MARCH, 2015

HONOLULU COMPLETE STREETS IMPLEMENTATION STUDY LOCATION REPORT

North King Street from Kalihi Street to ‘Umi Street (FINAL)

City & County of Honolulu

Department of Transportation Services

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Summary: North King Street from Kalihi Street to ʻUmi Street

Primary Urban Center Planning Area, Kalihi Sub-Area, Council District 7

NEED FOR PROJECT

Applying Complete Streets to this location will improve safety and amenities for all modes of transportation along this heavily utilized stretch of North King Street.

SUMMARY OF RECOMMENDATIONS

- Create intersections that are compact, create a sense of place, and emphasize pedestrian activities
- Redesign North King Street for a target speed of 25 MPH
- Narrow inside travel lanes to 10 feet wide and outside travel lanes to 11 feet wide
- Paint stop bars a minimum of 20feet back from unsignalized marked crosswalks and install appropriate signage
- Enhance channelized right-turn lane at Kalihi Street with a raised speed table crossing and curb extensions
- Consolidate marked unsignalized intersection crossings along North King Street
- Enhance unsignalized intersection crossings at Pūlaʻa Lane/Factory Street and Richard Lane by realigning crossings and adding curb extensions, pedestrian crossing islands and a pedestrian activated beacon
- Build bus bulbs at Gulick Avenue and Mokauea Street transit stops
- Install curb extensions along side streets with overly-wide turn radii
- Add sharrows and bicycle racks throughout the study area

COST BREAKDOWN

Total: $3,299,121.95

Design: $186,742.75

Construction: $3,112,379.20

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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.

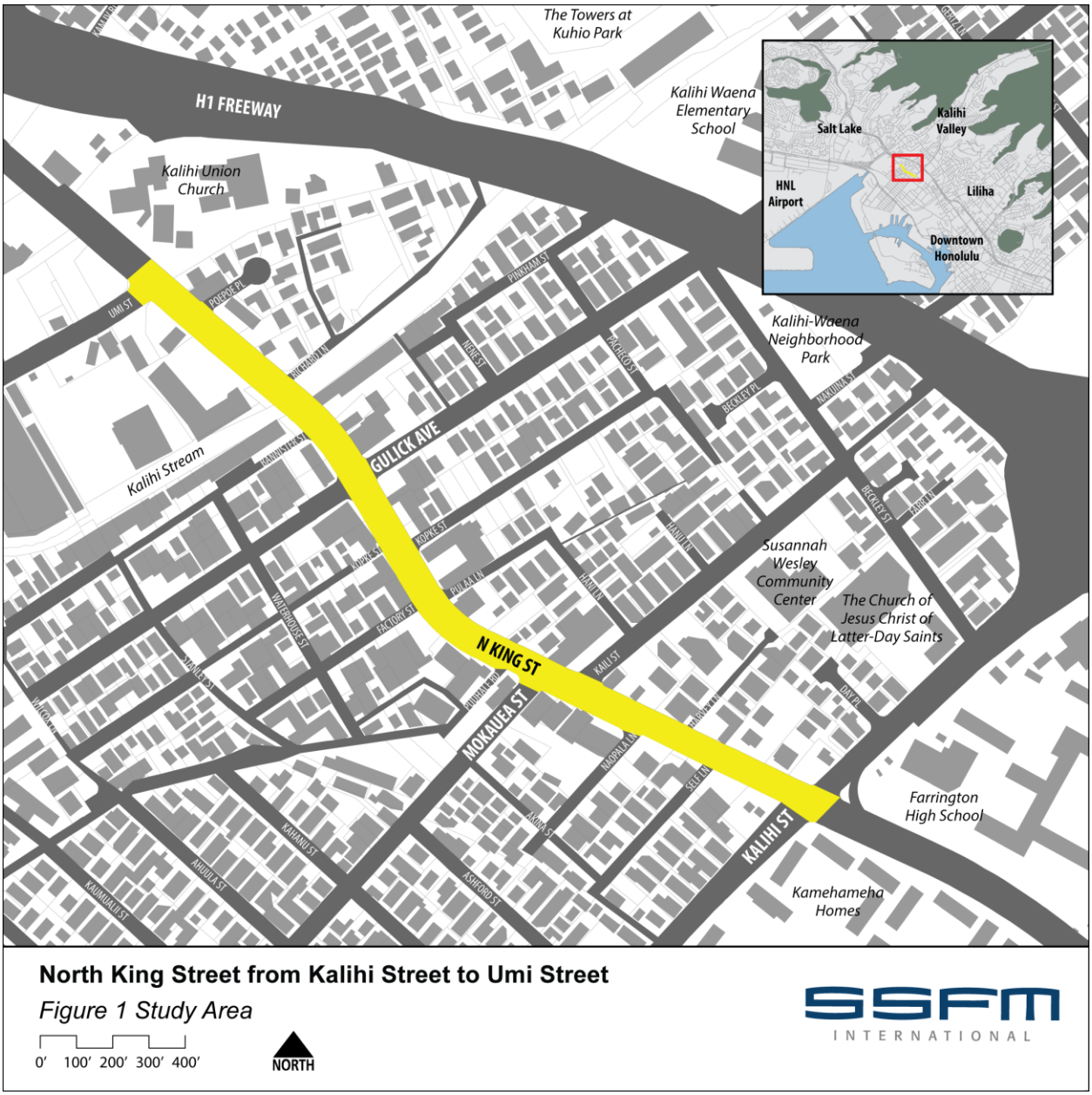
Implementing Complete Streets requires integrating transportation with community planning. Changes are brought about by transforming the built environment. Engineers, planners, architects, landscape architects, and urban design professionals work along with health providers, business leaders, elected 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 Hawai'i 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, guidelines during maintenance and paving projects, and designing projects in specific locations. The City and County of Honolulu selected fourteen across the island of O'ahu 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 North King Street from Kalihi Street to 'Umi Street (Figure 1). It is located in the City and County of Honolulu's Primary Urban Center Planning Area, Sub-Area of Kalihi, in City Council District 7. North King Street is a key urban corridor, connecting people to Downtown Honolulu through a busy neighborhood. Land uses along the North King Street corridor include schools, medical offices, retail shops, residential housing, transit stops, and parks. As of July 2014, four bus routes operated on North King Street, serving a total average of 6,891 riders a day. The demand for transit is high and many in the area use transit as their sole mode of transportation. High transit usage generates high pedestrian traffic, as people of all ages navigate to and from transit stops and frequent schools and businesses. People on bicycles were observed in the area as well, however most travel was on the sidewalk, conflicting with pedestrian travel, due to the lack of bike facilities, high vehicle speeds and vehicle volumes.

Figure 1 Study Area



This segment of North King Street includes four major intersections, all of which serve as neighborhood centers of activity:

- North King Street at Kalihi Street is the largest intersection in the study area. It is a gateway into the Kalihi neighborhood and Farrington High School, and a vital exchange for motorists wanting to access the H-1 Freeway. The future Honolulu Rail Transit station will be located at Kalihi Street and Dillingham Boulevard, 2,000 feet south of the intersection of North King Street and Kalihi Street.
- Mokauea Street's intersection with North King Street is another key neighborhood node. It is located less than 100 feet from the Kāʻili Street-North King Street intersection, creating a skewed T-intersection. This area serves as a hub for pedestrians, motorists, and transit riders accessing local small businesses and transit connections.
- Gulick Avenue at the intersection of North King Street features one of the most heavily used bus stops in Honolulu, serving an average of 2,900 daily riders. Foot traffic is heavy in this area and is a major focal point of neighborhood activity with retail and residential uses on each corner.
- The intersection of ʻUmi Street and North King Street is a transit hub as well as a gateway from the H-1 Freeway into the neighborhood. Cars exit off the H-1 approximately 700 feet ʻEwa from this intersection, marking a transition from high-speed highway to a slower-speed urban corridor.

NEED FOR PROJECT

Kalihi's population density, age diversity, and proximity of community destinations, including commerce, transit, and schools make the neighborhood a vibrant area that already supports multiple modes of transportation including transit, pedestrians, and bicyclists. However, safety along this stretch is a major concern. Between 2007 and 2013, there were 11 pedestrian fatalities. In 2014 alone, there have been three fatalities.

