway and the vehicle lane.

The Kulanihakoi Street bicycle lanes should also be extended further mauka when the roadway is extended. They will become important for bicycle access to new developments whenever they occur. Also the community's bikeway master plan should be modified to show the proposed improvements for Kulanihakoi Street associated with the school. It would be appropriate to initiate a process to modify the community bicycle master plan to reflect planned developments inland from Piilani Highway. This should include consideration of the establishment of greenbelts providing recreational trails suitable for walking and bicycling on such greenbelts. One of the potential corridors is along the watercourse south of the school site. It is suggested that the school be planned to provide a corridor for a potential connection to a greenbelt along this watercourse. The process to update the bikeway plan generally needs to be a community effort, since it is not directly related to the high school.

The traffic signal and required additional improvements for Kulanihakoi Street and Piilani Highway should be carefully designed to maximize safety and bicycle friendliness. The proposed Kulanihakoi Street approach roadway should provide a left turn lane, a through lane, and a right turn lane at the highway. Crosswalks should be provided across both the north and south legs of Piilani Highway. Also, since turning vehicles will conflict with through pedestrians and bicyclists along Kulanihakoi Street, the traffic signal should be designed to serve left turn vehicles and through vehicles/pedestrians/bicyclists separately. This could be accomplished through various measures, but we would suggest separate left turn phasing for Kulanihakoi Street, so that left turns do not turn through pedestrian or vehicle streams.

4.2 Kihei Greenway

Extension of the Kihei Greenway bikeway from Kulanihakoi Street south to the existing bikeway at Waipuilani Road would be a very attractive improvement. It bypasses the bike lane gaps on Kihei Road and provides a direct route to the shopping area at Piikea Avenue, likely to become a popular destination for students after school. While a treatment comparable to the newly opened bikeway would be desirable, this would be a costly project. A more spartan improvement consisting of a paved bike trail from Kulanihakoi Street to Waipuilani Road, including a low flow dip crossing of the watercourse could be constructed for about \$200-300,000. If provided, this facility would likely serve 70-80% of bicycle traffic for the high school. If funds become available in the future, additional improvements such as landscaping, an all-weather bridge, and security features could be added. This facility would be useful and attractive to the entire community, while also benefitting the school. It does not appear reasonable to require this improvement to be completed concurrently with school construction.

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The trail extension could be supplemented by a landscaped traffic circle or small roundabout at the Kulanihakoi Street intersection that would be similar to but smaller than the new roundabout at Liloa Drive. This would also serve as a further traffic calming device for Kulanihakoi Street and its potential bicycle boulevard. This measure stems from changes attributable to the school, but these changes can be fully mitigated without this level of improvement. If landscaped features are incorporated into the intersection, it is not reasonable to attribute the needs the school.

Extension of the bike trail to the north from Kulanihakoi Street is desirable, but it is not considered to be as attractive in the short term. While it would be desirable improvement for bicycling in general, the potential student population to the north is not as large, and the Kihei Road bike lanes serve most of this area effectively. This segment is not viewed as providing as much value to the school and its needs are not greatly increased by the proposed school.

4.3 Kihei Road

It would be desirable to address the missing segment without bicycle lanes on Kihei Road from Kulanihakoi Street to Waipuilani Road. However these lanes are not feasible based upon existing width, travel lanes, and the need to maintain a two way left turn lane to serve major driveways and intersections. In the short term, no simple solution is evident; however it would be appropriate for posting of bike route signs, sharrow markings, and special signage.

In the long term, the need for the left turn lane on Kihei Road could potentially be reduced through a more ambitious community program to provide roundabouts, such as the new installation at Piikea Avenue and Liloa Drive. Since roundabouts do not require space for left turn lanes, they can often free up space for bicycle lanes. In some cases, it may be necessary to prohibit left turns from intersections or driveways, but roundabouts make it much easier to make U turns. They also make it easier for pedestrians to cross due to median refuges and the shortened roadway width, features that are all evident at the new community's roundabout. In fact, some of the traffic signals and important uncontrolled intersections that now exist along Kihei Road could potentially be replaced by roundabouts. It should be noted that roundabouts are accepted to be one of the most efficient and safest forms of traffic control, while also providing other community, environmental, and aesthetic benefits.

