MAY 2015

HONOLULU COMPLETE STREETS IMPLEMENTATION STUDY LOCATION REPORT

Nuuanu Avenue from Kuakini Street to Craigside Place (FINAL)

City & County of Honolulu

Department of Transportation Services

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Summary: Nuuanu Avenue from Kuakini Street to Craigside Place

Primary Urban Center Planning Area, Nuuanu Sub-Area, Council District VI

NEED FOR PROJECT

Nuuanu Avenue serves dense residential communities and two schools in the project area, resulting in a high number of children using the street. Long distances between marked crosswalks and large intersections hamper walkability. At the same time, low daily vehicular traffic volumes indicate an opportunity to reshape the street into a multi-modal corridor.

Applying Complete Streets to this location will:
1) encourage walking and biking to school,
2) reinforce the posted speed limit, 3) create safer street crossings, and 4) add greenery.

SUMMARY OF RECOMMENDATIONS

The recommendations for Nuuanu Avenue will create a street environment that is inviting, safer, and emphasizes pedestrian and bicycle activities. Recommendations include:

- Use a road diet to reconfigure vehicular traffic into a three-lane cross section with one lane per direction and a central two-way left turn lane.
- Add 5’ wide bicycle lanes on both sides of the street. This provides a parallel route to the bike lanes proposed ½-mile away along Liliha Street.
- Install two mini-roundabouts at key intersections to facilitate traffic flow while calming traffic speeds.
- Extend and widen sidewalks. Include street trees and pedestrian refuges for enhanced multi-modal travel.
- Reconfigure midblock and uncontrolled crossings with a Z-crosswalk protected by Rectangular Rapid Flash Beacons (RRFBs).
- Create a raised intersection at Kuakini Street and Nuuanu Avenue with ‘Barnes Dance’ signal phase before and after school hours.

COST BREAKDOWN

Total: $4,626,444.20

Design: $261,874.20

Construction: $4,364,570.00

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Part One: Introduction, Study Area, & Need for Project

WHAT ARE COMPLETE STREETS?

Complete Streets is a transportation policy and design approach that aims to create a comprehensive, integrated network of streets that are safe and convenient for all people whether traveling by foot, bicycle, transit, or automobile, and regardless of age or ability. Complete Streets moves away from streets designed with a singular focus on automobiles towards a design approach that is context-sensitive, multi-modal, and integrated with the community's vision and sense of place. The end result is a road network that provides safe travel, promotes public health, and creates stronger communities.

Implementing Complete Streets requires integrating transportation with community planning. Changes are brought about by transforming the built environment. Engineers, planners, architects, landscape architects, and urban design professionals work along with health providers, business leaders, elected officials, community organizations, and residents to promote Complete Streets implementation. Actively engaged community members in Complete Streets are important participants and stakeholders. They help to ensure that efforts are relevant to the community's use, values, and priorities for the neighborhood.

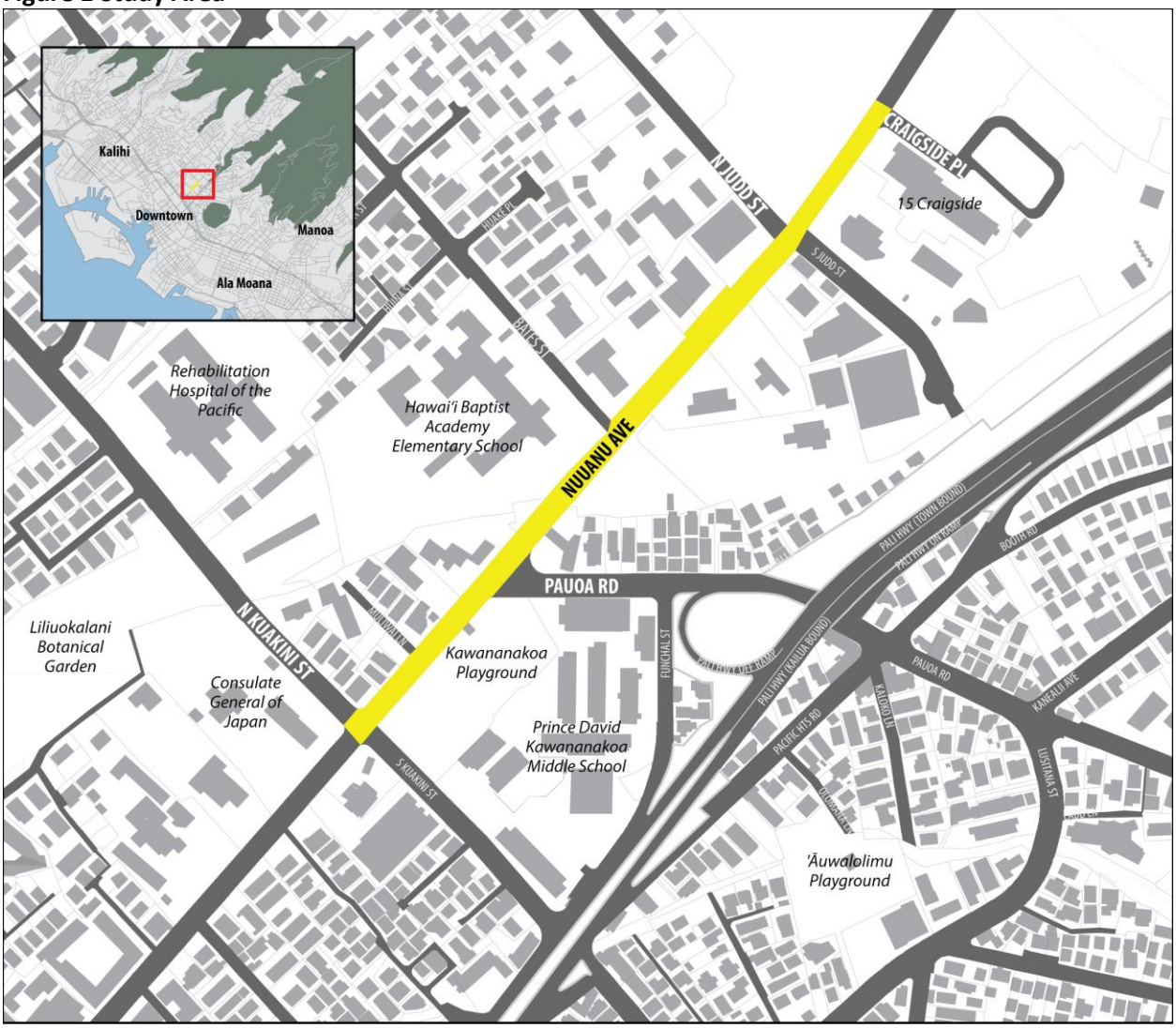
The State of Hawaii adopted Complete Streets in 2009 and required each County to follow suit. In May 2012, the Honolulu City Council adopted a "Complete Streets" policy and passed Ordinance 12-15. The City and County of Honolulu is now taking aggressive steps to implement Complete Streets by updating policies, instituting guidelines during maintenance and paving projects, and designing projects in specific locations. The City and County of Honolulu selected fourteen sites across the island of Oahu for in-depth study to illustrate how Complete Streets can be applied in a specific location. This report describes one of the selected sites and presents recommendations to implement Complete Streets at that location.