This section of North King Street is a 60' wide four-lane undivided roadway. The large width and high operating speeds on North King Street increase a pedestrian's vulnerability to "multiple-threat crashes," in which one vehicle stops for a pedestrian, while another motorist continues in the through lane, potentially striking the pedestrian. The H-1 interchanges near this stretch of North King Street create transitional speed zones from high to lower speeds. Presently, there are few visual cues or physical design elements that encourage motorists leaving the highway to slow to posted speed limits, creating further danger to pedestrians and bicyclists. Placemaking elements and visual cues are needed to reinforce the 25 mph posted and target speed along this stretch of North King Street. Implementing Complete Streets in this area will add to the area's vibrancy while making it safer and more inviting for pedestrians and people on bicycles.

EXISTING LAND USE, TRANSPORTATION FACILITIES, AND USAGE PATTERNS

Land Use, Transportation Facilities and Traffic Accidents

Figure 2 shows land use, transportation facilities, and locations of traffic accidents within the study area. Properties fronting North King Street in the study area consist mostly of small, street-oriented commercial establishments including markets, restaurants, craft supply shops, grocery stores, banks, health clinics, gas stations, and more. A handful of multifamily residential buildings and small single-family dwellings front the street as well.

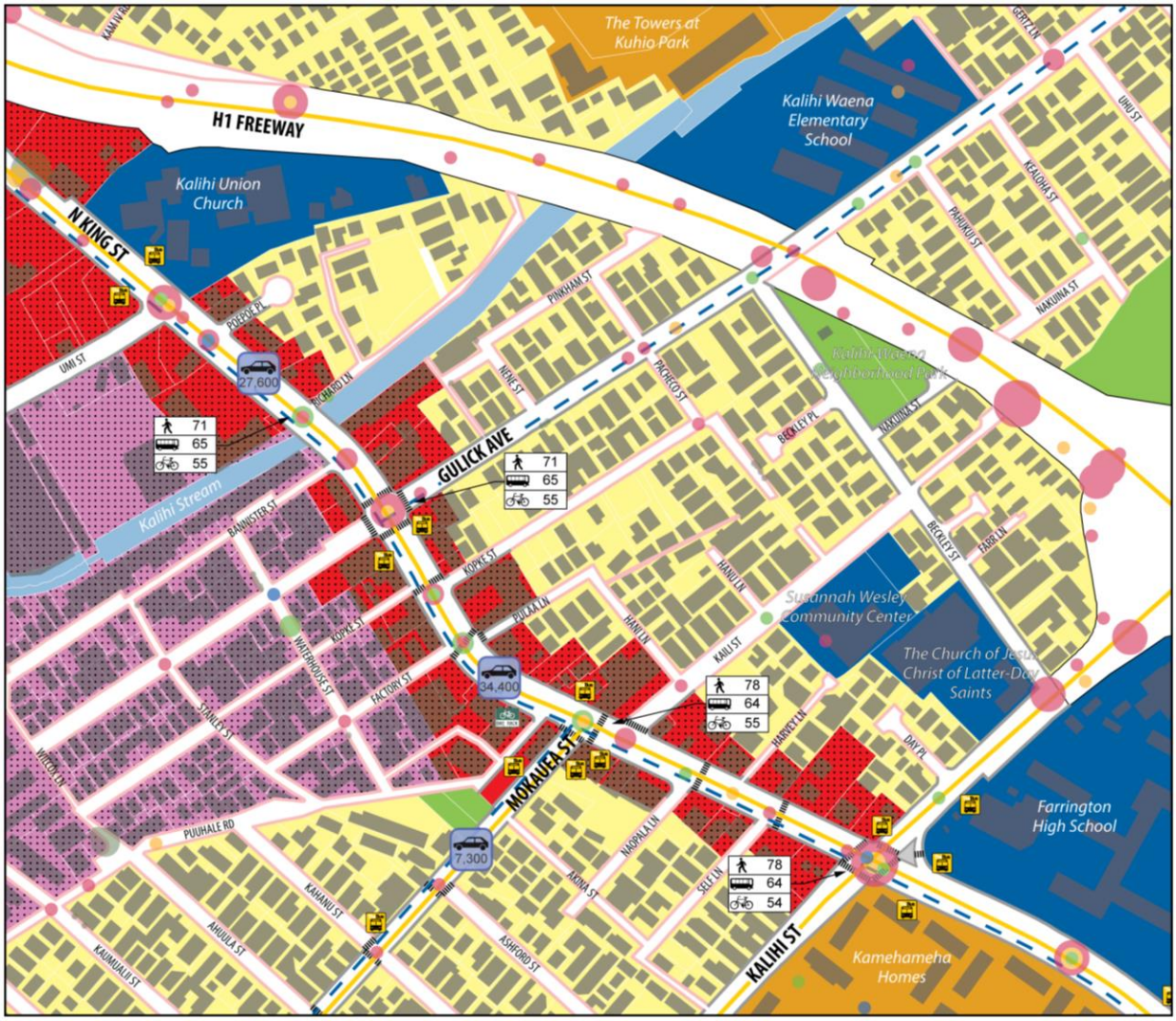
North King Street is rich in diversity, from the small business located along the corridor to people using the street. However, safety concerns prevail due to a road that is overbuilt for one mode—the car.

Photo descriptions *(clockwise from top): Pedestrians cross North King Street at Kāʻili Street; pedestrians using a North King Street sidewalk; woman pushes a stroller across an intersection; a pedestrian in a crosswalk with a shopping bag.*

The mix of uses is generally uniform along the length of the study area, although the uses behind North King Street transition from residential to Industrial Mixed Use as the route proceeds ʻEwa. Farrington High School and a large low-income housing complex are located just beyond the Kalihi Street side of the study area. Farrington High School is located at the intersection of North King Street and Kalihi Street. King David Kalākaua Middle School and Kalihi Kai Elementary are located on Kalihi Street less than a quarter-mile makai of the North King Street intersection.

There are eleven (11) bus stops along North King Street within the study area (see Table 1). Sidewalks exist along both sides of North King Street and span the full extent of the study area. Signalized crosswalks (from ʻEwa to Diamondhead) are located across North King Street at Gulick Avenue, Mokauea/Kāʻili Street, and Kalihi Street. Unsignalized crosswalks are located at Richard Lane, Kopke Street, Pulaa Lane/Factory Street, Nāʻōpala Lane, and Self Lane. There are currently no bicycle lanes, routes, or paths in the study area, and only one bike rack located on the ʻEwa corner of Puuhale Road and North King Street. Scores for walking, transit, and bicycling were obtained for several locations within the study area, rated on a scale of 1-100 by walkscore.com. Walk Scores in the area are high, in the mid to upper 70's. Transit scores are in the mid-60's, and bicycle scores are in the mid-50's, indicating a lower level of accessibility for people on bicycles throughout the study area.

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



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

SSFM INTERNATIONAL

North King Street from Kalihi Street to Umi Street

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 Mixed Use
- Industrial Mixed Use
- Institutional
- Park/Open Space
- Residential

Pedestrian Facilities
- No Sidewalk
- Sidewalk
- Crosswalk

Usage Patterns

Table 1 describes existing usage patterns by pedestrians, bicyclists, vehicles, and transit users in the study area. Data on pedestrian use is not available, however a walking audit conducted in the summer of 2014 indicated anecdotally that there is a high level of pedestrian use throughout the study area (see Figures 3 and 4). Bicycle count data is likewise not available for the study area. The walking audit in 2014 noted a "moderate" amount of bicycling in the area.

Four bus routes operate along this stretch of North King Street daily. Data from TheBus indicates that public transit use is high, with the most riders boarding at the intersection of Gulick Avenue. Bus stops at North King and Kalihi Streets are the second most utilized. Average daily ridership (ADR) for each bus stop is presented in Table 1.

2012 traffic count data indicated average daily vehicular volumes of 27,525 vehicles per day between Poepoe Place and Richard Lane, which is located within the study area. Another segment between Pūlaʻa Lane and Puʻuhale Road registered 29,674 vehicles per day.

Table 1 provides accident data for the area between 2011-2014, and accident locations are depicted on Figure 2. The intersections at Gulick Avenue and Mokauea Street stand out as having higher concentrations of accidents involving vehicles, pedestrians, and motorcycles/mopeds than other locations in the study area.

