ALA WAI ALTERNATIVES ANALYSIS

APPENDIX H:

MULTIMODAL TRANSPORTATION ASSESSMENT

CITY AND COUNTY OF HONOLULU · STATE OF HAWAII

Honolulu COMPLETESTREETS

ALA PONO
an Ala Wai crossing

MEMORANDUM

To: Dr. Nicola Szibbo, Ph.D, Department of Transportation Services, City and County of Honolulu

From: Drusilla van Hengel and Lauren Squires, Nelson\Nygaard

Date: June 19, 2019

Subject: Ala Wai Alternatives Analysis Draft Multimodal Transportation Assessment Report

BACKGROUND

The purpose of the Ala Wai Crossing Alternatives Analysis or Ala Pono is to identify, develop, and evaluate alternatives for additional access across the Ala Wai Canal between Ala Moana Boulevard and the Manoa/Palolo Stream and select the least environmentally damaging practicable alternative (LEDPA). Ala Pono assessed options for new active transportation infrastructure, including a pedestrian and bicycle bridge, over the Ala Wai Canal that will provide an additional connection between the Waikīkī, and McCully/Mōʻiliʻili neighborhoods. Crossing alternatives were assessed using several technical analysis to evaluate which alternative best meets the purpose and need of the project.

This memo documents the related Multimodal Transportation Assessment, conducted in accordance with methodology established as a part of the Complete Streets program. The multimodal assessment describes the quality of service for people driving, walking, and bicycling across intersections or along roadway segments of the project alternatives. The multimodal transportation assessment includes the following:

1. A **Multimodal Level of Service Analysis** determines the level and quality of service by mode, for people walking, using bicycles, and driving automobiles.
2. The **Parking Assessment** inventories parking supply and documents existing utilization in the areas surrounding new crossing alternatives
3. The **Traffic Safety Assessment** includes hot spot analyses along key walking and bicycling routes within the project area to evaluate which crossing alternative provides the safest crossing for people walking and bicycling using vehicle-, pedestrian- and bicycle-involved collision data for from the State of Hawaii Department of Health.
4. The **Evacuation Modelling and Public Safety Analysis** evaluates walking travel times out of Waikīkī for people evacuating on-foot during emergency situations, such as tsunamis, hurricanes, and other emergency events. Sea Level Rise (SLR), climate change, and resilience issues are taken into consideration in the evacuation modeling.

Purpose and Need

The primary goals of Ala Pono are to improve multimodal network connectivity and enhance public safety for people walking and bicycling. The secondary goals are to ensure comfortable, sustainable mobility options that enhance economic vitality, environmental health, and social equity. These goals served as the basis for the evaluation of crossing alternatives. Metrics were selected for each project goal to support data-driven analysis of the alternatives' performance.

The full set of ten project goals are listed below:

- **Complete Streets Connectivity:** The project must fulfill the need for expanded connectivity for people walking and bicycling between key destinations in the study area.
- **Travel Time and Convenience:** The project must improve travel times and convenience for people crossing the Ala Wai Canal by bike and foot.
- **Sustainable Mobility and Public Health:** The project must encourage the use of sustainable and active transportation modes in order to improve environmental and public health conditions in the study area.
- **Safety from Traffic:** The project must reduce the exposure of people walking and bicycling to high-crash locations and provide a low-crash link across the canal improving public safety for all and reducing the number of crashes in the study area.
- **Public Process Input:** The project must align with the preferences of the community as expressed throughout the public process associated with the project.
- **Vibrant Canal:** The project must bolster the economic vitality of the study area by creating a landmark character, bolstering public life and commercial activity in the area.
- **Affordable Access:** The project must serve the elderly, young and low-income populations of Honolulu to provide lower cost transportation options for the people who need affordable alternatives the most and are most likely to walk or bike.
- **Non-Motorized Emergency Evacuation and Public Safety:** The project must enhance tsunami evacuation by foot or bicycle and create more foot traffic in the study area to enhance public safety through consistent on-street activity.
- **Implementation:** The project must be implementable with an achievable capital and operational cost as well as a reasonable design and construction time.
- **Potential Environmental Impacts:** The project must avoid and/or mitigate any potential environmental impacts including direct impacts to parks, residences, business properties, and other environmental, cultural, and historic resources.

The analyses detailed in this memo informed evaluation of alternatives in relation to the following project goals: Safety from Traffic, Complete Streets Connectivity, Sustainable Mobility and Public Health, and Non-Motorized Emergency Evacuation and Public Safety.

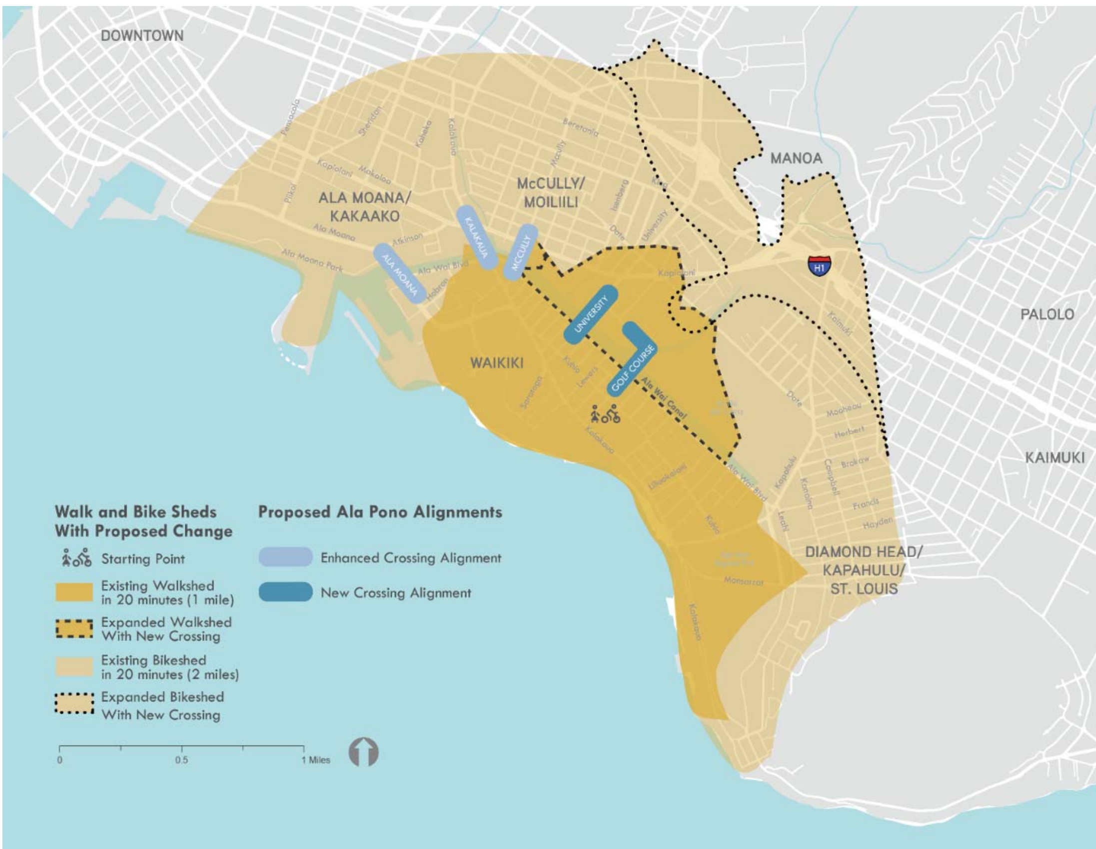
Agency Context

The City and County of Honolulu Department of Transportation Services (DTS) is leading the Ala Wai Crossing Alternatives Analysis or Ala Pono, in cooperation with the Oahu Metropolitan Planning Organization (OahuMPO). For this assessment, the Honolulu Department of Emergency Management provided guidance on evacuation routing. The Hawaii Department of Health provided motor vehicle crash data, as recorded by the Honolulu Police Department.