STUDY AREA

The subject location of this assessment is Nuuanu Avenue from Kuakini Street to Craigside Place (Figure 1). It is located in the Primary Urban Center Planning Area, Sub-Area of Nuuanu, in City Council District VI. Nuuanu Avenue runs parallel to the Pali Highway, and acts as a neighborhood connector and minor arterial serving schools and high-density neighborhoods. Nuuanu Avenue provides access to several types of urban open space including recreation parks and Nuuanu Stream.

At the south end of the study corridor, Nuuanu Avenue runs past Prince David Kawananakoa Middle School. Farther mauka, Nuuanu Avenue serves the Hawaii Baptist Academy (HBA) Elementary School. Outside of the study area is HBA upper campus, Cathedral Catholic Academy, and Soto Mission of Hawaii. At the northern end of the study area, a senior living complex is located at Craigside Place. These land uses generate a high number of children and older adults traveling along Nuuanu Avenue. High use by these groups creates the need for a comfortable walking environment and safe street crossing facilities.

Figure 1 Study Area



Nuuanu Avenue from Kuakini Street to Craigside Place

Figure 1 Study Area

0′ 100′ 200′ 300′ 400′

NORTH

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NEED FOR PROJECT

Nuuanu is one of Honolulu's more historic and dense neighborhoods. The connection of this neighborhood to downtown Honolulu comes through Nuuanu Avenue, which also is a primary mauka-makai route. The Nuuanu neighborhood's proximity to downtown Honolulu and its high residential density make it an ideal location for promoting alternative modes of transportation (e.g., walking, biking, and transit). However, Nuuanu Avenue's large intersections, narrow sidewalks, and lack of bike facilities tend to discourage the use of alternative modes of transportation. These conditions, in addition to high peak hour traffic volumes contribute to uncomfortable conditions for all users. Nuuanu Avenue also provides access to a number of schools, government buildings, retail shops, senior apartments, residential housing, and parks, which makes it an important place for investment in public infrastructure.

Top: Barriers to walkability include skewed intersection design, resulting in long crossing distances on certain intersection legs (Nuuanu Avenue and Pauoa Rd). Bottom: A high number of children walk and bicycle in the study area, heightening the need for safe walking and bicycling facilities.

Streets provide both mobility and access. On streets like Nuuanu, that provide a crucial mauka-makai link, all modes must be accommodated. A person on foot or bike, for example, has no choice but to use Nuuanu Avenue, thus it must provide both safety and comfort to more than just drivers. The tree-lined nature of the street and its residential/institutional land uses present the chance to create a multi-modal neighborhood street while still maintaining vehicular capacity.

EXISTING LAND USE, TRANSPORTATION FACILITIES, AND USAGE PATTERNS

Land Use, Transportation Facilities and Traffic Accidents

Nuuanu Avenue has the potential to become a green and multi-modal neighborhood street. The street contains numerous schools and multi-family residential buildings, as well as several large mature monkey pod trees. Nuuanu Avenue runs parallel to the Pali Highway as well as Liliha Street, and provides an important mauka-makai connection between high-density residential buildings and downtown Honolulu.

The site area begins at Nuuanu Avenue and Kuakini Street, adjacent to the Kawananakoa Middle School. A larger number of children walking to and from school use this intersection immediately before and after school hours. Mauka of Kuakini Street, land use along Nuuanu Avenue becomes predominantly residential, and includes apartment housing mauka of Bates Street.

The study area, which measures 0.4 miles in length, ends at Craigside Place, where the Oahu Cemetery begins. Despite its steep grade, the street is lined with many trees and is pleasant for walking. However,

sidewalks are narrow, and in some places nearly blocked by large tree trunks. Currently the street contains two lanes per direction with on-street parking allowed during off-peak hours. On the Ewa side of the road, between Bates Street and Judd Street, parking is restricted between 6:30 AM to 8:30 AM. On the Diamond Head side of the road, between Bates Street and Craigside Place, parking is restricted between 3:30 PM to 5:30 PM.

At the makai section of the study area between Kuakini Street and Pauoa Street, the presence of pedestrians and close signal spacing compel motorists to drive slower, which improves the walking environment. Mauka of Pauoa Street, signals are spaced further apart (~1/4 mile), leading to speeding and a less comfortable street for pedestrians. Walk scores reflect this change in walkability. Walk scores for the areas makai of Pauoa Road were about 71, but gradually declined to mid 40s further mauka of Pauoa Road[1].

Transit scores were moderately good (mid to low 60s). Transit scores may improve as a result of the Honolulu High-Capacity Transit Corridor Project, which proposed restructuring bus routes in the Nuuanu area.

Bike scores were mediocre in the areas surrounding the project site (mid 40s and 50s). Poor bike scores are likely due to the lack of dedicated bicycle facilities on Liliha Street and in the surrounding areas. No dedicated bicycle facility exists along the corridor, but Nuuanu Avenue is designated as a Bicycle Route in the Oahu Bicycle Plan.

Usage Patterns

Table 1 summarizes existing usage patterns by pedestrians, cyclists, vehicles, and transit users in the study area. Counts of pedestrian users was not available; however, during a walking audit of the study area conducted in the Fall of 2014, a very high number of children were observed along Nuuanu Avenue around Kuakini Street in the early afternoon. Bicycle counts are not available, but usage was observed as low.

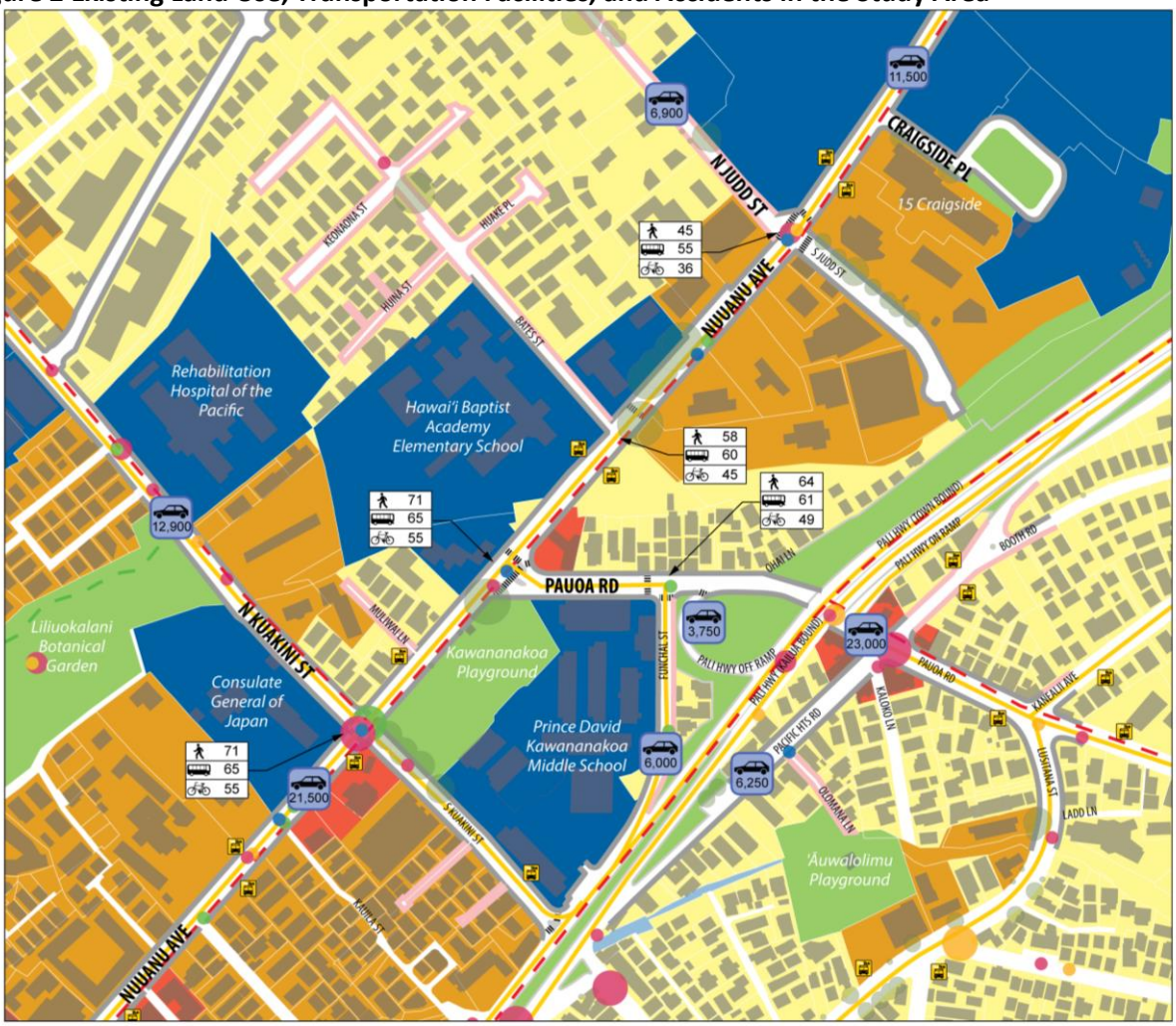
Traffic volumes along Nuunanu Avenue at the south end of the study area total 21,250 per day, but this volume drops off sharply at the northern end of the street, where volumes total 11,500 per day. The volumes indicate that some vehicle lane space could be devoted to other users without negatively affecting traffic flow.