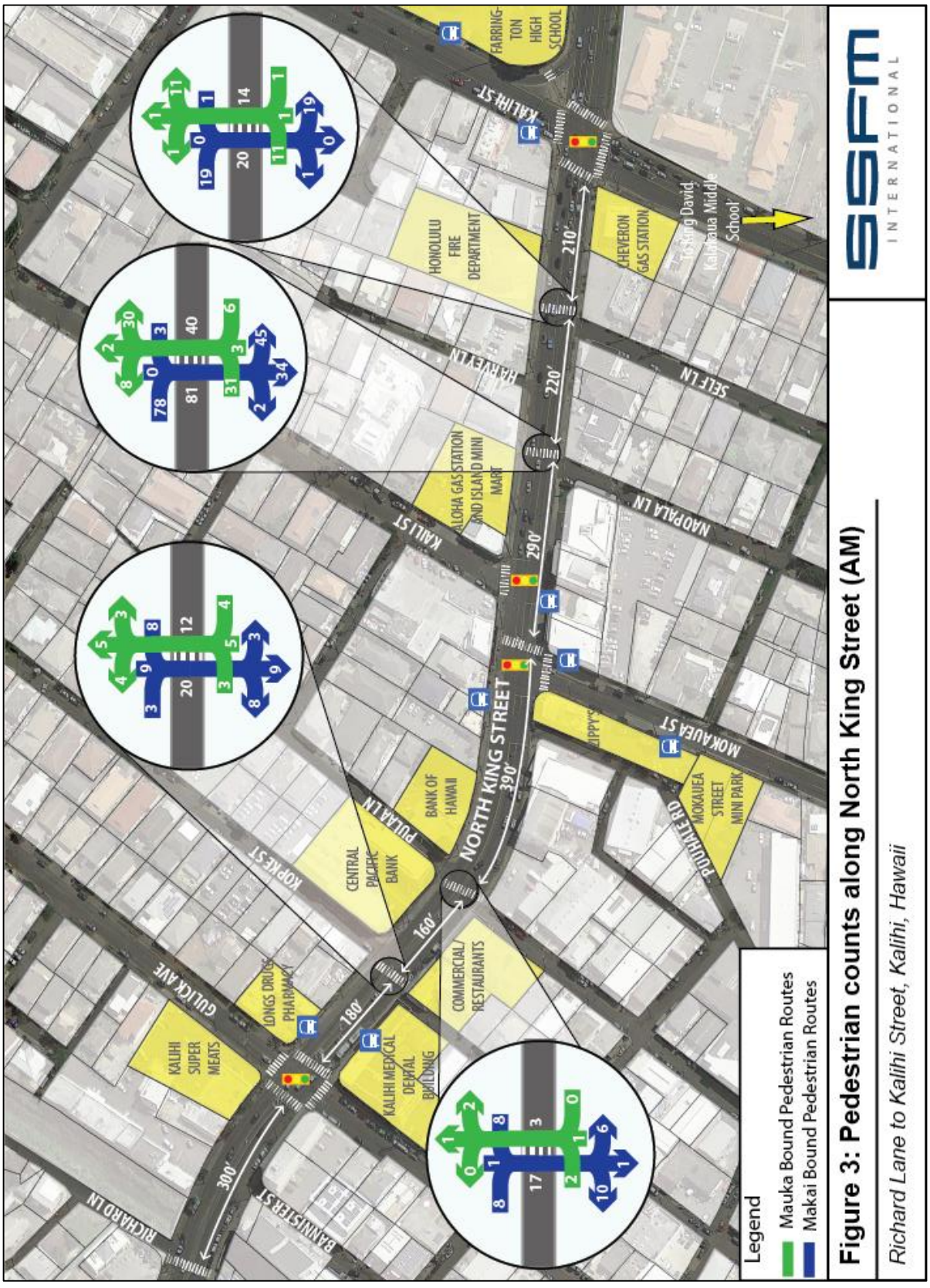


Figure 3: Pedestrian counts along North King Street (AM)

Richard Lane to Kalihi Street, Kalihi, Hawaii

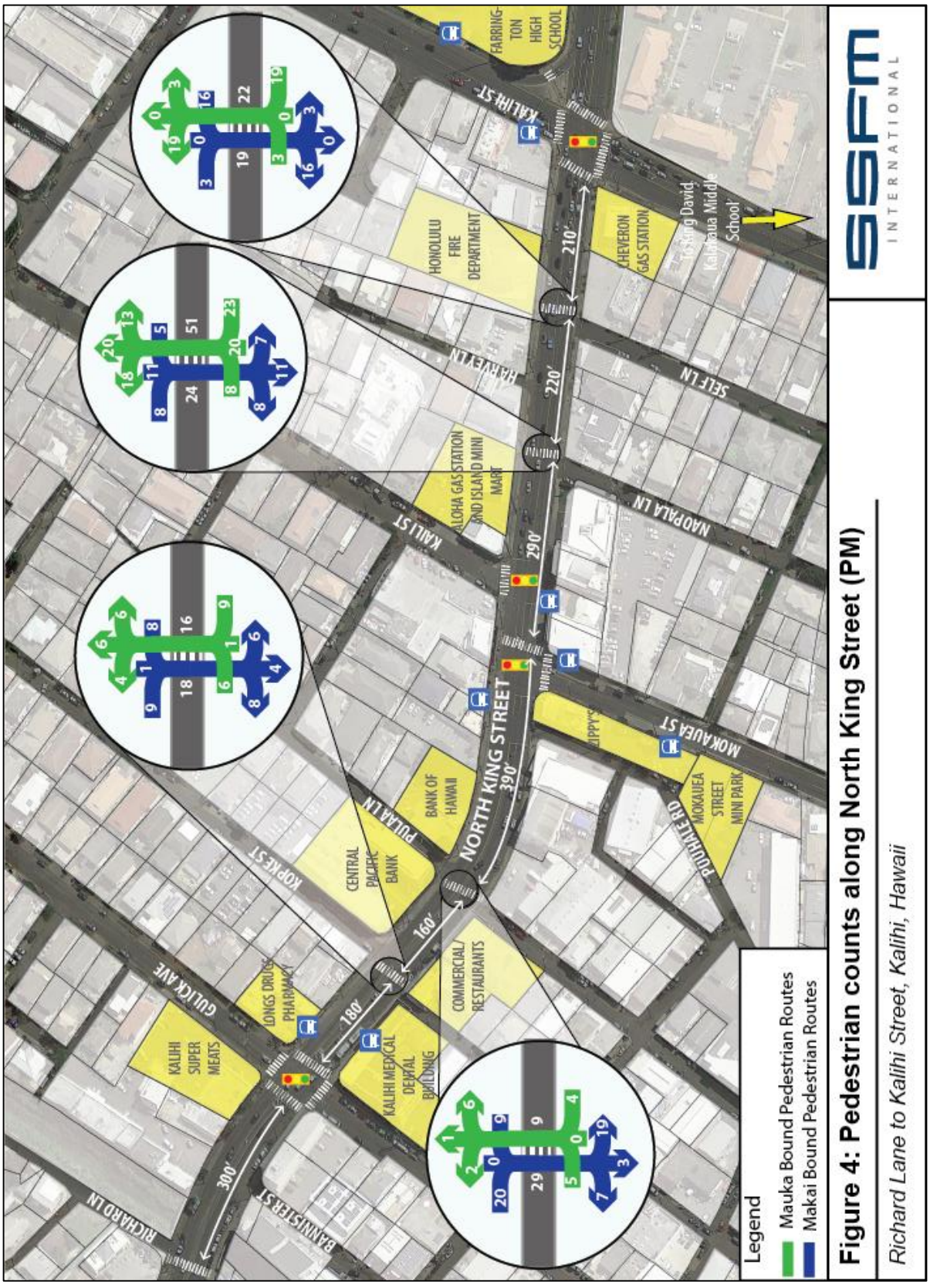


Figure 4: Pedestrian counts along North King Street (PM)