Study Area

A new or enhanced Ala Wai Canal crossing can provide additional walking and bicycling connectivity between the Waikīkī, Ala Moana, and McCully/Mō'ili'ili neighborhoods. The project area is therefore defined as the walk and bike sheds, or the areas within an easy twenty-minute walk or bike ride of central Waikīkī. The project team evaluated five alignments for improved canal crossings: three are improvements to existing bridges, and two are new bridges crossing the canal (Figure 1).

Figure 1 Ala Pono Study Area



EXECUTIVE SUMMARY

The Multimodal Transportation Assessment includes findings from the Multimodal Level of Service Analysis, Parking Assessment, Collision Analysis and Evacuation Modeling and Public Safety Analysis.

The Multimodal Level of Service analysis shows that a high quality user experience can be expected both with changes to existing bridges and a new crossing. Because on-street parking demand already exceeds capacity, the Parking Assessment determined that it is unlikely that any alternative would generate a significant or perceivable difference to parking demand. In contrast, a new pedestrian and bicycle bridge at University Avenue ranked as the highest-scoring alternative in both the Collision Analysis and Evacuation Modeling and Public Safety Analysis.

The findings detailed in this memo should be considered within the larger context of the comprehensive evaluation of all project alternatives that included twenty-four metrics and data-driven analyses aligned with the project's goals. Key findings of the Multimodal Transportation Assessment are as follows:

Multimodal Level of Service (MMLOS)

The Multimodal Level of Service section of this report illustrates that all alternatives assessed will create high quality walking and bicycling conditions. For existing bridges, improvements at Ala Moana and Kalakaua would provide a greater degree of improvement for people walking and bicycling than at McCully. Due to the on-street methodology employed, the nuance that a new bridge crossing would provide an even higher highest quality experience because of the absence of vehicle traffic is not perceptible.

MMLOS methodology does not show a change in conditions for people driving cars in any alternative. It also does not account for other improved conditions for people walking and bicycling such as travel time and convenience, connections to Complete Streets network, and expansion in the number of people who could conveniently walk and bike to Waikiki by creating a new connection where there currently isn't one.

Parking

The Parking Assessment section describes how utilization of on-street parking within the study area already exceeds the City's target, with many streets experiencing a rate higher than 85% while off-street facilities are under-utilized at 70%. This usage pattern leaves people with an impression that parking is scarce in the area. Understandably, community members express frustration and concern about the impact of a new crossing on people looking for residential, Waikiki bound, and park-access parking.

Given this condition, a new Ala Pono crossing is unlikely to make a perceptible difference to nearby on-street parking demand. Any increase in demand for parking as a result of a new crossing is likely to be observed in off-street parking facilities, such as the Ala Wai Neighborhood Parking lot. Some of the pedestrian and bicycle activity across a new crossing will be the result of mode shift out of cars, but this is also unlikely to prompt significant changes in local parking demand.

Parking management strategies should be further studied as a separate and immediate effort to improve management of existing parking resources. A sample of parking management strategies is included.

Collision Analysis

The Collision Analysis section shows where crashes in the study area occurred between 2014 and 2018. Thirty of the 86 collisions near the five Ala Pono alternatives segments involved people walking or biking. Collisions are more common on the mauka side of the canal, with Kalakaua Avenue experiencing 30 collisions overall, and 12 pedestrian or bicycle involved collisions. Despite bike lanes on the McCully Street bridge, it has experienced 10 collisions involving pedestrians or cyclists in the past 5 years. The proposed University Avenue alignment is the lowest-crash link across the canal, with only two collisions in the past five years.

Evacuation Modeling and Public Safety

The Evacuation Modeling and Public Safety Analysis section describes how new canal crossings will provide a more direct route with quicker travel times for people walking and bicycling to reach the nearest Tsunami Evacuation Safe Zone. A new pedestrian and bicycle bridge at University Avenue provides the greatest evacuation benefit for the most people as it offers a 15-minute travel time reduction for approximately 18,300 people evacuating Waikīkī to a Tsunami Evacuation Safe Zone. This crossing would be the shortest path out of Waikīkī in the event of an emergency for one third of Waikīkī residents and 70% of employees based in Waikīkī.

Conclusion

The conclusion summarizes the information above and offers additional design considerations to improve multimodal transportation and safety.

MULTIMODAL TRANSPORTATION ASSESSMENT

The Multimodal Transportation Assessment for this project consists of several parts.

First, the City and County of Honolulu's multimodal level of service (MMLOS) methodology established as a part of the Complete Streets program is used to assess baseline and proposed future user experience for people walking, bicycling and driving. The assessment compares existing conditions with future expected user experiences among the project alternatives. This methodology highlights which project alternatives achieve Complete Streets goals related to the highest quality user experience for people walking and bicycling.

Parking, Collision, and Evacuation Modeling and Public Safety analyses supplement the MMLOS analysis.

Multimodal Level of Service (MMLOS) Methodology

Modal performance for walking and bicycling are determined by using the Pedestrian Environmental Quality Index and Level of Traffic Stress methods that estimate how safe and comfortable people will feel based on different street design conditions, motor vehicle traffic qualities, and separation from traffic. These tools highlight how specific street improvements can improve level-of-service by mode and meet the goals of the City of Honolulu Complete Streets Policy. Output scores from both methods are adjusted using a uniform multimodal score of one (1) as the best experience and four (4) as the worst. Baseline assessments utilize current designs on the existing bridges. Future assessments assume the highest level of separation is achieved via a protected bike lane or cantilevered path.

Baseline conditions for people who might want to cross at University Street and near Ala Wai Golf Course can be measured either as a weakest link assessment of the alternative routing required to cross currently, or not applicable. For the purpose of evaluating the bridges themselves, the baseline analysis is considered as not applicable; however, a weakest link assessment is included in the Appendix. For the future conditions, although the Complete Streets methods do not strictly apply to paths, it was assumed that community input would influence bridge design, with separation for people walking and bicycling on a bridge 20' in width or more. A rating of one (1), the highest quality experience is predicted.

Vehicular LOS is calculated for street segments based on the HCM 2010 Generalized Daily Service Volumes for Urban Street Facilities. This approach provides a high-level scoring of auto conditions based on roadway capacity across multiple segments. Vehicular LOS is determined based on vehicular volumes and number of lanes. A Level of Service C receives a uniform multimodal score of one (1) representing a high quality experience and a calculated score of F is translated to a four (4), at a Level of Service F or lower.