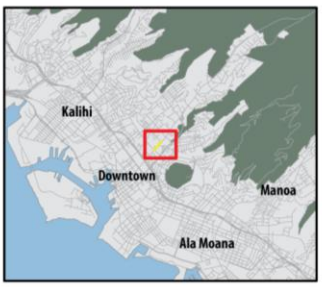
Transit use is fairly low, with 757 average daily boardings and alightings. Most transit activity occurs at bus stops at Kuakini Street and Nuuanu Avenue.

Nineteen traffic crashes occurred between 2007-2011. The most crashes occurred at Nuuanu Avenue and Kuakini Street. According to a 2014 article in the Honolulu Advertiser, the States Emergency Medical Services & Injury Prevention System Branch was notified of eight bicycle and nine pedestrian injuries between 2007 and 2014. The article also mentions a memorial to honor a bicyclists who has killed in 2015 while riding on Nuuanu Avenue near the intersection with Pauoa Road.

[1] Walk, transit, and bike scores are an index of walkability, transit accessibility, and bikeability (respectively) based on proximity to amenities and destinations (e.g., grocery stores, schools, parks, restaurants, and retail). Walk scores are developed by “Walk Score” a private company (https://www.walkscore.com/).

Figure 2 Existing Land Use, Transportation Facilities, and Accidents in the Study Area





0' 100' 200' 300' 400' NORTH

*Source: City and County of Honolulu, Department of Planning & Permitting, Honolulu Land; *www.walkscore.com*

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Nuuanu Avenue from Kuakini Street to Craigside Place

Bicycle Facilities
Existing=Solid, Proposed=dashed
- Lane
- Path
- Route
- Bicycle Racks

Transit Facilities
- Bus Route
- Bus Stop

Walk Scores
- ## Walk Score
- ## Transit Score
- ## Bike Score

Traffic Accidents
- 1 crash
- 2 crashes
- 3-9 crashes
- 10+ crashes

Red = Car/Truck,
Orange = Motorcycle/Moped,
Blue = Bicyclist,
Green = Pedestrian

Traffic Counts
- ### Average Daily Traffic

Street Trees
- Canopy Diameter

Existing Land Use
- Apartment
- Business
- Institutional
- Park/Open Space
- Residential

Pedestrian Facilities
- No Sidewalk
- Sidewalk
- Crosswalk

Table 1 Existing Usage Patterns along Nuuanu Avenue

Pedestrian Use	High number of Kawananakoa Middle School students who walk to school
Bicycle Use	Low
Transit use: Average daily boardings + alightings (Source: *Global Stop Summary by Trip*, TheBus, 2012)	<u>Stops:</u> Nuuanu Avenue + Kuakini Street: 295 Average Daily Ridership (ADR) Nuuanu Avenue + Pauoa Road (mauka-bound): 64 ADR Nuuanu Avenue + Judd Street: 95 ADR Kuakini Street + Pali Highway: 11 ADR Nuuanu Avenue + Judd Street: 79 ADR Nuuanu Avenue + Pauoa Road (makai-bound): 64 ADR Nuuanu Avenue + Kuakini Street: 147 ADR <u>Ridership by Route:</u> Route 4 – Nuuanu to University: 750 ADR Route 10 – Kalihi Kai and Alewa Heights: 7 ADR
Daily Vehicular Volumes (Source: *Historical Traffic Station Maps*, HDOT, 2013-2009)	Nuuanu Avenue: Hialoa Street to School Street-21,250 (2011) Nuuanu Avenue: Kawananakoa Place to Robinson Lane-11,500 (2010) Judd Street: Lee Place to Bachelot Street-7,250 (2011) Kuakini Street: Huli Street to Nuuanu Avenue-13,500 (2012)
Use by Trucks or Large Vehicles	N/A
Peak Periods (Source: *Historical Traffic Station Maps*, HDOT, 2013)	Nuuanu Avenue: Hialoa Street to School Street-7:15-8:15 AM; 4:45-5:45 PM (2011) Nuuanu Avenue: Kawananakoa Place to Robinson Lane-7-8 AM; 4:30-5:30 PM (2010) Judd Street: Lee Place to Bachelot Street-7-8 AM; 4:15-5:15 PM (2011) Kuakini Street: Huli Street to Nuuanu Avenue-7-8 AM; 3:30-4:30 PM (2012)
Accident History (Sources*: State of Hawaii Motor Vehicle Accident Reports,* Honolulu Police Department, Records Division, 2007-2011)	Kuakini St. and Nuuanu Ave. Intersection: 1 bicycle, 7 car, 4 pedestrian accidents (2007-2011) Kuakini St. between Nuuanu Ave. and Pali Hwy.: 1 car accident (2007-2011) Pauoa Rd. and Nuuanu Ave. Intersection: 1 bicycle, 1 car accidents (2007-2011) Nuuanu Ave. between Bates St. and Judd St.: 1 bicycle, 1 pedestrian (2007-2011) Judd St. and Nuuanu Ave. Intersection: 1 bicycle, 1 car, 1 motorcycle accidents (2007-2011)

Part Two: Field Work and Key Findings

The walking audit brought together 19 stakeholders on September 16, 2014 from the City and County of Honolulu, the community, and several key state partners.