Richard Lane to Kalihi Street, Kalihi, Hawaii

Table 1 Existing Usage Patterns along North King Street

Pedestrian use	Kopke St and N King St: 32 pedestrians per hour (pph) AM, 34 pph PM Pulaa Lane and N King St: 20 pph AM, 38 pph PM Naopala Ln and N King St: 121 pph AM, 75 pph PM Self Ln and N King St: 34 pph AM, 41 pph PM
Bicycle use	Moderate
Transit use (Average daily boardings + alightings) (Source: *Global Stop Summary by Trip*, TheBus, 2012)	<u>Stops</u> N King St + Kalihi St: 649 average daily riders (ADR) N King St + Gulick Ave (Westbound): 1360 ADR N King St + Gulick Ave (Eastbound): 1543 ADR N King St + Kalihi St: 742 ADR N King St + OPP ʻUmi St: 36 ADR N King St + ʻUmi St: 499 ADR N King St + Mokauea St: 550 ADR N King St + OPP Mokauea St: 526 ADR Mokauea St + N King St: 180 ADR Kalihi St + N King St: 399 ADR Mokauea St + N King St: 79 ADR <u>Boardings and Alightings by Route</u> Route 1: 3457 Route 7: 970 Route 10: 139 Route A: 2325 Total: 6,891 (average daily)
Daily Vehicular Volumes (Source: *Historical Traffic Station Maps*, HDOT, 2012)	King Street: Poepoe Place to Richard Lane (2012):27,525 vehicles King Street: Pūlaʻa Lane to Puʻuhale Road (2012): 29,674 vehicles Mokauea Street: Ashford Street to ʻAkina Street (2011): 6,562 vehicles
Use by trucks or large vehicles	High truck and bus use
Peak periods (Source: *Historical Traffic Station Maps*, HDOT, 2012)	King Street: Poepoe Place to Richard Lane (2012) - 07:30 AM to 08:30 AM and 03:15 PM to 04:15 PM King Street: Pūlaʻa Lane to Puʻuhale Road (2012) - 06:45 AM to 07:45 AM and 03:30 PM to 04:30 PM Mokauea Street: Ashford Street to ʻAkina Street (2011) - 07:00 AM to 08:00 AM and 03:00 PM to 04:00 PM
Accident History Sources*: State of Hawaiʻi Motor Vehicle Accident Reports,* Honolulu Police Department, Records Division, 2011-2014	N King Street and Gulick Avenue: 12 car/truck, 2 motorcycle/moped, 3 pedestrian N King Street + Richard Lane: 2 car/truck; 3 pedestrian N King Street + Kopke Street: 2 car/truck, 2 pedestrian Total Car/Truck: 16; Total Motorcycle/Moped: 2, Total Pedestrian: 8

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Part Two: Field Work and Key Findings

The walking audit brought together 27 leaders on July 16, 2014 from the City and County of Honolulu, including the Department of Transportation Services (DTS) and the Mayor's office, Hawai'i State Department of Health, O'ahu Transit Services, school representatives, and neighborhood residents.

STAKEHOLDER INPUT

The findings of this report are informed by input received from community stakeholders that participated in a walking audit along North King Street from Kalihi Street to 'Umi Street. SSFM International, Inc., and a team of national consultants, including Dan Burden, national walkability expert, led the walking audit on July 16, 2014. The following stakeholder groups participated in the walking audit:

- City and County of Honolulu Department of Transportation Services (DTS), including Mark Garrity, Kelly Cruz, Chris Sayers, Jack Patterson, Randall Kurashige, Peggy Ho, Tammy Nakajo, Leon Lau, Darin Anbe, Shawn Butler, Rika Uechi, Greg Tsugawa, and Erron Redoble;
- Staff from the Mayor's office;
- Hawai'i State Department of Health (DOH), Heidi Hansen-Smith;
- The Bus—O'ahu Transit Services (OTS), Roger Morton;
- Neighborhood residents, Jonathan Aguilar;
- Farrington High School Leaders;
- Consultant Team: Mike Packard, Alan Fujimori, and Michael Motoki from SSFM; Dan Burden and Samantha Thomas from Blue Zones; Gary Toth from Gary Toth Associates; and Evan Corey from Nelson Nygaard.

One participant, Jonathan Aguilar, grew up in the neighborhood. His father was hit and killed by a motorist while crossing King Street in the marked crosswalk at Richard Lane in June 2014. Another concerned resident accompanied the group to demonstrate the challenges she faces on a daily basis navigating the streets in a wheelchair. These citizens attest to the community's personal interest in making North King Street a safer place.

Together, the group observed and identified conditions that affect active living, social connectivity, safe routes to school, and access to daily needs along North King Street from Kalihi Street to 'Umi Street. Gulick Avenue was observed to be the "heart" of the study area, as evidenced by a high volume of people of all ages walking, using transit, and frequenting businesses. Business owners are engaged and watchful of happenings on the street, and one business owner emerged to inquire what walking audit participants were doing.

The participants observed vehicles traveling at higher than posted speeds along North King Street throughout the study area. They observed a large amount of people walking and using transit and commented on the danger of pedestrians crossing at unsignalized intersection marked crossings due to need to traverse the four- to five- lane road. Many of the observations supported an over-arching need to improve pedestrian safety. The group showed enthusiasm about safety-oriented solutions such as slowing down vehicles with gateway treatments and providing pedestrian crossing islands.

Roger Morton with TheBus, O'ahu Transit Services, shared during the walking audit that North King Street has a history rooted in transit and was once a key streetcar line. Transit ridership will continue to grow with the planned Honolulu Rapid Transit station at Mokauea Street and Dillingham Avenue, adjacent to the elementary school.

Participants shared their visions, barriers, and opportunities for complete streets on North King Street from Kalihi Street to 'Umi Street. The goal of the walking audit was to discuss possible treatments for North King Street and its major intersections in order to improve pedestrian safety and accessibility.

Photo descriptions: *Top row from left – Roger Morton from TheBus, Consultant Dan Burden talks with resident Jonathan Aguilar, Heidi Hansen-Smith from State DOH; Middle row from left – Walk audit team discusses area concerns and reviews maps of transportation conditions, DTS Deputy Director Mark Garrity, Randall Kurashige from DTS; Bottom row – a citizen demonstrates the obstacles she encounters daily navigating city streets in a wheelchair.*

During the hour-long walking audit, many people, of all ages, were observed walking, waiting for transit, socializing and businesses and business owners who were keeping a watchful eye on the street. The images (left) capture snap shots of the street life along N King Street.

Photo descriptions *(clockwise from top left): a shopkeeper at a dry goods store; a transit user at a bus stop fronting a barber shop; Pedestrians crossing at the Kā'ili Street intersection; pedestrians seeking shade under street front awnings; a pop-up sale at a local business; socializing and conversation on the street.*

FINDINGS

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

Finding: The built design speed is higher than the posted speed, increasing the risk of pedestrian fatalities.

Pedestrian crossing in uncontrolled marked crosswalk.

The posted speed limit is 25 mph, but drivers tend to travel much faster, reflecting the road's "design speed." Along North King Street, vehicles were regularly observed traveling at speeds of 35 mph and greater. Road design should be consistent with the "target," or desired, vehicle speed, which is typically equal to or less than the posted speed limit. As speeds increase, the risk of pedestrian fatality increases. A pedestrian hit by a motorist traveling 20 mph has a 95 percent chance of surviving; a pedestrian hit by a motorist traveling 30 mph has a 60 percent chance of survival; and a pedestrian hit by a motorist traveling 40 mph has a 20 percent chance of survival.

Finding: There is a high risk for multiple-threat crashes due to road design features.

Vehicle stopped in outside lane while pedestrians cross in uncontrolled marked crosswalk.

Four-lane undivided roads combined with unsignalized intersection crosswalks present the potential for "multiple-threat crashes," in which one vehicle stops for a pedestrian, while another motorist continues on in the through lane. In this situation, the pedestrian and motorist in the through lane cannot see each other.

Pedestrians need crossings with appropriate devices (islands, curb extensions, lighting, and advanced stop bar lines) to reduce their exposure time and danger of a multiple-threat crash. Unsignalized marked crosswalks at intersections exist at Richard Lane, Factory Street and Kopke Street within the study area. In these locations, pavement markings such as advanced stop bars set 20 feet back from the crosswalk mitigate multiple-threat crashes by creating better sight lines. Currently, there are no advanced stop bar markings at any of the unsignalized marked crossings on North King Street. Additional mitigation includes the addition of raised medians, providing refuge for crossing pedestrians so that they only needed to cross one direction of vehicle travel at a time.

Finding: The intersection of North King Street and Kalihi Street is complex due to the channelized right-turn lane and multiple through lanes

This intersection is key as it connects motorists to the H-1 Freeway, students, families, and school staff to Farrington High School, and people driving, walking, bicycling or using transit to businesses located on North King Street.

Channelized right-turn lane from King Street to Kalihi Street.