The MMLOS evaluation for the Ala Wai Crossing Alternatives Analysis did not focus on transit level-of-service (using Transit Capacity Quality of Service Method) due to the types of improvements evaluated. Transit assessments take into account a range of factors that include bus frequency, transit priority features, and the relative speed of transit vehicles to auto traffic. The alternatives evaluated did not propose transit route realignments or transit priority features as part of this project thus existing conditions and level-of-service for transit would not change as a result of any of the project alternatives.

A detailed explanation of the methodology and results for both bridge crossings and weakest link studies of the street approaches for all existing and proposed crossings is provided in Appendix A.

Multimodal Level of Service (MMLOS) Results

Existing crossing experiences are described in Figure 2, for people walking and bicycling. Table 1 describes the existing and proposed future level of service for walking, bicycling, and driving.

Figure 2 Multimodal Transportation Assessment: Existing Canal Crossings

Table 1 Existing and Proposed Alternative Multimodal Level of Service on Bridge Segments

Alternative	Vehicle		Bicycle		Pedestrian	
	Existing	Proposed	Existing	Proposed	Existing	Proposed
Ala Moana Blvd.	4	4	2	1	4	1
Kalakaua Ave.	4	4	4	1	2	1
McCully St.	4	4	2/3	1	2/3	1
University Crossing	NA	NA	NA	1	NA	1
Golf Course Crossing	NA	NA	NA	1	NA	1

Ala Moana Boulevard Crossing

Improvements to this existing structure could range from structural solutions such as the cantilevering of additional walking and bicycling space off the existing bridge to the reallocation of existing curb-to-curb space to provide expanded and separated and expanded surfaces for walking and bicycling. The segment of Ala Moana Boulevard evaluated extends from Atkinson Drive to Holomoana Street.

Pedestrian Environmental Quality Index

The Ala Moana Boulevard crossing includes sidewalks for pedestrians in both directions to connect major shopping destinations in Waikīkī and Ala Moana Center. Based on existing conditions for pedestrians that include wide sidewalks not buffered from vehicular traffic, both sides of the Ala Moana Boulevard bridge crossing receive a PEQI score of 2 indicating that a basic level of pedestrian amenities exist.

Bicycle Level of Traffic Stress

The Ala Moana Boulevard crossing as currently designed accommodates three lanes of traffic in each direction with a concrete median barrier. The lack of bicycle infrastructure on the highly trafficked boulevard contributes to a score of LTS 4. LTS 4 is the highest level of traffic stress for people bicycling. Only the most experienced bicyclists are expected to be comfortable riding on this type of roadway.

Vehicular LOS

The current Ala Moana Boulevard crossing is composed of three lanes in each direction as part of a six-lane road. As of September 2018, 24-hour count data showed 73,000 vehicle trips in this road segment. This high volume of trips results in a LOS F or a score of 4 which translates to jammed conditions with back-ups occurring regularly. Proposed improvements for people walking and bicycling forecasts 250 daily trips would shift from vehicles to walking or bicycling trips. However, this shift in mode choice would not meaningfully affect the conditions drivers experience currently. Improvements that reduce lanes on the bridge crossing to less than a six-lane road results in a LOS F and score of 4 for vehicle operations, in large part because there is no lower score.

Kalakaua Avenue Crossing

This alternative explores whether specific improvements to the existing crossing of the Ala Wai Canal at Kalakaua Avenue are feasible, avoid environmental impacts, and meet the project's purpose and need. The improvements to this existing structure could range from structural solutions such as the cantilevering of additional walking and bicycling space off the existing bridge to the reallocation of existing curb-to-curb, widening the existing sidewalks for expanded and separated walking and bicycling space. The segment of Kalakaua Avenue evaluated extends from Kapiolani Boulevard to Ala Wai Boulevard.

Pedestrian Environmental Quality Index

The Kalakaua Avenue bridge crossing includes sidewalks for pedestrians in both directions to connect major destinations in Waikīkī and the Hawai'i Convention Center. Based on existing conditions for people walking that include wide sidewalks not buffered from vehicular traffic, both sides of the Kalakaua Avenue crossing receive a PEQI score of 2. This means that a basic level of pedestrian amenities exist.

Bicycle Level of Traffic Stress

The Kalakaua Avenue crossing is comprised of three lanes of traffic in each direction with high traffic volumes throughout the day. There are no bicycle lanes or other forms of bicycling infrastructure on this segment of Kalakaua Avenue, which results in a score of LTS 4. LTS 4 is the highest score, which discourage all but the most experienced riders from bicycling the corridor.

Vehicular LOS

The current Kalakaua Avenue crossing is composed of three lanes in each direction as part of a six-lane road. As of September 2018, 24-hour count data showed 71,000 vehicle trips in this segment. This high volume of trips results in a LOS F or a score of 4 which translates to jammed conditions with back-ups occurring regularly. Proposed improvements for people walking and bicycling forecast 350 daily trips would shift from vehicles to walking or bicycling trips. However, this shift in mode choice would not meaningfully affect the conditions drivers experience currently. Improvements that reduce lanes on the bridge crossing to less than a six-lane road results in LOS F and score of 4 for vehicle operations.

McCully Street Crossing

This alternative explores whether specific improvements to the existing crossing of the Ala Wai Canal at McCully Street are feasible, avoid environmental impacts, and meet the project's purpose and need. The improvements range from structural solutions such as the cantilevering of additional walking and bicycling space off the existing bridge to the reallocation of existing curb-to-curb lane assignments, for separated and expanded walking and bicycling space. The segment of McCully Street evaluated extends from Kapiolani Boulevard to Ala Wai Boulevard.

Pedestrian Environmental Quality Index

The McCully Street crossing includes sidewalks for pedestrians in both directions to connect major destinations in Waikīkī and the McCully – Mōʻiliʻili neighborhood. Based on existing conditions for people walking that include sidewalks not buffered from vehicular traffic, both sides of the McCully Street bridge crossing receive a PEQI score of 2. This means that a basic level of pedestrian amenities exist.

Bicycle Level of Traffic Stress

The McCully Street crossing is comprised of two vehicle lanes in the makai direction and three vehicle lanes in the mauka direction with a center turn lane. Painted bicycle lanes in both directions provide some space for bicyclists, but the placement of the bicycle lane in the mauka direction results in a higher stress level for people bicycling. The score in the makai direction is LTS 2 and the score in the mauka direction is LTS 3.

Vehicular LOS

The current McCully Street crossing is a six-lane road comprised of three lanes in mauka direction and two lanes in the makai direction with a center turn lane. As of September 2018, 24-hour count data showed 71,000 vehicle trips in this road segment. This high volume of trips results in a LOS F or a score of 4 which translates to jammed conditions with back-ups occurring regularly. Proposed improvements for people walking and bicycling forecast 250 daily trips would shift from vehicles to active transportation modes. However, this shift in mode choice would not meaningfully affect the conditions vehicles experience currently. Improvements that reduce lanes on the bridge crossing to less than a six-lane road results in LOS F and score of 4 for vehicle operations.