STAKEHOLDER INPUT

Community stakeholders participated in a walking audit along Nuuanu Avenue from Kuakini Street to Craigside Place on Tuesday, September 16, 2014. SSFM International, Inc., and a team of national consultants, including Dan Burden, national walkability expert, led a walking audit with 19 members of the community and DTS. The following stakeholder groups participated in the walking audit:

- City and County of Honolulu Department of Transportation Services (DTS), including Mark Garrity, Yamato Milner, Kelly Cruz, Erron Redoble, Randall Kurashige, Shawn Butler, Rika Uechi;
- City and County of Honolulu Department of Facility Maintenance (DFM), including Randy Leong;
- Hawaii State Department of Health (DOH), Heidi Smith;
- Honolulu City Council, Councilwoman Carol Fukanaga;
- Staff representing political offices such as Jenn Takenouchi from Representative Ohno's office;
- University of Hawaii at Mānoa staff and students, including Thomas Lee and Lehua Choy;
- Neighborhood leaders including Neighborhood Board #14s Carole Kaapu, Gavan Abe from Hoopono, and Daniel Alexander from the Hawaii Bicycling League;
- Consultant Team: Mike Packard, Alan Fujimori, and Mike Motoki from SSFM, Dan Burden and Samantha Thomas from Blue Zones, Stephanie Wright from Nelson\Nygaard.

Together, the group identified conditions that affect active living, social connectivity, access to daily needs, and safe routes to school, work and play. Maps of existing land use and transportation conditions were prepared before the walk audit. Participants walked as a group from Kuakini Street and Nuuanu Avenue mauka, stopped at Craigside Place, and then walked back. At the close of the audit, each participant volunteered a potential improvement or issue on Nuuanu Avenue that impedes non-motorized access.

Participants shared visions, barriers, and opportunities for Complete Streets along Nuuanu Avenue from Kuakini Street to Craigside Place.

Photo descriptions: *Top Row – Members of the community; Middle row – Walkability expert Dan Burden and the walk audit participants skirting a large tree trunk; Bottom row – audit group debrief.*

Cyclists, children, and older adults are frequent users of Nuuanu Avenue. ***Photo descriptions clockwise from top left:*** *Cyclist riding on sidewalk due to lack of bicycle facilities; Children crossing to get to school; Pedestrian crossing; Transit customers take up most of the narrow sidewalk; Mature trees create a pleasant environment; Older adults who live on Craigside Place.*

FINDINGS

This section summarizes key findings based on observations made by the consultant team with input from Department of Transportation Services staff and community representatives who participated in the walking audit. These inform the recommendations summarized in the next section.

Finding: Sidewalks are blocked by trees and other obstructions

The street's beautiful mature monkey pod trees also encroach into the sidewalk space. Along the residential areas of Nuuanu Avenue, the trees have grown large enough to block the sidewalk almost completely. In other areas of the corridor, utility poles and other obstructions result in pinch points that are not ADA-accessible.

Large street trees create tripping hazards, obstruct ADA paths, and impinge into the sidewalk space.

Finding: Long distance between legal crosswalks

Pedestrians need to cross the street frequently to get to major land uses and intersections. Mauka of Bates Street, no legal crossing exists for 660 feet, which would require someone to walk more than 3 minutes out of their way to cross at a marked crosswalk. Mauka of Judd Street, it is 737 feet before the next crosswalk appears.

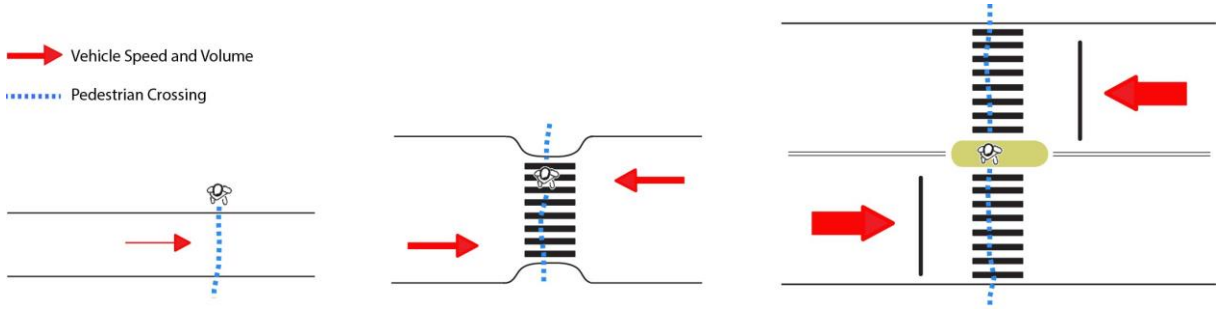
A pedestrian crossing at an unmarked location adjacent to Craigside Place.

Finding: Multi-lane mid-block street crossings need safety enhancements

This multi-lane midblock crosswalk has signage but no signalization.

A key principle of street safety is visibility and minimizing exposure. Visibility means ensuring that drivers see pedestrians and vice versa. Exposure refers to the amount of time and space pedestrians are exposed to vehicle traffic – or the distance between the curbs. Nuuanu Avenue contains a marked crosswalk between signalized intersections near Bates Street, providing access to Hawaii Baptist Academy. In general, providing a place for people to cross the street every 200-400 feet allows people to easily access destinations without having to walk out of their way to the signals at Judd Street or Pauoa Road. The location of the crosswalk on Nuuanu Avenue makes sense from a walking and network perspective, but there is no design element that signifies to drivers that they must stop at the advanced stop line. The diamond pedestrian sign (in the image on the right) alerts motorists to pedestrian activity but it does not direct motorists to stop.

The ability to cross a street safely is a factor of the visibility, width of the street, the traffic volumes, and the speed of vehicles. For a three or four-lane street, more explicit signage stopping drivers, a median island, or a signal is needed. The *Manual on Uniform Traffic Control Devices* requires an R1-5b (Stop Here For Pedestrians) sign to be included adjacent to advanced stop lines at uncontrolled marked crossings.



As vehicular operating speeds and traffic volumes increase, more protection is necessary to provide a safe crossing.

Finding: Wide curb radius results in high turning speeds and long crossing distance

Wider curb radii accommodate higher vehicular speeds because drivers can navigate them without slowing down. Curb radii also have a direct correlation to pedestrian crossing distance; the smaller the radius, the shorter the crossing distance. At Craigside Place and Judd Street, the curb radius is very wide (~25 feet).

Wide turning radius at Craigside Place.

Finding: The intersection of Pauoa Road and Nuuanu Avenue has an awkward alignment

Excess space on the Diamond Head side of this three-leg intersection results in a very long crossing for pedestrians crossing Pauoa Road. The acute angle formed by Pauoa Road and Nuuanu Avenue, the width of the intersection, and its function as a gateway into the residential area of Nuuanu Avenue make it a prime candidate for a roundabout.

Wide turning radius at Craigside Place.

Finding: Nuuanu Avenue has a wealth of trees and green space

Nuuanu Avenue is a beautiful and green street, lined with numerous mature trees. Nuuanu Stream passes under the street at Bates Street. The existing landscaping of the street would benefit an improved walking and bicycling environment.

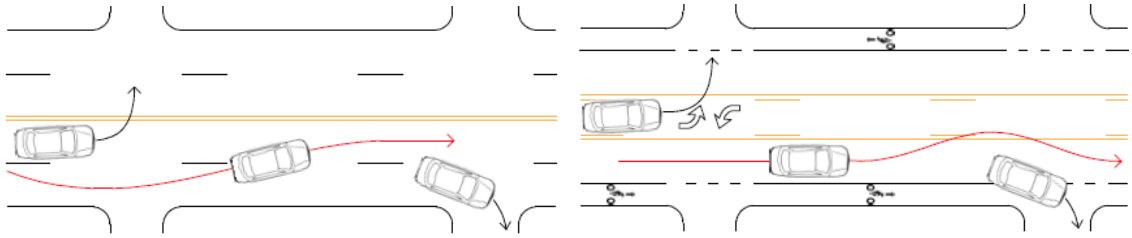
Street trees provide shade which improves the walking environment on Nuuanu Avenue. However, some trees are encroaching into the sidewalk.