The intersection at Kalihi Street is complex due to high-speed channelized right-turn lanes and multiple through lanes. The existing turning radius is overly wide, which encourages high-speed, free flowing right-hand turning movements. Narrowed lanes or a curb extension can reduce turning speeds, and improve drivers' yielding behavior and visibility of pedestrians and vehicles.

Finding: The confluence of North King Street, Mokauea Street, and Kāʻili Street is a complex area that could be made more compact and easy to navigate

Intersection of North King Street and Mokauea Street.

There is a need to simplify vehicular and pedestrian movements to improve traffic efficiency, safety, walkability, and overall quality of place and life. The area where North King Street, Mokauea Street, and Kāʻili Street meet is complex due to a confluence of streets, uses, and pedestrian activity. The T-intersection at North King and Mokauea Streets is less than 100 feet from the T-intersection of North King Street and Kāʻili Street. Pedestrian crossings are missing from a leg on each of these intersections to allow for continuous left-hand turning movements from the side streets onto North King Street during the signal phase. There are three bus stops in the immediate vicinity of these two intersections. On stop, heading east on North King Street is located between Mokauea Street and Kāʻili Street. The position of the stop and the limited distance between intersections could cause larger articulated buses to block the intersection of Mokauea Street. There is no on-street parking allowed at this intersection area. Community gathering places such as transit stops and grocery stops create places where pedestrians linger.

Finding: The intersection design of North King Street and Gulick Avenue can be improved to accommodate multiple modes

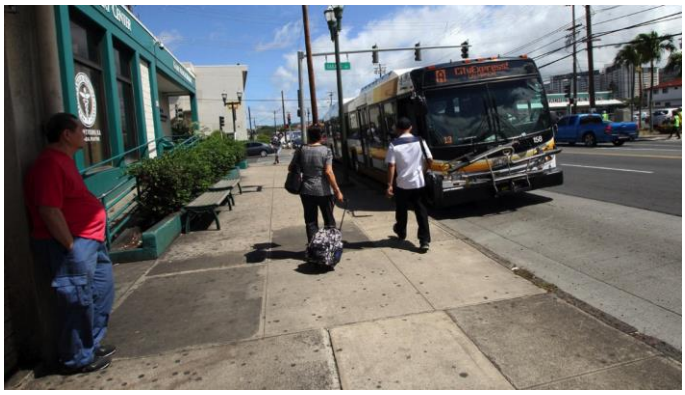
Intersection of North King Street and Gulick Ave.

Most conflicts between roadway users occur at intersections, where users cross each other's path. Well-designed intersections indicate what users must do and who has to yield. High left-turn vehicular traffic volumes, high pedestrian traffic, and the lack of a protected left-turn phase for motorists on North King Street turning mauka on to Gulick Avenue all contribute to the highly likelihood of modes crossing paths.

The intersection of North King Street and Gulick Avenue features a high amount of pedestrian activity and two of the most heavily used bus stops in Honolulu. Over the last year, at least one pedestrian fatality has occurred at the intersection. The intersection should be designed to accommodate safe and convenient travel by all modes with shorter pedestrian crossings, convenient bus stops with amenities, designated bicycle facilities, and slower vehicle speeds.

Intersection geometry is a critical element of intersection design, regardless of the type of traffic control used. Geometry sets the basis for how all users traverse intersections and interact with each other. For example, curb extensions create a visual cue for motorists to reduce their speed, and creates shorter crossing distances for pedestrians and has the potential to improve the pedestrian environment by providing additional space for street furnishings.

Finding: The study area lacks transit shelters and awnings to protect transit users and pedestrians from the elements



Bus stop along North King Street at Gulick Ave.

The bus stop at Gulick Avenue is one of the busiest in Honolulu, yet it lacks a bus shelter despite having ample sidewalk space for one. Transit stations should be seen as places; a transit stop can serve much more than a transportation function. It can be a setting for community interaction, a place that fosters a diversity of activities. During the walk audit, many people were observed seeking shade under the awnings of adjacent buildings while waiting for the bus or navigating the street. One solution is to encourage placement of buildings and home with zero setbacks and street side awnings. This not only provides shade, it also creates natural "surveillance" of buildings over the street and opportunities for people on the street to meet or socialize.

Additional pedestrian space for bus shelters can be created by installing bus bulbs. Bus bulbs are curb extensions that extend the length of the transit stop on streets with on-street parking. They improve transit performance by eliminating the need for buses to merge into mixed traffic after every stop. They also facilitate passenger boarding by allowing the bus to align directly with the curb; waiting passengers can enter the bus immediately after it has stopped. Bus bulbs improve pedestrian conditions by providing additional space for people to wait for transit and by allowing the placement of bus shelters where they do not conflict with a sidewalk's pedestrian zone. Crossing distance of a street is also reduced with bus bulbs. The use of bus bulbs causes buses to block the curbside travel lane. On the other hand, bus bulbs can reduce the time needed for the bus driver to position the bus correctly, and expedite passenger boarding.

Finding: A lack of parking enforcement disrupts sightlines for motorists and pedestrians

Vehicles, such as this car parked in a no parking area, often disregard parking restrictions.

Parking restrictions are not being fully enforced. Street parking occurred outside designated areas and often too close to intersections, which blocked sightlines for both motorists and pedestrians. Curb extensions help enforce and encourage correct parking by insetting street parking. Curb extensions also improve sightlines, reduce crossing distances for pedestrians, reduce the time motorists are held back at the traffic signal, and provide space for placemaking features.

Finding: Many obstacles exist for people walking, including wide driveway crossings that interrupt the sidewalk, missing curb ramps and lack of buffer from moving vehicles in the street

Photo description (clockwise): Wheelchair bound pedestrian shows some of the areas where travel along the sidewalk are constrained; A pedestrian walking along the sidewalk watches for a motorist pulling into a driveway; Utility poles and signage in the frontage zone although no landscaping exists.

The sidewalks along North King Street have a 'walk-talk' zone of six feet and a 'furniture' zone—the area that houses street furniture, utility poles, street trees, and hydrants— of four feet (as seen in images on right). The sidewalk is "attached" to the street with minimal to no barrier between people walking and moving vehicles; it lacks street trees or other greenery, and benches.

Missing curb ramps, lack of ADA accessible paths, and overly wide driveways create additional barriers for people walking and for people in wheelchairs. Where driveways exist, the sidewalk should be continuous through the driveway, signaling to the motorist that he/she is crossing an area where pedestrians are expected. Raised crosswalks can improve pedestrian access and slow vehicle travel at locations where curb ramps are missing or cannot be feasibly installed, such as at Richard Lane due to the existing bridge abutment.

Finding: The area lacks infrastructure and features that support bicycling.

There are no bicycle lanes, routes, or paths, in the area, and only one bike rack. The outside lanes of North King Street in the study area are as wide as 20 feet, providing ample space for bicycle facilities however, no signage or marking exists to remind motorists that bicycles are permitted to ride in the street. Due to this stretch of N. King Street being within a business district, bicycles are actually prohibited from riding on the sidewalk and are required to ride in the street.

The walking audit suggested a moderate amount of people use bicycles in the area. Bicycle usage would likely increase given additional bicycle infrastructure. TheBus provides bicycle racks on its vehicles, and it's possible that many of those that presently walk to the bus stops on North King Street would choose to bicycle if there were bike lanes, sharrows, or other features that made it safer and more inviting.

Both children (above) and adults (below) were observed riding bikes on the sidewalk due to a lack of bikeways and an apparent uncomfortableness sharing the road with vehicles.

Enhanced bikeway infrastructure such as bike lanes or protected bike lanes should be considered as a part of future improvements along the whole corridor however the constraints of this project area do not lend themselves to spot improvements that aren't connected to existing bike facilities.

Part Three: Recommended Application of Complete Streets Concepts

This section describes the recommended application of Complete Streets concepts for North King Street from Kalihi Street to ʻUmi Street. 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 reinforce the posted and target speed limit of 25 mph
- Address transition from higher speeds to lower speeds
- Create safer and more compact intersections
- Enhance unsignalized marked crossings
- Apply placemaking principles to transit stops
- Celebrate streets as places with streetscaping

COMPLETE STREETS RECOMMENDATIONS

Conceptual Illustrations of Recommendations

The Concept Plan for North King Street presented in Figures 3-5 provides direction for the City in conducting the engineering traffic study and design process to implement these projects and to gain additional buy-in from the community. The drawings depict the recommended improvements along three segments of the road:

- ʻUmi Street to Gulick Avenue (Figure 3)
- Gulick Avenue to Mokauea Street (Figure 4)
- Mokauea Street to Kalihi 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 through 5 are summarized below. The following section describes implementation priorities and timeframes.