New Crossing Alternatives

University Street

Currently, the nearest existing canal crossing for people walking and bicycling in the vicinity of University Street is the existing McCully Street crossing. This alternative at University currently requires people walking and bicycling to travel on the Ala Wai Park Trail and connect to McCully Street bike lanes or sidewalk. The Appendix shows the weakest link analysis for this location.

In order to directly compare the bridges themselves, the MMLOS determination for the baseline condition is “not applicable.”

An alternative that provides a direct connection with no exposure to vehicle traffic is more like a path, which creates an exceptional walking and bicycling experience by having sufficient width and separated users. Based on community input for design features, this alternative receives a uniform multimodal score of one (1), highest quality. An evaluation of vehicle level of service at this location is not applicable in baseline or future conditions.

Ala Wai Golf Course

Currently, the nearest existing canal crossing for people walking and bicycling in the vicinity of the Ala Wai Golf Course is Kapahulu Avenue. This alternative at the Golf Course requires people walking and bicycling to travel on Kapahulu Avenue to access destinations in Waikīkī. The Appendix shows the weakest link analysis for this location.

In order to directly compare the bridges themselves, the MMLOS determination for the baseline condition is “not applicable.”

An alternative that provides a direct connection with no exposure to vehicle traffic is more like a path, which creates an exceptional walking and bicycling experience by having sufficient width and separated users. Based on community input for design features, this alternative receives a uniform multimodal score of one (1), highest quality. An evaluation of vehicle level of service at this location is not applicable in baseline or future conditions.

Conclusion

For each of the Ala Pono crossing alternatives, the MMLOS methods show that future facilities for people walking and bicycling can result in a safe and comfortable connection by increasing separation from traffic.

Other considerations

It is important to note that this particular methodology is insensitive to the possibility that a walking and bicycling experience completely isolated from vehicle traffic could be an even more pleasant experience. It is also insensitive to whether a poor quality vehicle experience, with a rating of (4) would be even worse if a travel lane were removed to achieve that separation.

The multimodal transportation assessment of each alternative was one metric among a suite of metrics used to evaluate crossing alternatives. While evaluating degree of negative impact or benefit to people driving, walking, or bicycling informed the scoring of alternatives, other factors in the comprehensive evaluation of crossing alternatives such as travel time reduction, network connectivity, walk/bike shed expansion, a placemaking experience, and public input bore more weight in determining the highest-scoring alternative.

Future analyses, during bridge design, should incorporate the Complete Streets design work currently underway on Ala Wai Boulevard and University Street. Furthermore, in order to maintain ADA accessibility, the bridge would likely need to run ewa and toward Diamond Head to get to the makai street level. This would increase activity across Ala Wai Boulevard at Olohana and Launiu. Therefore crosswalk assessments and intersection level of service calculations will be needed to select the appropriate crossing treatments.

PARKING ASSESSMENT

While Ala Pono is intended to be for people walking and bicycling, its placemaking features and linkage to City parks and Waikiki require consideration of area parking. Furthermore, if roadway reconfiguration is required to meet other design objectives, there may be changes to local parking supply, especially on-street.

The parking analysis focuses on evaluating the availability of parking in the study area. It uses parking supply and occupancy data to define the parking ratio. Citywide, the goal for utilization is 85%, with adoption of parking management strategies to support this level of utilization and turnover in high demand locations with lower and medium demand locations supporting longer term and lower cost parking. This parking assessment informs potential parking management strategies that could be explored through a separate initiative.

Parking Assessment Methodology

Parking supply was inventoried for on- and off-street parking around the proposed enhanced and new-build alignments, as shown in Figure 3. Included in this inventory is parking restrictions and pricing.

Parking occupancy data was collected on three dates to capture a typical weekday, and weekend date at three time points: 5:30 AM, 12:00 PM, and 7:00 PM. Occupancy data focuses on areas around the new-build alternative alignments, as this is the only alternative with potential to impact parking behavior. Private parking facilities not accessible for occupancy counts are removed from the maps.

Parking Supply Findings

The parking supply on both sides of the canal is a mix of public and private spaces.

Mauka of the canal, 515 on street parking spaces are available free of charge and without restriction. There are 887 off-street public spaces in lots and more than 1,700 privately controlled spaces in residential towers and schools.

On the Makai side, the majority of the 744 on-street spaces are free and provided on minor roadways. Two hour metered parking between the hours of 6 AM and 10PM is applicable to 30% of these spaces. Free parking is provided along Ala Wai Boulevard with tow-away zones in effect on Mondays and Fridays during the hours of 8:30 AM and 11:30 AM. There are 1,740 off-street parking spaces available in public facilities plus additional uncounted off-street parking in private facilities, including residential towers and hotels. Hourly parking fees in the lots surveyed range from $4 to $7 during daytime hours. Evening flat rates are provided at three of the off-street parking lots with a starting rate of $7. Overnight parking is provided at only two of the parking lots, ranging from $24 to $34 in price.

Parking Utilization Findings

On-street parking utilization exceeds 80% within the study area and many streets on both sides of the canal see a utilization in excess of 85% throughout the day. Metered block segments experience rates of less than 85%. Off-street public parking is generally at 70% utilization, with the exception of special events. Calculated utilization rates are demonstrated in Figure 4 through Figure 9. Each time point provides a snapshot of parking demand driven predominantly by a particular user group: residents parking overnight at 5:30 AM, people working nearby at 12:00 PM, and people out for evening recreation at 7:00 PM.

Under-enforcement of the study area results in parked vehicles in on-street areas signed “ho parking” or parked within the restricted areas by driveways and crosswalks during the morning and evening periods.

Conclusion

The utilization of on-street parking within the study area already exceeds the City’s target, with many streets experiencing a rate higher than 85% while off-street facilities are under-utilized at 70%. This usage pattern leaves people with an impression that parking is scarce in the area. Understandably, community members express frustration and concern about the impact of a new crossing on people looking for residential, Waikiki bound, and park-access parking.

Other Considerations

Given this condition, a new Ala Pono crossing is unlikely to make a perceptible difference to nearby on-street parking demand. Any increase in demand for parking as a result of a new crossing is likely to be observed in off-street parking facilities, such as the Ala Wai Neighborhood Parking lot. Some of the pedestrian and bicycle activity across a new crossing will be the result of mode shift out of cars, but this is also unlikely to prompt significant changes in local parking demand.