Finding: Daily roadway vehicular capacity is higher than auto demand

Daily vehicular volumes on Nuuanu Avenue in the project area are 21,500 ADT. Road diets increase a roads efficiency by channeling turning vehicles out of the through lanes.[2] Streets carrying up to 25,000 vehicles per day function effectively with three lanes, depending on the traffic volumes of nearby adjacent streets[3].

Peak hour volumes are high along the corridor and therefore a reduction in capacity may extend the peak period. However, the improved sense of community and multi-modal safety are considered to be worth the trade-off with peak capacity. Vehicular volumes on Nuuanu Avenue total 2,500 vph during the AM peak hour, and 1,900 vph during the PM peak hour. The makai-bound traffic is busiest during the AM peak hour with a volume of 1,700 vph. With two makai-bound lanes in the AM, this equates to 850 vph per lane. Conversely, the mauka-bound traffic is busiest during the PM peak. The PM mauka-bound peak-hour volume is 1,200 vph, which works out to 600 vph per lane.

Many communities are finding that their four-lane roads through neighborhoods and downtowns have far more capacity than vehicle volume, and that valuable lane space can be reallocated to achieve multi-modal streets. A 4 to 3 lane conversion, or road diet, can improve traffic flow and reduce conflicts with turning vehicles. The 4-lane configuration has been shown to increase rear-end and side swipe vehicle crashes and poses a higher pedestrian crash risk.[4] Streets designed with either two lanes or a two-way left turn lane can cut crash risk by nearly half.



Weaving around left turning traffic creates conflicts in the four-lane configuration (left). Three lanes provide more safety for drivers and also creates space for other modes (right).

Finding: On-street parking along Nuuanu Avenue impedes visibility at Craigside Place

Off-peak parking is available on either side of Nuuanu Avenue north of Craigside Place. Participants who live on Craigside Place find that the parked cars on the Diamond Head side impede visibility to see makai-bound traffic.

Parking too close to the intersection may block the line of sight for motorist leaving side streets.

[2] Burden, Dan and Peter Lagerwey. "Road Diets: Fixing the Big Roads." 1999.
[3] Stamatiadis, Nikiforos and Adam Kirk. "Guidelines for Road Diet Conversions. 2012.
[4] Federal Highway Administration. "Evaluation of Lane Reduction 'Road Diet' Measures and their Effects on Crashes and Injuries." 2004

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Part Three: Recommended Application of Complete Streets Concepts

This section describes the recommended application of Complete Streets concepts for Nuuanu Avenue. It includes a written description of recommendations accompanied by illustrative drawings. The Complete Streets principles incorporated are:

- Encourage multiple modes of transportation, particularly walking and biking
- Promote safety for all modes of transportation
- Adjust the design speed of the road to match and reinforce the posted speed limit of 25 mph
- Promote safer street crossings, and
- Strengthen the sense of arrival.

COMPLETE STREETS RECOMMENDATIONS

Conceptual Illustrations of Recommendations

Figures 3, 4, and 5 graphically show how Complete Streets principles can be applied to transform Nuuanu Avenue within the study area. The conceptual drawings depict the recommended improvements along three segments of the road:

- Nuuanu Avenue from Craigside Place to Judd Street (Figure 3)
- Nuuanu Avenue at Bates Street (Figure 4)
- Nuuanu Avenue from Pauoa Road to Kuakini Street (Figure 5)

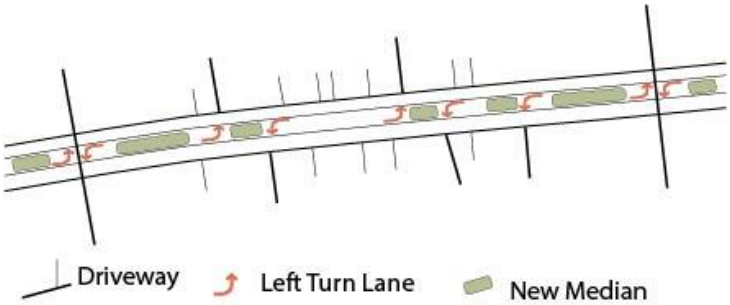
These recommended changes are described in the following section and summarized in Table 2.

Description of Recommendations

The recommendations in Figures 3-5 are summarized below.

A) Implement road diet, transitioning street from four to three vehicle lanes

- Maintain one 10’ lane per direction plus a 10’ center two-way left turn lane.
- Along stretches of Nuuanu Avenue without driveways, install medians in the center turn lane. A 40’ turn pocket can accommodate turning vehicles at driveways, while longer turn pockets can be used at full intersections.
- These medians may be landscaped, adding to the green element of the street.



Example of medians in a center-turn lane.

B) Add bicycle facilities along Nuuanu Avenue

- Install 5’ bicycle lanes on both sides of Nuuanu Avenue, in conformance with the Oahu Bicycle Plan guidance of a designated route, and providing a parallel facility ½-mile from the proposed bike lanes along Liliha Street.
- Pigment bicycle lanes with green paint at intersections, high-conflict driveways, or for the entire length of the corridor.
- Add bike parking to the streetscape and/or to curb extensions.

C) Extend and widen sidewalks on both sides of the street

- Enhance the walking environment by increasing sidewalk widths to a minimum of 10’ makai of Pauoa Road. Currently, sidewalks mauka of Pauoa Road are typically 6’, but are narrower in some areas.
- Constructed a paved sidewalk on the Diamond Head side of Nuuanu Avenue, mauka of Craigside Place. Currently, there is a narrow 3 foot unimproved sidewalk with overhead utilities poles residing that space.

D) Construct a raised intersection at Kuakini Street with Barnes Dance during peak school hours

- During peak school drop-off and pick-up times, a high volume of children cross this intersection. Adding a Barnes Dance signal phase allows pedestrians to cross in any direction uninhibited by vehicle traffic, which eases pedestrian congestion on corners and improves vehicle traffic by eliminating conflicts between turning vehicles and pedestrians trying to cross the street.

E) Create a mini-roundabout at Pauoa Road and Judd Street

- Install a roundabout to make better use of excess space.
- Extend the sidewalk around the outer edge of the roundabout.
- Install bike ramps and transition sidewalk surround the roundabout into an 11' shared-use path to provide less experienced bicyclists with an option for moving through the intersection. Use signage and markings to clearly indicate the expected path of travel.
- Plant trees in new curb extensions.

This bike lane transitions to a raised track between the roadway and sidewalk levels.

F) Add pedestrian safety measures to unsignalized and mid-block crosswalks

- Install Z-crosswalks (slightly offset as shown in the concept plans) with raised crossing island protection at Bates Street, Craigside Place, and Muliwai Lane. The Z shape forces people to turn and face oncoming traffic, increasing visibility between pedestrians and motorists.
- Install Rectangular Rapid Flashing Beacons (RRFB) at the unsignalized and midblock crosswalks at Bates Street, Craigside Place, and Muliwai Lane. RRFBs are activated manually by pedestrians with a push button or passively by a pedestrian detection system. They provide a high-visibility strobe-like warning to drivers when pedestrians are using the crosswalk.