A) Improve channelized intersection of North King Street and Kalihi Street to slow motorists turning speeds and improve sightlines.

- Realign marked crossings on the Diamond Head portion of North King Street and mauka (mountain side) along Kalihi Street, matching the desired line of pedestrians, which is the line with the approaching sidewalk and channelized island.
- Reduce the corner radius of the right-turn channelized lane at the intersection of North King Street and Kalihi Street with a curb extension. The corner radius should have a long (150 feet to 300 feet) radius followed by a short radius (20 feet to 50 feet).
- Provide a 55 to 60-degree angle between vehicle flows, which will reduce turning speeds and improves the yielding driver's visibility of pedestrians and vehicles.
- Install raised crosswalk in the right-turn lane about one car length back from where drivers yield to traffic on the other street, allowing the yielding driver to respond to a pedestrian crossing first, independently of a vehicle conflict, and then move forward when no pedestrians are present. A raised crossing is designed to maintain speeds at 15-20 mph 24 hours a day, which is key, especially near a school. Color is often used. Features such as bollards, paver stones, colorized concrete or colorized asphalt are often specified.

B) Consolidate marked unsignalized intersection crossings along North King Street, allowing for sufficient offset from signalized intersection crossings, to improve pedestrian crossing and motorist yielding behavior.

- Install advance stop bars a minimum of 20 feet in advance of all existing unsignalized intersection marked crossings. The setback allows a pedestrian to see if a motorist in the second lane is stopping after a driver in the first lane has stopped. Advance stop bars will improve sight lines improve yielding behavior, and allow pedestrians to cross the street more safely. This low-cost improvement should be made immediately and be integrated into any repaving projects.
- Remove marked crossings at Self Lane, Nāʻōpala Street and Kopke Street and install signage that prohibits crossing at locations that are less than 300 feet from a marked crossing at a signalized intersection. Marked crosswalks should also be located at least 300 feet from marked crossings at signalized intersections to improve motorist-yielding behavior. This recommendation is intended to create safer unsignalized crossings along North King Street by consolidating the number of marked unsignalized crossing locations, and enhancing several key locations.
- Install crosswalk with raised median island at intersection with Harvey Lane.
- Install street lighting at approach to each marked crosswalk. Lighting is important for the comfort and safety of road users. It provides cues to drives to expect pedestrians earlier.

C) Enhance unsignalized intersection crossings at Pūlaʻa Lane/Factory Street and Richard Lane.

- Pūlaʻa Lane/Factory Street is skewed and located on a curve, which increases the total pedestrian crossing distance and makes it difficult for motorists to see pedestrians in the crosswalk.
  - Create pedestrian refuge island in the median to reduce to total pedestrian crossing distance.
  - Add street lighting at the crossing for the comfort and safety of road users.
  - Add landscaping to curb extensions and center medians to "soften" the streetscape and to create a more walkable environment.
  - Install a pedestrian activated beacon to improve pedestrian safety.
  - Realign the marked crossing to improve sightlines.
  - Install curb extensions to shorten pedestrian crossing distances and to inset parking.
  - Paint advanced stop bars a minimum of 20 feet in advance of the marked crosswalk (see Recommendation A).
- Richard Lane
  - Add street lighting at the crossing for the comfort and safety of road users.
  - Realign the marked crossing to reduce the skewed angle and improve sightlines.
  - Paint advanced stop bars a minimum of 20 feet in advance of the marked crosswalk (see Recommendation A).
  - Remove the center-turn lane onto Richard Lane.
  - Install a raised z-crossing island. Inserting a 45-degree bend to the right helps orient pedestrians to the risk they encounter from motorists during the second half of their crossing.
  - Install a curb extension to reduce the right-hand turning radius on Richard lane onto North King Street.
  - Install a curb extension makai (seaside) on North King Street to bring pedestrians out beyond the parked cars and to improve sightlines for both pedestrians and motorists.
  - Install a pedestrian activated rectangular rapid flashing beacon (RRFB).

D) Reduce large corner radii and wide travel lanes to encourage motorists to drive the target and posted speed of 25 mph.

- Install curb extensions to reduce crossing widths, improve sight lines, and calm traffic. When properly implemented, curb extensions:
  - Improve safety for pedestrians and motorists at intersections and mid-block crossings
  - Increase visibility, drawing motorist's attention to people in the crossing
  - Reduce speed of turning vehicles
  - Encourage pedestrians to cross at designated locations
  - Prevent motor vehicles from parking at corners or too close to crossing
  - Decrease motorists' speed throughout the length of the corridor, and
  - Provide better design for ADA treatments
- Narrow inside travel lanes to 10 feet wide and the outside travel lanes to 11 feet wide.

E) Enhance Gulick Avenue and North King Street intersection by creating a more compact intersection, shortening pedestrian crossing distances and time it takes a motorist to travel through the intersection.

- Install curb extensions on makai corners of North King Street and Gulick Avenue to reduce crossing widths, improve sight lines, and calm traffic.
- Colorize the intersection of North King Street and Gulick Avenue to enhance placemaking.

F) Enhance transit stops with bus bulbs and bus shelters.

- Install bus bulbs to enhance the transit stops makai on North King Street at Mokauea Street and ʻUmi Street.
  - The station length should be at least 60' or long enough to accommodate the largest expected transit vehicle.
  - The bus bulb should extend far enough into the street to block the curbside travel lane.
- Install a bus shelter to protect bus passengers from the elements and to provide a more comfortable waiting environment. The shelter design can be context sensitive to match the surrounding land-uses. For example, the roof of the shelter could resemble historic cantilever metal awnings.
- Install a real-time information display to provide transit users with up-to-date route schedule information. Bus stops that serve multiple bus route and have high passenger boardings should provide passengers waiting to board with additional bus stop amenities.

G) Address higher speed to lower speed areas by installing gateway features, treating streets as places.

- Create visual cues to encourage drivers to slow to posted speeds.
  - Install street trees in the furniture zone where there is adequate width (6-8' typical). Street trees may also be considered in curb extensions.
  - Install pavement markings and design features such as narrowed travel lanes, bulb outs, and delineated parking stalls that make the neighborhood feel more enclosed to calm traffic.
- Create gateway features at ʻUmi Street, Richard Lane, and Gulick Avenue, to develop North King Street into a place that honors the community and all users of the street by creating a sense of arrival.

I) Install dedicated bicycle facilities to increase utilization of the area by people on bicycles.

- Install sharrows and bike route signage along North King Street. The Oʻahu Bike Plan proposes bike lanes on North King Street and Gulick Avenue. However, sharrows are recommended in order to retain on-street parking and make the most of the limited right-of-way.
- Install bicycle racks and bike corrals along the street front.

Table 2 Proposed Design Changes to North King Street

	CURRENT	AFTER RECOMMENDATIONS ARE IMPLEMENTED
Type of Facility	North King Street is a minor arterial in the study area, transitioning to a major arterial after Kalihi Street	No change
Street Width	Between Richard Lane and Gulick Avenue: 64'. Between Gulick Avenue and Kāʻili Street: 60'-62' Between Kāʻili Street to Kalihi Street: 52'-53'	Curb extensions and bus bulbs will narrow the street width in some sections
Speed Limit	25 MPH	No Change
Crosswalk Length (longest)	68' at N King St and Pulaa Ln/Factory St	63' at N King St and Umi St
Number of lanes	Between Richard Lane and Gulick Avenue: two WB (one 10', one 12'), three EB (two 10', one 22' with parking lane) Between Gulick Avenue and Kāʻili Street: two WB and two EB (two through and a parking lane) Between Kāʻili Street and Harvey Street: two WB (two through and a parking lane) and two EB Between Harvey Lane and Kalihi Street: two WB and three EB (one Left, one through, one through and right)	Reduce all inside travel lanes and turn lanes to 10 feet; reduce outside travel lanes to 11 feet. Restricted left turn at Richard Ln.
Distance to side streets	On average ~180' blocks, which range between ~300' to ~80'	No change
Driveways	Driveways off North King St provide access to commercial buildings. 9 Makai, 15 mauka	Driveways should be narrowed to improve pedestrian crossings and reduce motorist entry and exit speeds.
Parking	Between Gulick Avenue and Kāʻili Street Makai parking lane – 9 on-street stalls. Between Kāʻili Street and Harvey Lane Mauka parking lane: 5 on-street stalls. Off street parking lot for Long's Drugs Pharmacy	Existing on-street parking will be better organized, managed, and enforced through curb extensions and bulb-outs.
Sidewalks	Sidewalks on North King Street. Many side streets lack sidewalks, except for Gulick Avenue and Mokauea Street	Add curb extensions.
Transit Routes, Stops, Shelters	8 bus stops along North King Street in project area. Several stops on sidestreets	Improve bus shelters, add bus bulbs.
Proximity to future rail	Kalihi Station is less than 0.5 miles from project area, Middle Street Station is about 0.5 miles from Richard Lane	No change
Bicycle features	Oʻahu Bike Plan proposes bike lanes on North King Street and Gulick Avenue	Sharrows due to the limited ROW and desire to retain on-street parking
Nearby Schools	Farrington High School, and Kalihi Kai Elementary	No change
Nearby Institutions	N/A	N/A