South Kihei Road pedestrian improvements should be a high priority for the community based upon its goals and commitments toward walkability. However, the school will not significantly increase pedestrian flows in areas with greatest needs, and a plan for the entire community will be an ambitious undertaking.

Figure 9C-3. Example of Bicycle Lane Treatment at a Right Turn Only Lane

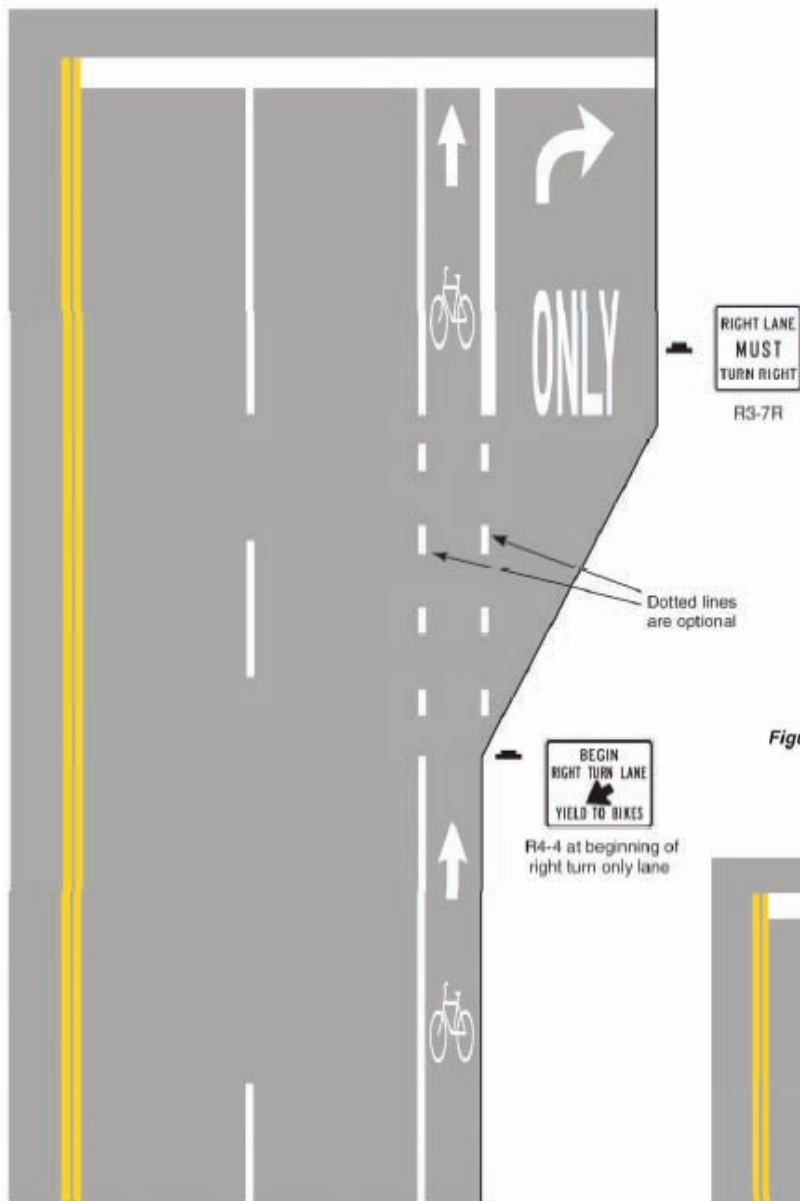
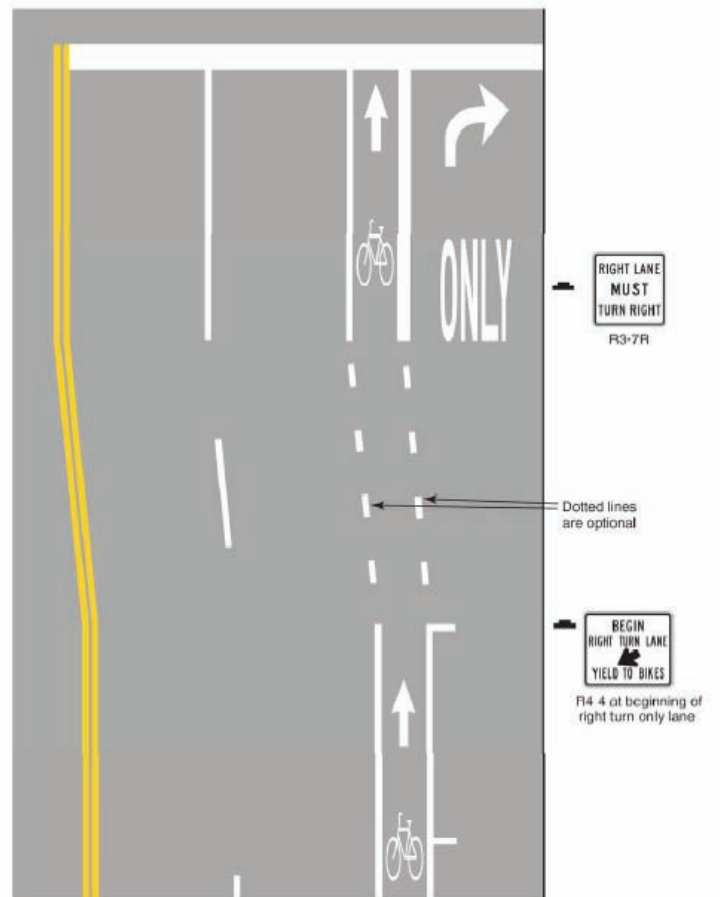