RRFBs at commercial center use flashing lights and signage.

Table 2 Proposed Design Changes to Nuuanu Avenue

	CURRENT	AFTER RECOMMENDATIONS ARE IMPLEMENTED
Type of Facility	Urban Minor Arterial	No change
Street Width	Between School St. and Kuakini St: 38' to 37' Between Kuakini St. and Pauoa Rd.: 40' to 43' Between Pauoa Rd. and Judd St.: 45'	40'
Speed Limit	25 mph	No change
Crosswalk Length (longest)	Nuuanu Ave. and Judd St.: 84'	Nuuanu Ave. and Kuakini St.: 47'
Number of Lanes	Two mauka lanes, two makai lanes between Kuakini St. and Bates St. One mauka lane, one makai lane between mauka of Bates St. with restricted (no parking in mauka lane during PM peak hours and no parking in makai lane during AM peak hours) on-street parking on both side of the street.	One mauka lane, one makai lane, one two-way left turn lane.
Distance to Side Streets	~225' from Kuakini St. to Mauiwai Ln., ~300' from Muiwai Ln. to Pauoa Rd., ~450' from Bates St. to Pauoa Rd., ~675' from Bates St. to Judd St., ~400' from Craigside Pl. to Judd St.	No change
Driveways	Driveways provide access to a mixture of single family, apartment, and businesses. 12' driveways on Diamond Head side of street, 9' driveways on Ewa side of street.	No change
Parking	Peak period restricted on-street parking between Kuakini St and Robinson Ln. On mauka bound lane, "tow away zone from 3:30 PM to 5:30 PM). On makai bound lane, "tow away zone from 6:30 AM to 8:30 AM."	Remove approximately 62 unmarked, peak-restricted, on-street parking stalls between Kuakini St and Robinson Ln.
Sidewalks	8' in most areas, however landscaping and street trees constrict sidewalks in some areas. No sidewalk fronting Oahu Cemetery & Crematory (mauka of Craigside Pl.)	10' on both sides between Craigside Place and Pauoa Rd. No change to sidewalk widths between Pauoa Rd. and Kuakini St. match existing widths.
Transit Routes, Stops, Shelters	7 stops, two with benches and trashcans. Routes 4 (Nuuanu-Punahou), and 10 (Kalihi-Alewa Heights). Four additional stops within 1/8th mile of project location, which do not provide access to additional routes.	The 2011 Honolulu High-Capacity Transit Corridor Project Final EIS includes the realignment of Route 17 and Route 6 to provide service on Nuuanu Ave. and access to downtown rail stations, and the restructuring of Route 10 and Route 4 away from Nuuanu Ave.
Proximity to Future Rail	Not within the 0.5-mile TOD Rail Station Planning Area.	No change
Bicycle Features	None, although the Hawaii Bike Plan includes bike routes on Nuuanu Ave. from Pali Hwy. to Vineyard Blvd.	5' Bike lanes along both sides of street.
Nearby Schools	Kawananakoa Middle School, Hawaii Baptist Academy – Elementary School	No change
Nearby Institutions	Honolulu Memorial Park, Consulate General of Japan	No change

Figure 3 Concepts for Nuuanu Avenue from Craigside Place to Judd Street

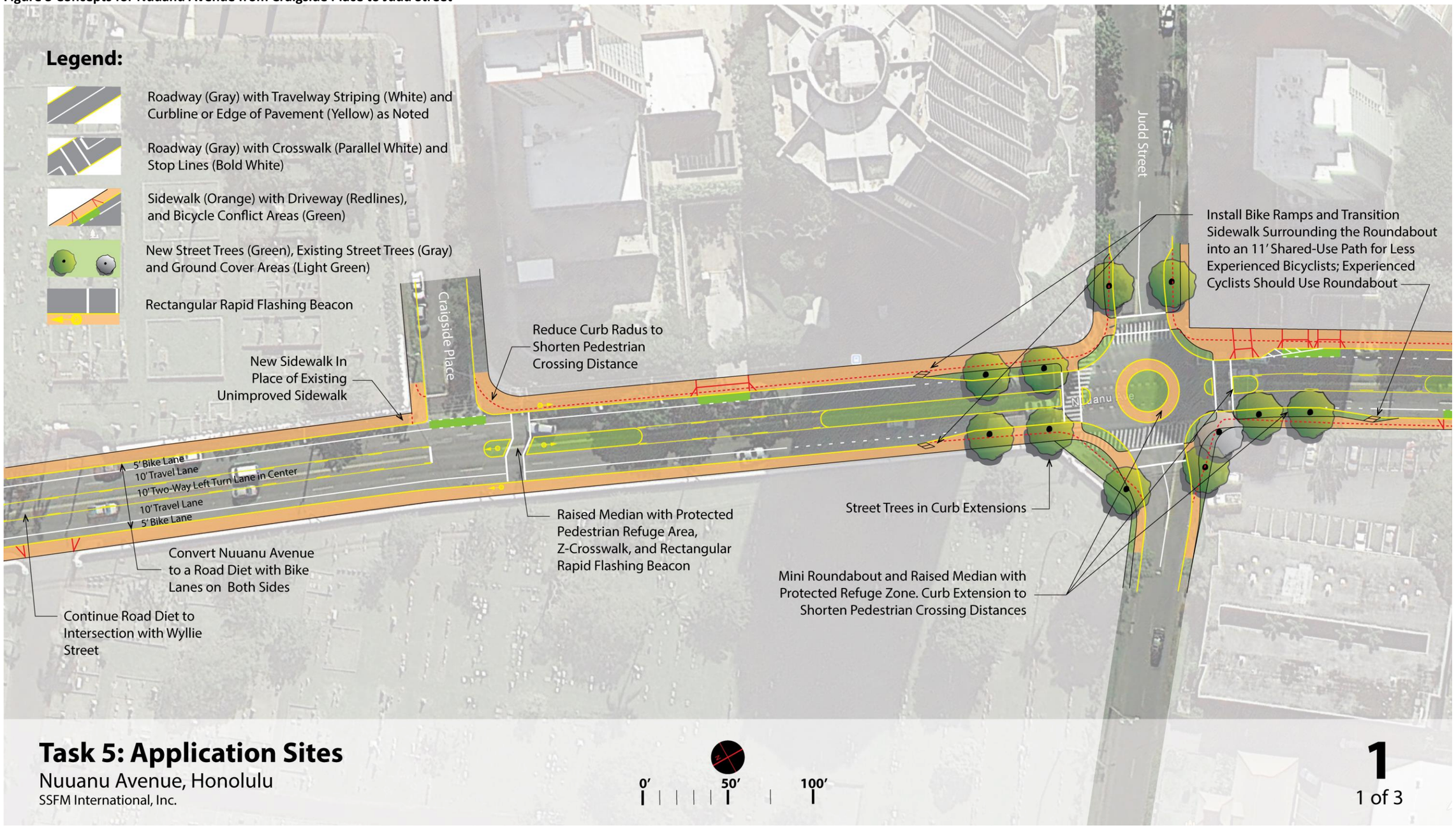


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Figure 4 Concepts for Nuuanu Avenue at Bates Street