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Figure 3 Concepts for North King Street from ‘Umi Street to Richard Lane

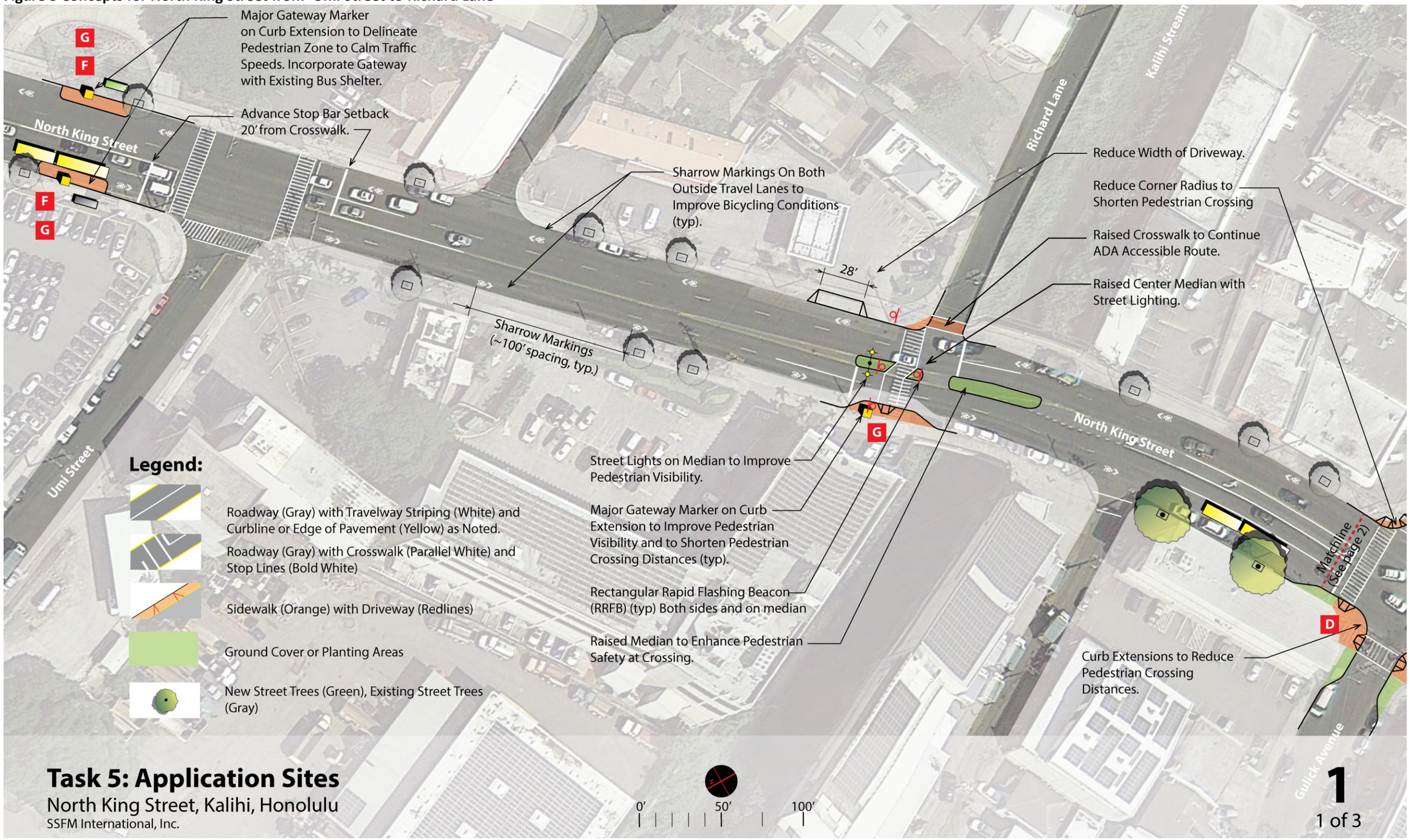

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Figure 4 Concepts for North King Street from Gulick Avenue to Kaili Street

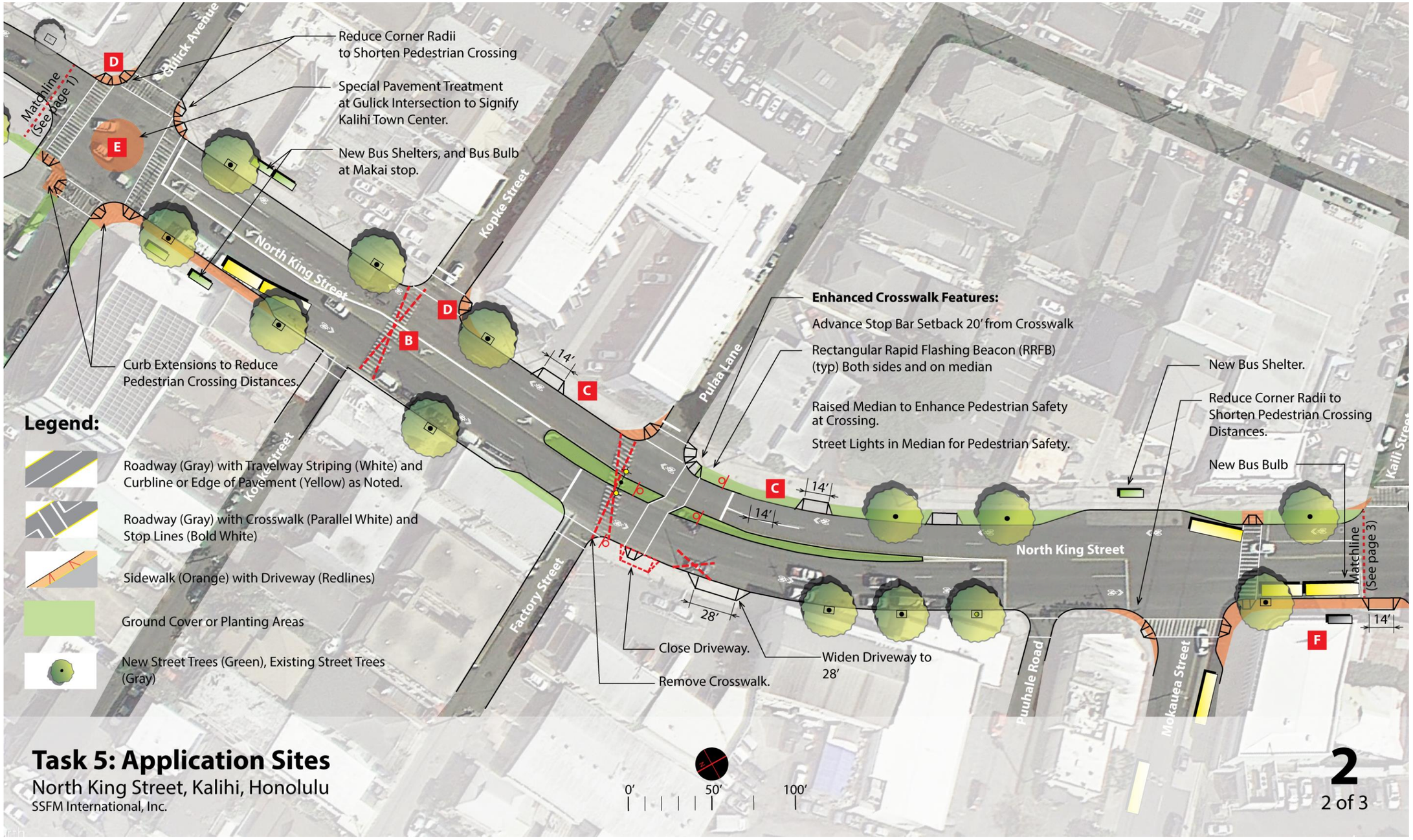

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Figure 5 Concepts for North King Street from Kaili Street to Kalihi Street

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Part Four: Implementation

This section presents a recommended 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 taken within 1 year. Mid-term actions are those that may be taken within 5 year. Longer-term actions are those that may require or warrant a longer planning horizon due to logistical, financial, or other considerations.