Figure 9C-4. Example of Bicycle Lane Treatment at Parking Lane into a Right Turn Only Lane



5.0 On-Site Campus Recommendations

There are features that should be considered for the new campus to facilitate or encourage bicycling. The most important infrastructure is bicycle parking. It should be located in a convenient area closer to school buildings than student parking. It is important for students who drive to see that students who don't drive are receiving the small favor of convenient parking. Bike racks should be provided in a semi fenced area (a bike corral), so that access is controlled and locks can provide basic security. It should be noted that about 16 bicycles can park in the space occupied by one vehicle parking stall. Placement of a closed circuit TV security camera aimed at the bike corral will deter thefts, a common problem with bicycle parking. If a camera is infeasible, it is recommended that the bike corral be located in a highly visible public location for security purposes.

Bicycle racks that provide optimum features should also be considered. The popular wave rack often selected by architects or others not experienced in bicycling, is not a good design for efficiency and security. Other bike rack types are preferred for this type of application. The designer should consult with a bicycle planning expert for proper ideas, which can be found in an excellent publication, *Bicycle Parking*, published by the Association of Pedestrian and Bicycle Professionals (APBP).

Walking/bicycling expert Dan Burden remarked that the school site does not seem ideally situated to serve the community. Placing it on the inland side of Piilani Highway limits the ability to access the school site from makai residential communities and will reduce the potential for walking and cycling.

However, there is likely no suitable site more centrally located to the existing community, without acquiring private properties and requiring residents to be relocated from their homes. Our recommendations are based upon the likelihood that there is no suitable alternative site on the west side of Piilani Highway that is more accessible to the existing community. Measures as suggested in this report will help to maximize the potential to access the site via walking and bicycling.

6.0 Conclusions

The proposed Kihei High School will place new demands on roadways in the vicinity of the school for pedestrians and bicycling. The bicycle lanes along Piilani Highway are not expected to serve much school traffic, but Kulanihakoi Street will become a very desirable route for pedestrians and bicycles. At minimum, bike route improvements, including sharrows and signs should be considered for Kulanihakoi Street, from Mahealani Street to South Kihei Road. (There are already bicycle lanes from Piilani Highway to Mahealani Street). Further improvements for traffic calming for a bicycle boulevard may also be appropriate.

A sidewalk gap on Kulanihakoi Street near Piilani Highway should be addressed. This segment will experience significant walking activity upon opening of the High School, while it is used negligibly at this time.

Improvement of the primitive trail from Kulanihakoi Street south to Waipuilani to link up with the new bike trail will be desirable. This route, if improved, would likely be used by up to 80% of school bicycle traffic. It would also bypass a significant gap in the Kihei Road bike lanes south of Kulanihakoi Street. If possible, it would be desirable to provide this improvement on a schedule that is compatible with school development. It will also greatly reinforce the community's commitment to bicycling and investment in the newly completed Kihei Greenway trail.

The school, the extension of Kulanihakoi Street, and the intersection with Piilani Highway should be planned and constructed with the expectation that bicycle traffic is expected and facilities should be provided desirable for bicycling and pedestrians. These include signal phasing, crosswalks, and channelization improvements as recommended in this study.