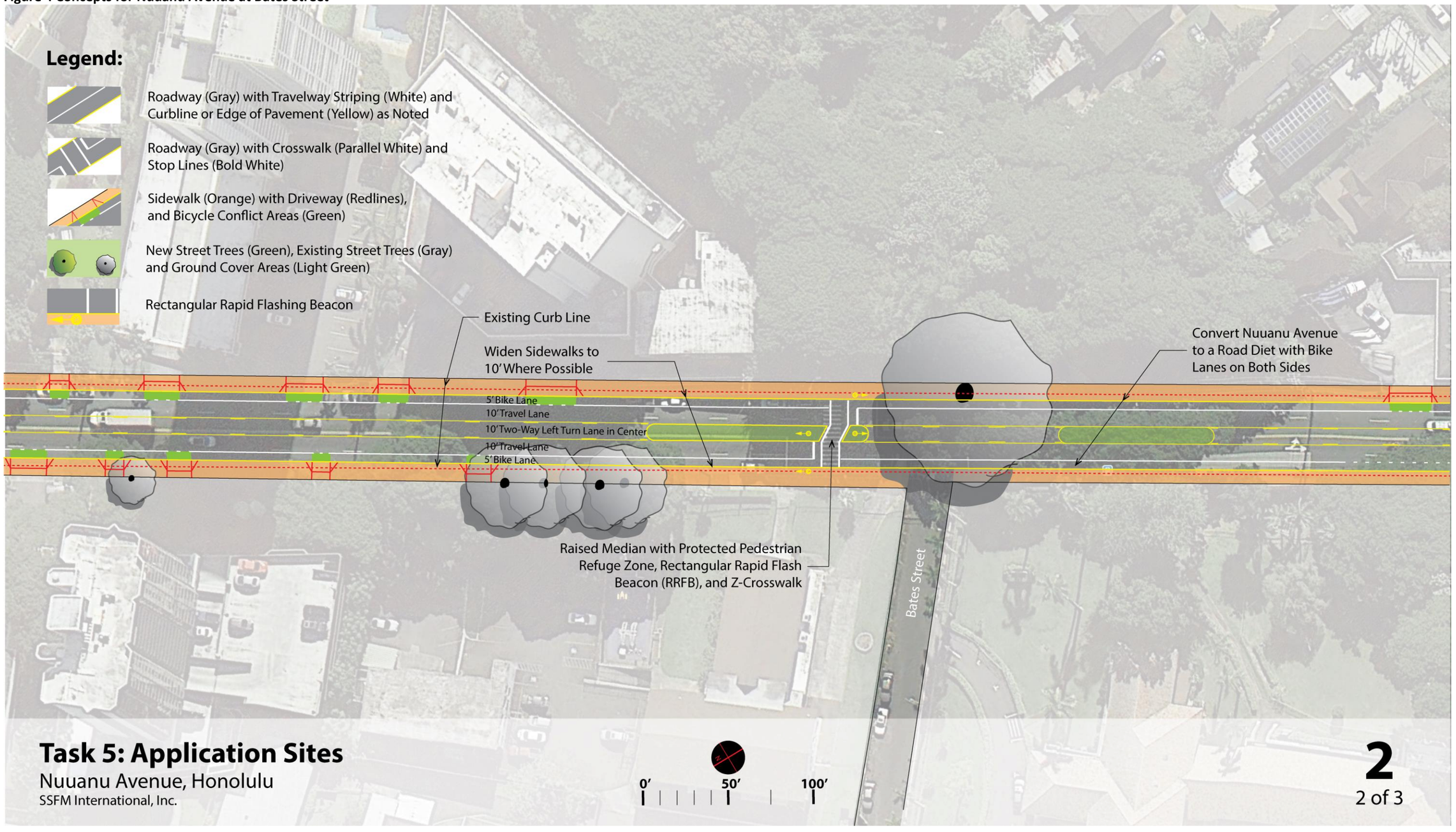

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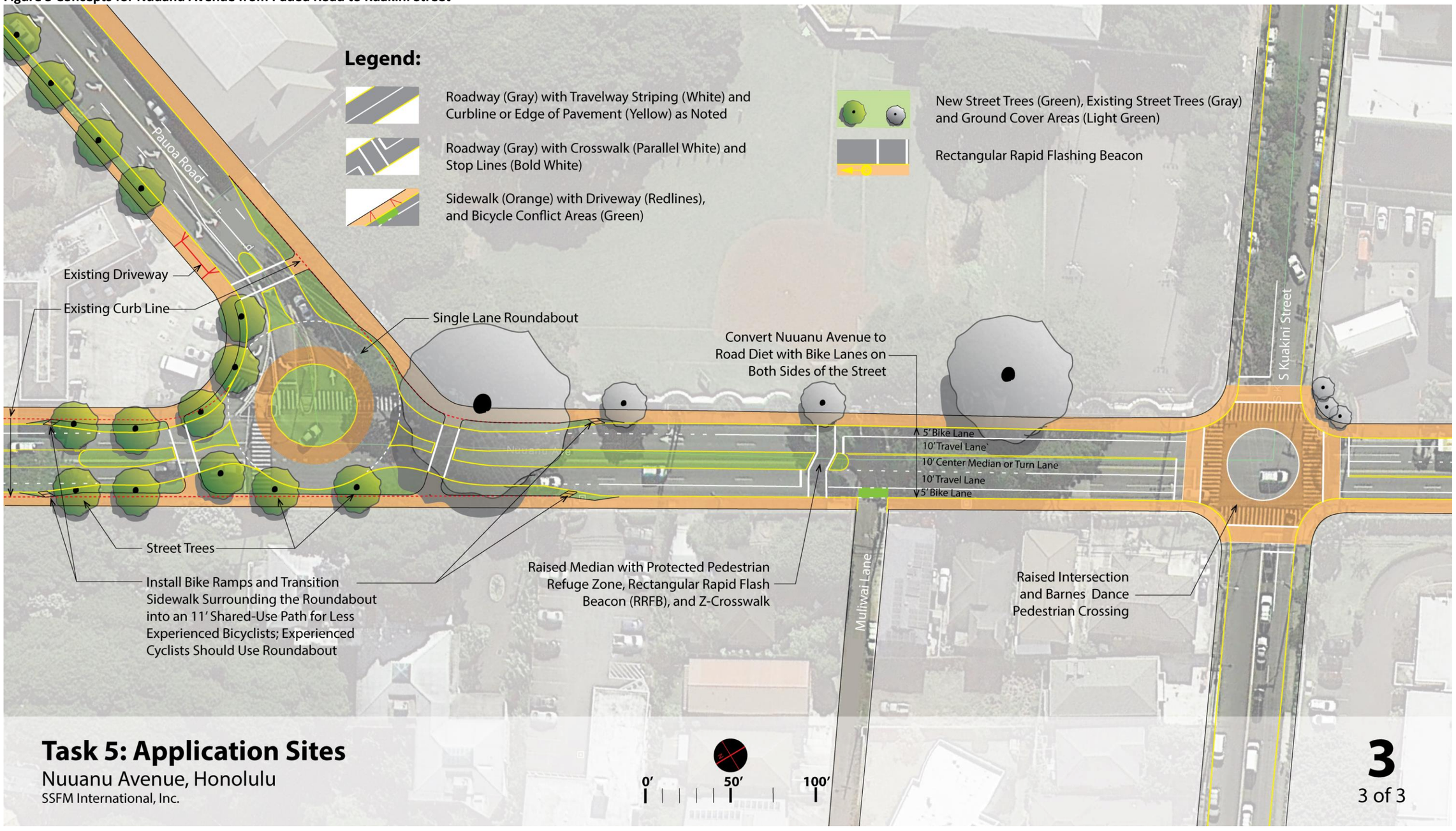
Figure 5 Concepts for Nuuanu Avenue from Pauoa Road to Kuakini Street



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Part Four: Implementation

This section presents a timeline for actions that support implementation of the Complete Streets recommendations. Recommendations are numbered according to how they were presented in the preceding section, with actions bulleted beneath. Near-term actions are those that may be implemented immediately through incorporation into existing City paving, marking, or signage projects or maintenance funding. Mid-term actions are those that may require or warrant a longer planning horizon (1 to 5 years) due to logistical, financial, or other considerations. Longer-term actions are those that may require or warrant an even longer planning horizon (5 years and beyond).