Near-Term Actions (Within 1 year):

A) *Improve channelized intersection of North King Street and Kalihi Street to slow motorists turning speeds and improve sightlines.*

- Use paint to demonstrate a corner radius reduction.
- Conduct a detailed study on the impacts of a reconfigured turn lane and island.

B) *Consolidate marked unsignalized intersection crossings along North King Street to improve pedestrian crossing and motorist yielding behavior.*

- Paint advance stop bars at existing mid-block crossings a minimum of 20 feet from the crossing on all of the marked unsignalized intersection crossings.

C) *Enhance unsignalized intersection crossings at Pūlaʻa Lane/Factory Street and Richard Lane.*

- Pūlaʻa Lane/Factory Street: Paint in the median and crossing island, along with curb extensions. Paint advanced stop bars.
- Richard Lane: Realign the Richard Lane marked crossing, reducing the skewed angle. Paint advance stop bars.

D) *Reduce large corner radii and wide travel lanes to encourage motorists to drive the target and posted speed of 25 mph.*

- Use paint to demonstrate a corner radius reduction.

E) *Enhance Gulick Avenue and North King Street intersection by creating a more compact intersection, shortening pedestrian crossing distances and time it takes a motorist to travel through the intersection.*

- Use paint to demonstrate curb extensions.

F) *Enhance transit stops with bus bulbs, giving priority to transit riders.*

- None.

G) *Address higher speed to lower speed areas by installing gateway features, treating streets as places.*

- None.

H) *Install bicycle facilities to increase utilization of the area by people on bicycles.*

- None.

Mid-Term Actions (1 to 5 years):

A) *Improve channelized intersection of North King Street and Kalihi Street to slow motorists turning speeds and improve sightlines.*

- Build a curb extension using concrete or A/C berm and enhance the crossing with a raised table crossing.

B) *Consolidate marked unsignalized intersection crossings along North King Street to improve pedestrian crossing and motorist yielding behavior.*

- Remove marked crossings at Self Lane, Nāʻōpala Street and Kopke Street, filling the curb cuts at Kopke Street.
- At intersection with Harvey Lane, install marked crossing with raised medians and crossing islands using concrete or A/C berm.
- Add street lighting at approach to each marked crosswalk

C) *Enhance unsignalized intersection crossings at Pūlaʻa Lane/Factory Street and Richard Lane.*

- Pūlaʻa Lane/Factory Street: Install raised medians and crossing islands using concrete or A/C berm. Install a pedestrian activated beacon.
- Richard Lane: Install a raised z-crossing island using concrete or A/C berm, removing the left-turn onto Richard Lane. Reduce the right-hand turning radius on Richard lane onto King Street with a curb extension using concrete or A/C berm. Install a curb extension using concrete or A/C berm on the makai side of crosswalk. Install a pedestrian activated RRFB.
- Add street lighting at approach to each marked crosswalk.

D) *Reduce large corner radii and wide travel lanes to encourage motorists to drive the target and posted speed of 25 mph.*

- Narrow inside travel lanes to 10 feet wide and the outside travel lanes to 11 feet wide.
- Install curb extensions using concrete or A/C berm throughout the Study Area.

E) *Enhance Gulick Avenue and North King Street intersection by creating a more compact intersection, shortening pedestrian crossing distances and time it takes a motorist to travel through the intersection.*

- Install curb extensions using concrete or A/C berm on makai corner of North King Street and Gulick Avenue.

F) *Enhance transit stops with bus bulbs, giving priority to transit riders.*

- None.

G) *Address higher speed to lower speed areas by installing gateway features, treating streets as places.*

- Create gateway features at ʻUmi Street, Richard Lane, and Gulick Avenue.
- Plant street trees along North King Street Corridor.

H) *Install bicycle facilities to increase utilization of the area by people on bicycles.*

- Add sharrows and Bike Route signage along North King Street. Install bicycle racks and bicycle corrals.

Longer-Term Actions (5 Years and Beyond):

A) *Improve channelized intersection of North King Street and Kalihi Street to slow motorists turning speeds and improve sightlines.*

- Realign marked crossings on the Diamond Head portion of North King Street and mauka (mountain side) along Kalihi Street

B) *Consolidate marked unsignalized intersection crossings along North King Street to improve pedestrian crossing and motorist yielding behavior.*

- None.

C) *Enhance unsignalized intersection crossings at Pūlaʻa Lane/Factory Street and Richard Lane.*

- Pūlaʻa Lane/Factory Street: Install concrete raised medians and crossing islands.
- Richard Lane: Install a concrete raised z-crossing island. Reduce the right-hand turning radius on Richard lane onto King Street with a concrete curb extension. Install a concrete curb extension on the makai side of crosswalk.

D) *Reduce large corner radii and wide travel lanes to encourage motorists to drive the target and posted speed of 25 mph.*

- Install concrete curb extensions throughout the Study Area.

E) *Enhance Gulick Avenue and North King Street intersection by creating a more compact intersection, shortening pedestrian crossing distances and time it takes a motorist to travel through the intersection.*

- Install concrete curb extensions on makai corner of North King Street and Gulick Avenue.
- Paint the center of the intersection at North King Street and Gulick Avenue, transforming the space into a place that honors the people and neighborhood as a community destination.

F) *Enhance transit stops with bus bulbs, giving priority to transit riders.*

- Install bus bulbs to enhance the transit stops makai on North King Street at Mokauea Street and ʻUmi Street.

G) *Address higher speed to lower speed areas by installing gateway features, treating streets as places.*

- None.

H) *Install bicycle facilities to increase utilization of the area by people on bicycles.*

- None.

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Part Five: Cost Sheet

ITEM	*UNIT*	*QUANTITY*	*UNIT COST*	*TOTAL COST*
Removals/Demo				
Demolish existing sidewalk	Sq. Ft.	1697	$ 5.00	$ 8,485.00
Demolish existing Pavement	Sq. Ft.	14101	$ 8.00	$ 112,808.00
Erosion Control	L.S.	1	$ 10,000.00	$ 10,000.00
Site improvements				
Roadway				
Mill and Overlay existing AC pavement	Sq. Ft.	133295	$ 6.00	$ 799,770.00
Curb Gutter and Sidewalk	Sq. Ft.	7413	$ 20.00	$ 148,260.00
Drainage works	each	5	$ 7,000.00	$ 35,000.00
Raised Median	Sq. Ft.	3140	$ 20.00	$ 62,800.00
Rectangular Rapid Flashing Beacon	each	4	$ 15,000.00	$ 60,000.00
Power Supply	each	1	$ 50,000.00	$ 50,000.00
Ducting	Lin. Ft.	450	$ 70.00	$ 31,500.00
4" Stripe (white/Yellow)	Lin. Ft.	10000	$ 6.00	$ 60,000.00
12"stripe (white)	Lin. Ft.	2145	$ 9.00	$ 19,305.00
Striping Symbols	each	61	$ 300.00	$ 18,300.00
Intersection				
Traffic Signal Modification	each	2	$ 350,000.00	$ 700,000.00
Street lights	each	2	$ 15,000.00	$ 30,000.00
Landscaping				
Trees	each	22	$ 1,000.00	$ 22,000.00
Boulevard Landscape	Sq. Ft.	5490	$ 10.00	$ 54,900.00
Misc.				
Traffic Control	L.S.	1	5%	$ 111,156.40
Mobilization	L.S.	1	10%	$ 222,312.80
Contingency - 25%			25%	$ 555,782.00
Design				
Design Cost			6%	$ 186,742.75
TOTAL CONSTRUCTION				**$ 3,112,379.20**
TOTAL COST				**$ 3,299,121.95**