Near-Term Actions (0 - 1 years):

A) Implement road diet, transitioning street from four to three vehicle lanes

- Conduct peak hour traffic counts during weekday to assess road diet viability
- Re-stripe street to one 10’ lane per direction, a 10’ center two-way left turn lane, and 5’ bicycle lanes
- Reconfigure traffic signals to accommodate road diet at intersections

B) Add bicycle facilities along Nuuanu Avenue

- In conjunction with Recommendation A, re-stripe road to include 5’ bike lanes
- Pigment bicycle lanes with green paint at intersections, high-conflict driveways, or for the entire length of the corridor
- Install bike route signage and bike lane pavement markings

C) Extend and widen sidewalks on both sides of the street

- None

D) Construct a raised intersection at Kuakini Street with Barnes Dance during peak school hours

- Determine ability of the existing traffic signal controller to implement time of day phasing for Barnes Dance
- Conduct an intersection traffic count to determine vehicle and pedestrian use at this intersection

E) Create a mini-roundabout at Pauoa Road and Judd Street

- Determine design vehicle (largest vehicle who frequently uses the intersection) and design roundabout
- Re-stripe for a more compact intersection with smaller corner radii to slow vehicle speeds and improve sight distance

F) Add pedestrian safety measures to unsignalized and mid-block crosswalks

- Add signage and re-stripe crosswalks with advanced stop lines

Mid-Term Actions (1 to 5 years):

A) Implement road diet, transitioning street from four to three vehicle lanes

- Along stretches of Nuuanu Avenue without driveways, install raised Asphalt Concrete (A/C) berm (or similar) to delineate median islands

B) Add bicycle facilities along Nuuanu Avenue

- Add bike parking to the streetscape and/or to curb extensions

C) Extend and widen sidewalks on both sides of the street

- Construct an A/C path on the Diamond Head side of Nuuanu Avenue, north of Craigside Place

D) Construct a raised intersection at Kuakini Street with Barnes Dance during peak school hours

- Install a new controller if needed
- Adjust and optimize signal timing to include new Barnes Dance phase
- Implement a Barnes Dance signal phasing during peak school hours

E) Create a mini-roundabout at Pauoa Road and Judd Street

- Install an A/C berm to supplement curbs and create smaller intersection

F) Add pedestrian safety measures to unsignalized and mid-block crosswalks

- Install an A/C berm for protected Z crossing in median

Longer-Term Actions (5 years and Beyond):

A) Implement road diet, transitioning street from four to three vehicle lanes

- Redesign and reconstruct median islands to allow for landscaping
- Plant trees in the median islands

B) Add bicycle facilities along Nuuanu Avenue

- None

C) Extend and widen sidewalks on both sides of the street

- Increasing sidewalk widths to a minimum of 10’ mauka of Pauoa Road
- Extend the concrete sidewalk on the Diamond Head side of Nuuanu Avenue, north of Craigside Place

D) Construct a raised intersection at Kuakini Street with Barnes Dance during peak school hours

- Construct a raised intersection.
- Work with schools to create unique design in the raised intersection that honors nearby schools or the Nuuanu neighborhood.

E) Create a mini-roundabout at Pauoa Road and Judd Street

- Install a single lane mini-roundabout.
- Extend the sidewalk around the outer edge of the roundabout to no less than 11’ and designate as a shared-use path. Install signage and markings to clearly indicate the expected path of travel for pedestrians and bicyclists.
- Install bike ramps before and after the roundabout on Nuuanu Avenue.
- Redesign and reconstruct sidewalk to allow for landscaped planting areas.
- Plant trees in new curb extensions.

F) Add pedestrian safety measures to unsignalized and mid-block crosswalks

- Install RRFBs at the unsignalized and mid-block crosswalks where needed.

Part Five: Cost Sheet

ITEM	*UNIT*	*QUANTITY*	*UNIT COST*	*TOTAL COST*
Removals/Demo				
Remove existing pavement striping	Lin. Ft.	4472	$ 3.00	$ 13,416.00
Remove existing pavement symbol	each	6	$ 300.00	$ 1,800.00
Demolish existing sidewalk	Sq. Ft.	20433	$ 5.00	$ 102,165.00
Demolish existing Pavement	Sq. Ft.	20513	$ 5.00	$ 102,565.00
Demolish existing catch basin	each	6	$ 2,000.00	$ 12,000.00
Erosion Control	L.S.	1	$ 10,000.00	$ 10,000.00
Site improvements				
Roadway				
2" AC Pavement	Sq. Ft.	472	$ 7.00	$ 3,304.00
6" Concrete Curb	Lin. Ft.	4178	$ 15.00	$ 62,670.00
4" Concrete Sidewalk	Sq. Ft.	29309	$ 15.00	$ 439,635.00
6" Aggregate Base Course	Sq. Ft.	29309	$ 5.00	$ 146,545.00
Crosswalk - Special	Sq. Ft.		$ 40.00	$ -
Drainage works	each	4	$ 7,000.00	$ 28,000.00
Raised Intersection	L.S.	1	$ 300,000.00	$ 300,000.00
Rectangular Rapid Flashing Beacon	each	8	$ 10,000.00	$ 80,000.00
Ducting and power supply	Lin. Ft.			$ -
4" Stripe (white/Yellow)	Lin. Ft.	7709	$ 6.00	$ 46,254.00
12"stripe (white)	Lin. Ft.	1530	$ 9.00	$ 13,770.00
5' Bike lane (Green)	Sq. Ft.	1554	$ 9.00	$ 13,986.00
Striping Symbols	each		$ 300.00	$ -
Catch Basin	each	2	$ 1,000.00	$ 2,000.00
Pipe for Catch Basin Relocation	Lin. Ft.	240	$ 150.00	$ 36,000.00
Curb Ramps	each	19	$ 3,500.00	$ 66,500.00
Reconstruction of Driveway	each	15	$ 2,000.00	$ 30,000.00
Intersection				
Single Lane Roundabout	each	2	$ 600,000.00	$ 1,200,000.00
includes sidewalk, roadway, striping and lighting				
Mini-Circle Mountable Domed Center	each		$ 15,000.00	$ -
Traffic Signal Modification	each	1	$ 350,000.00	$ 350,000.00
Landscaping				
Trees	each	9	$ 1,000.00	$ 9,000.00
Grass Landscaping in Medians	Sq. Ft.	4794	$ 10.00	$ 47,940.00
Irrigation	L.S.	1		$ -
Misc.				
Traffic Control	L.S.	1	5%	$ 155,877.50
Mobilization	L.S.	1	10%	$ 311,755.00
Contingency - 25%	L.S.	1	25%	$ 779,387.50
Design				
Design Cost			6%	$ 261,874.20
TOTAL CONSTRUCTION				**$ 4,364,570.00**
TOTAL COST				**$ 4,626,444.20**