Parking management strategies should be further studied as a separate and immediate effort to improve management of existing parking resources. A sample of parking management strategies that could be applied for improved turnover or resident access include:

- Pricing existing parking supply
- Resident Parking Permit program
- Shared-Parking agreements with private lot operators
- Transportation Demand Management services and infrastructure
- Enhanced communication about parking availability
- Shuttle services to the bridge head from remote parking
- Wayfinding, signage, and information improvements

Figure 3 Parking Inventory Map

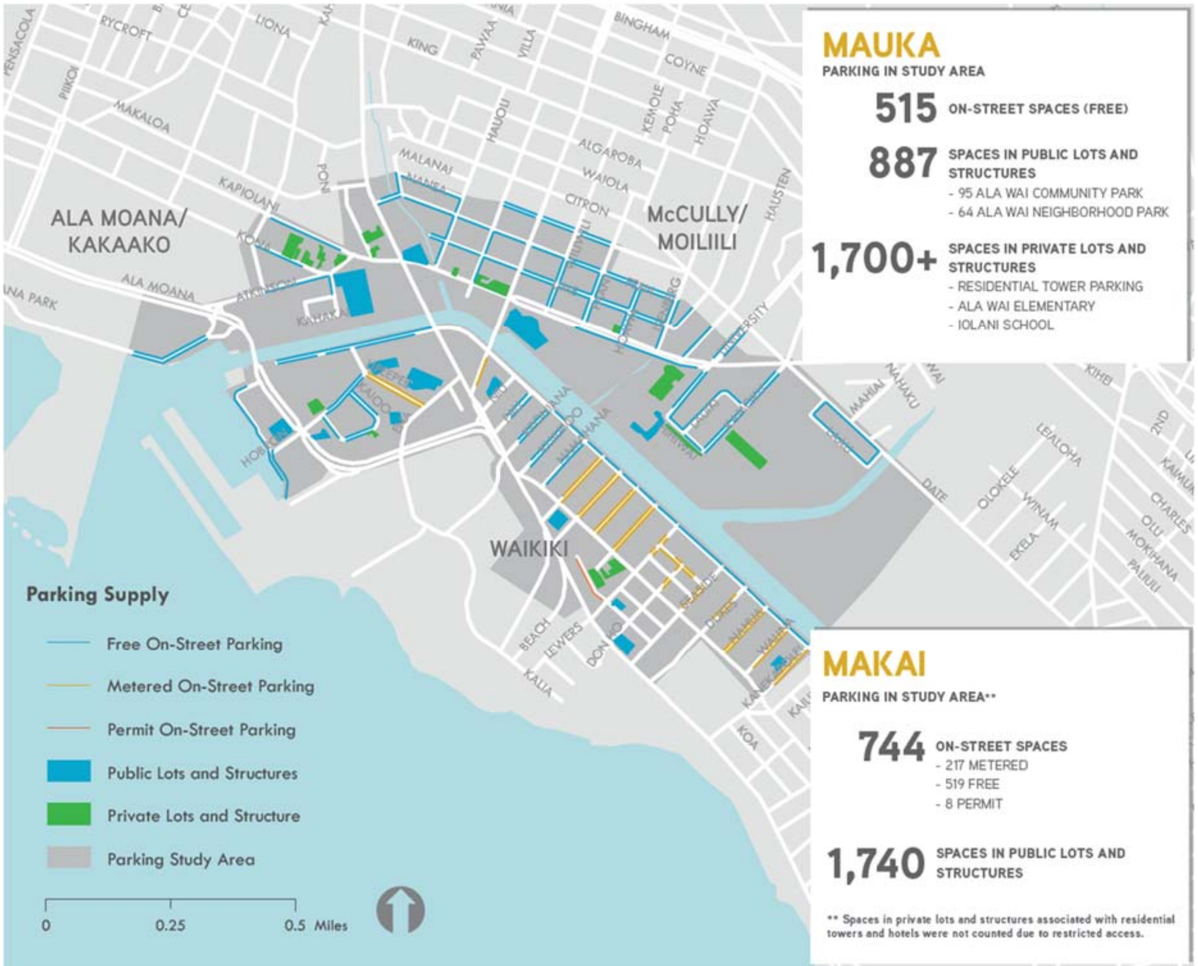


Figure 4 Parking Utilization Map, Weekday 5:30 AM

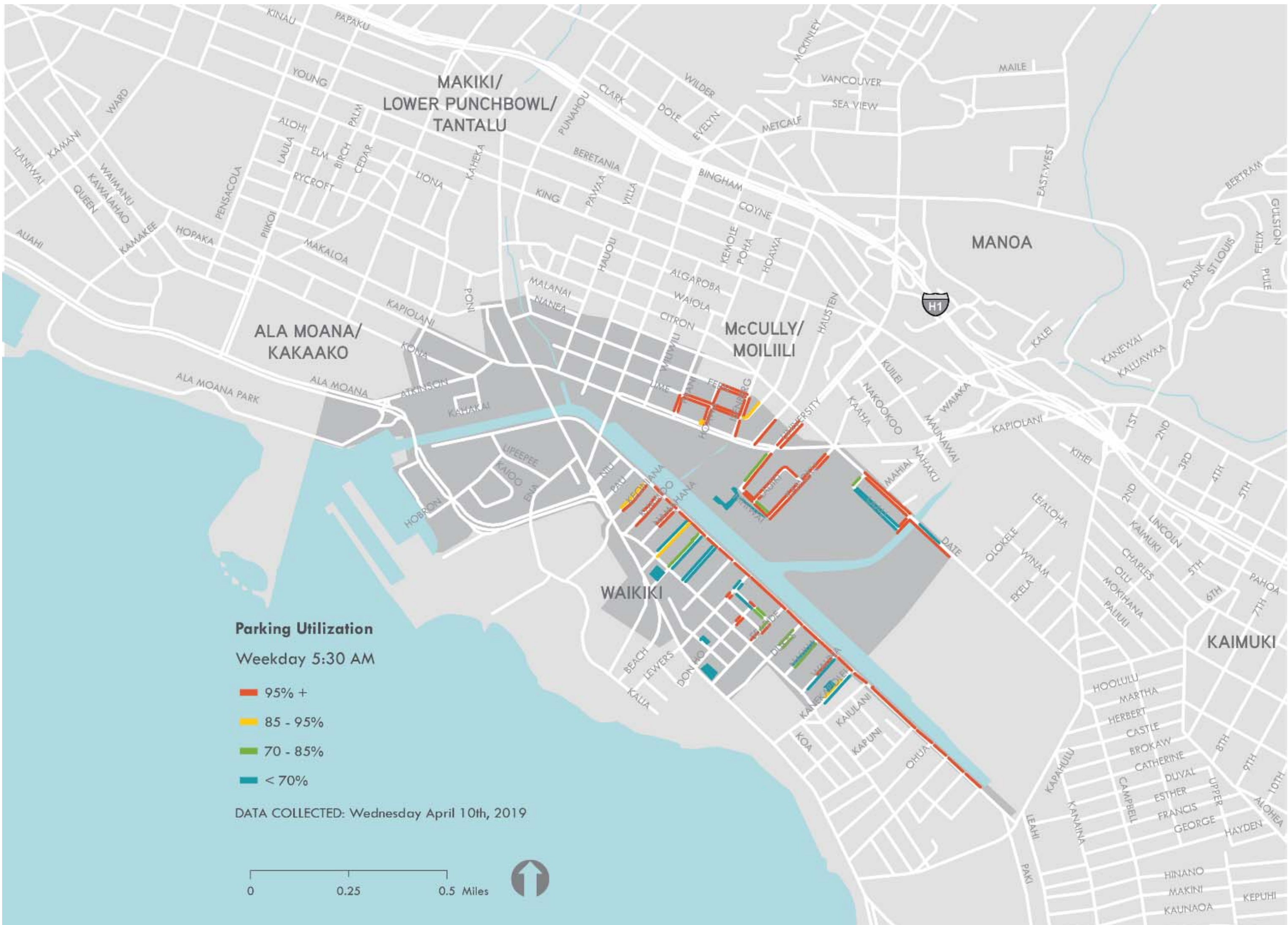


Figure 5 Parking Utilization Map, Weekday 12:00 PM

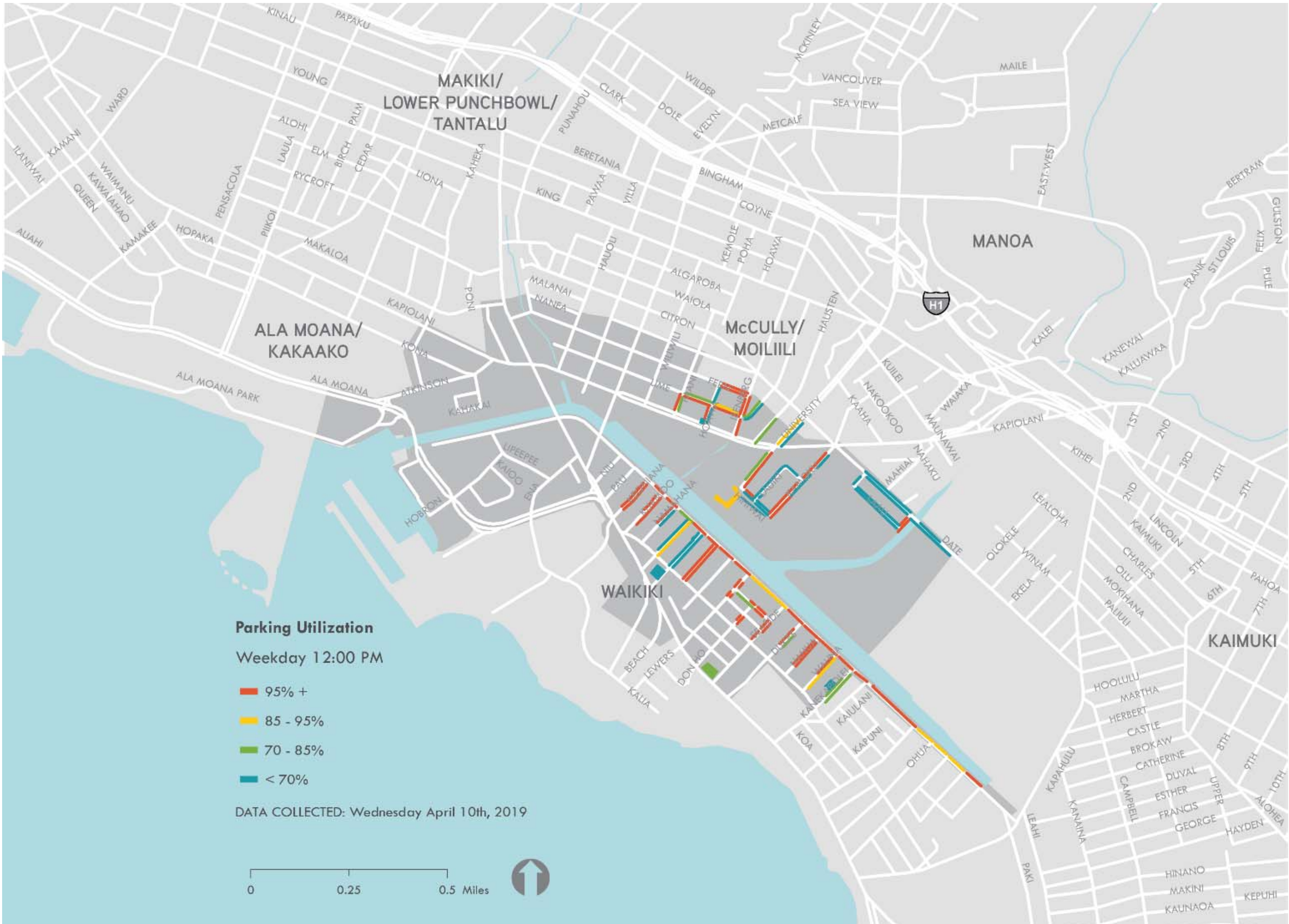


Figure 6 Parking Utilization Map, Weekday 7:00 PM

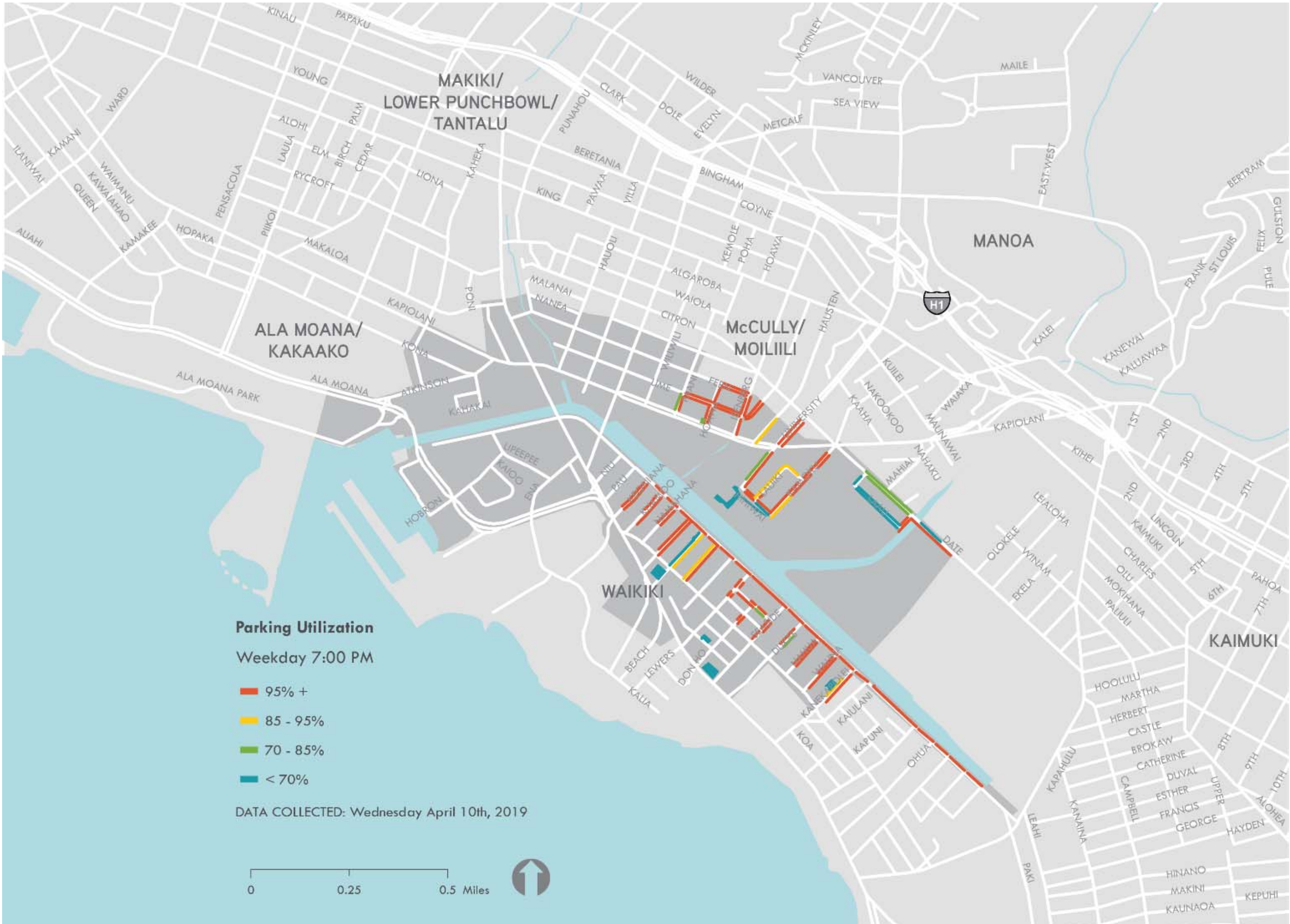


Figure 7 Parking Utilization Map, Saturday 5:30 AM

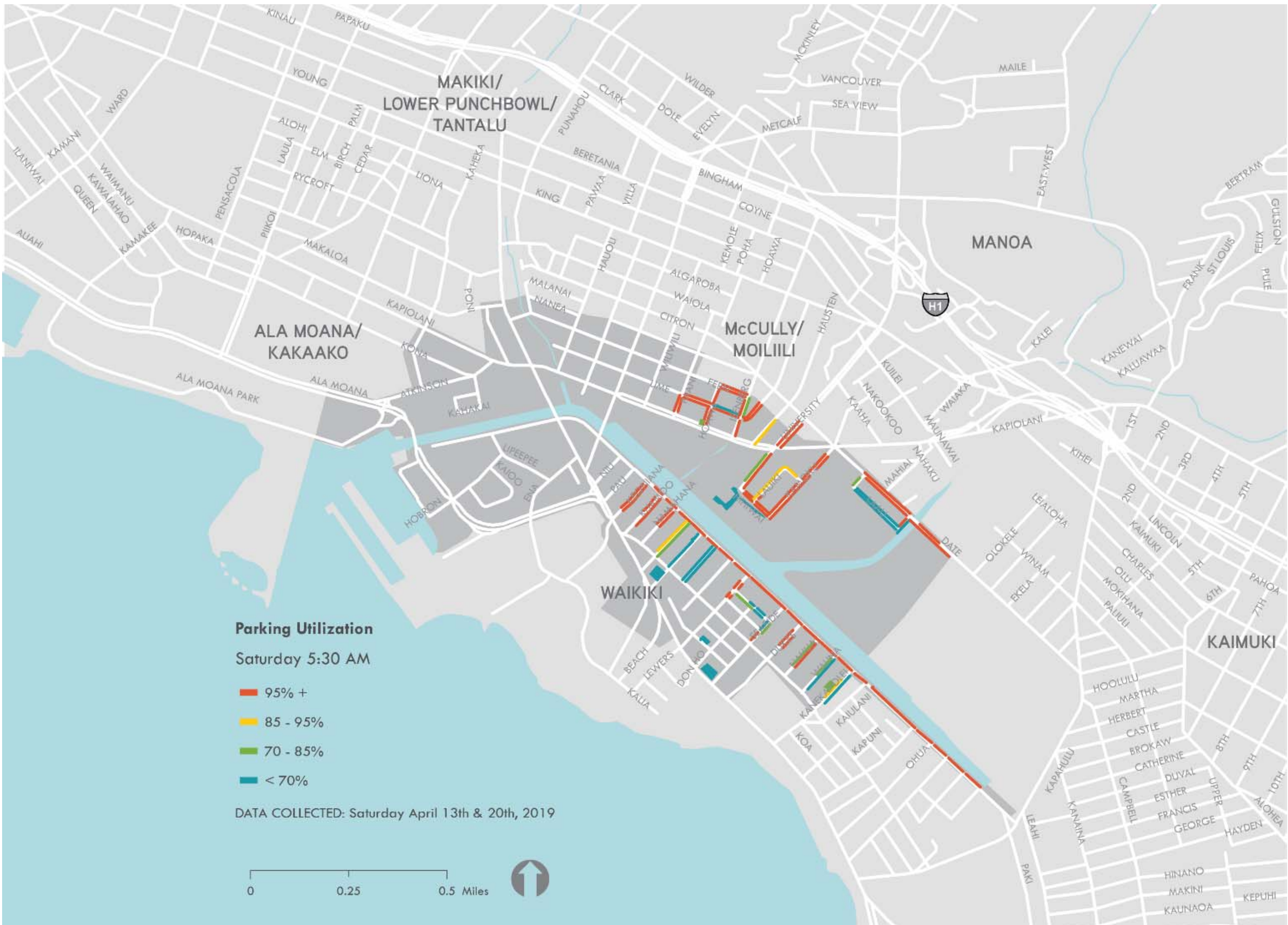


Figure 8 Parking Utilization Map, Saturday 12:00 PM

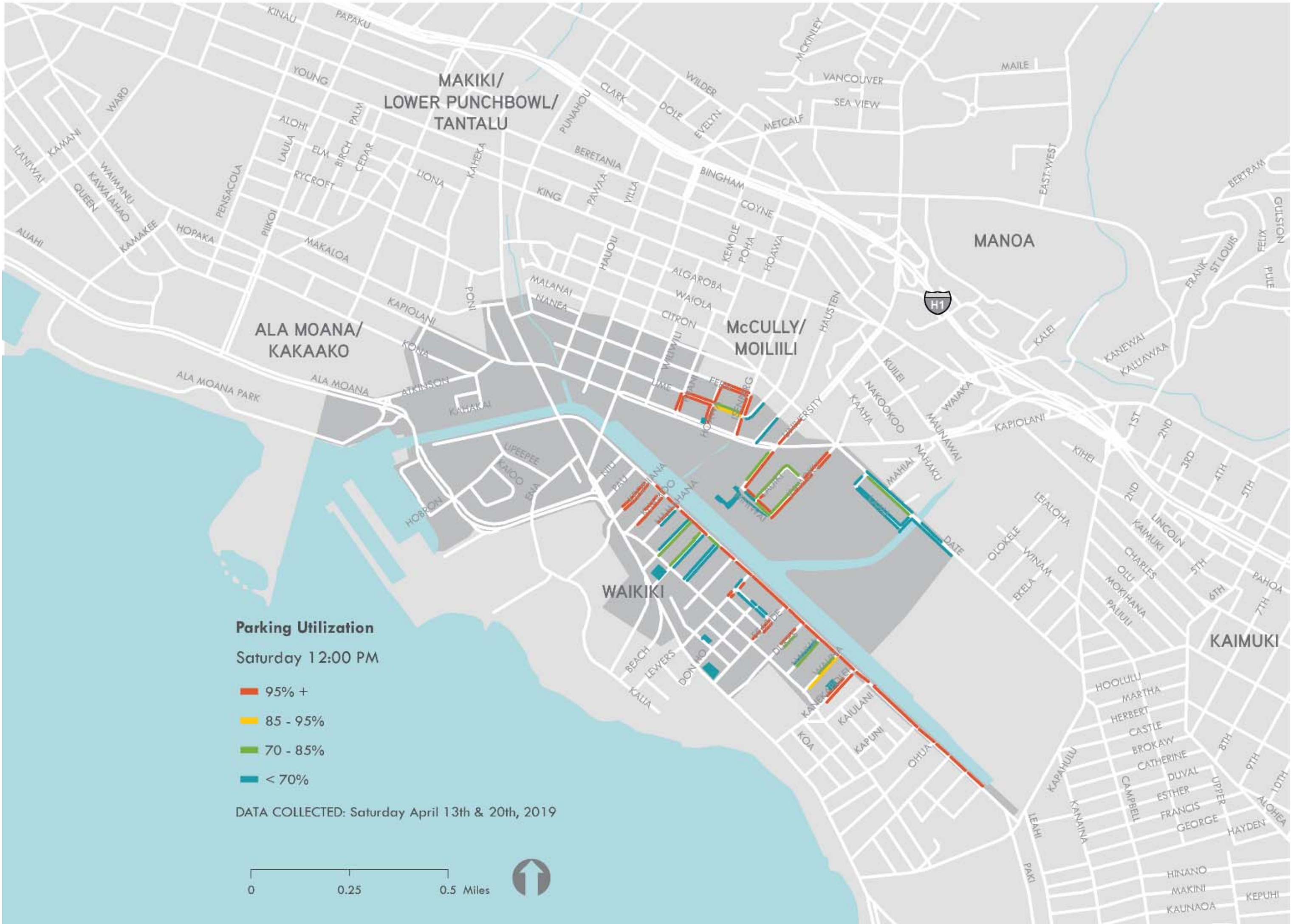
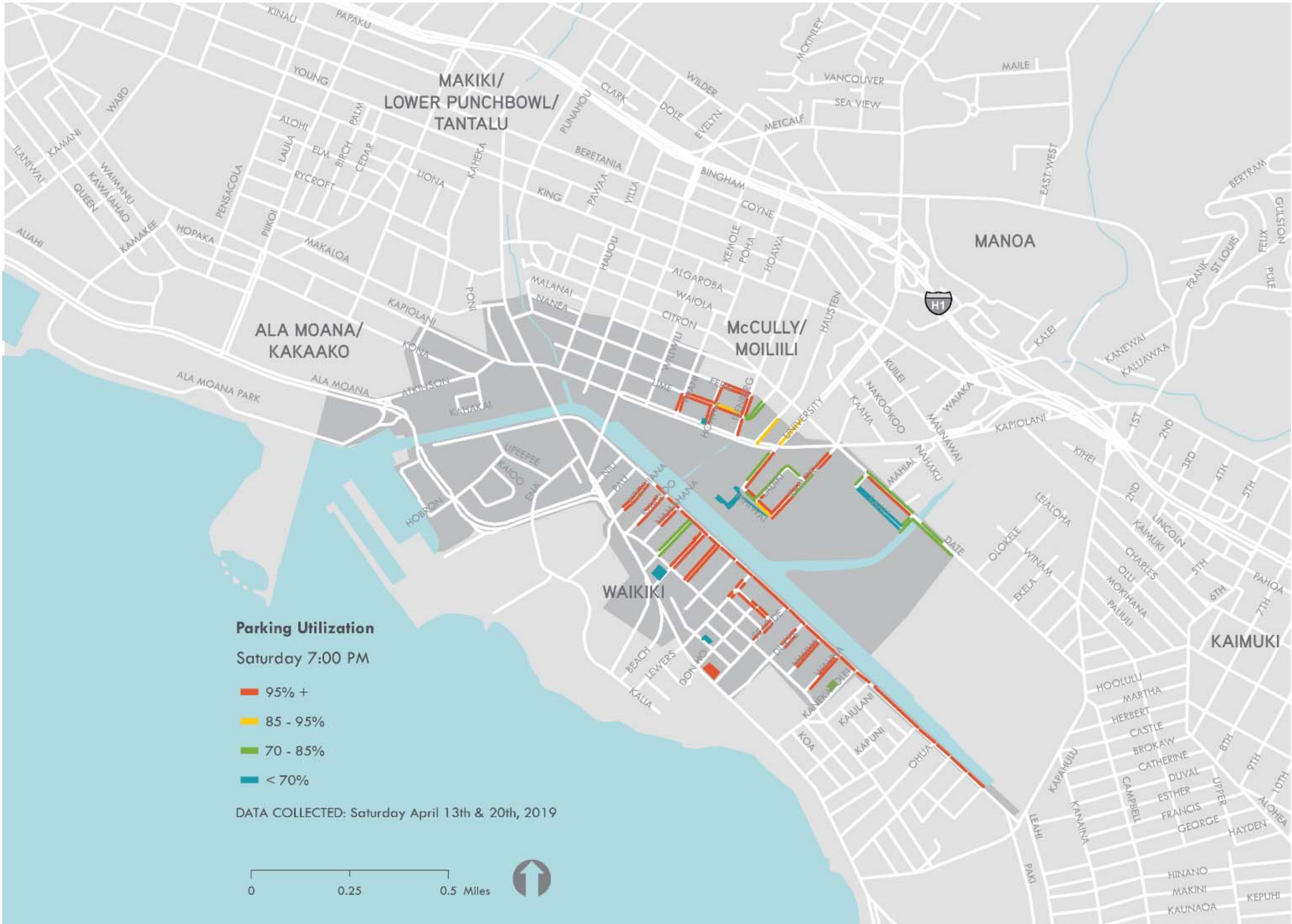


Figure 9 Parking Utilization Map, Saturday 7:00 PM



COLLISION ANALYSIS

The project team conducted collision hot spots and crash type analyses along the key routes in the Waikīkī bike-shed to identify a low-crash path across the Ala Wai Canal. This assessment is informed by collision data from the EMS-attended motor vehicle crash database, maintained by the Hawaii Department of Health.

Collision Analysis Methodology

Five years (2014-2018) of vehicle-, pedestrian- and bicycle-involved collision data were downloaded from the Hawaii Department of Health EMS-attended motor vehicle crash database. These collisions were mapped with existing and proposed bicycle infrastructure improvements, using data from the Honolulu Department of Transportation Services, to compare the locations of collisions with existing and proposed active transportation network.

Collision location points were categorized into two groups: 1) intersection collisions, for crashes within 50 feet of an intersection, and 2) non-intersection collisions, for all other crashes. Collision hot-spots were identified on the five Ala Pono alternatives and Kapahulu Avenue.

Area of Analysis: An expanded Waikīkī bikeshed, defined as the existing 20-minute bikeshed of Waikīkī, plus addition areas accessible within a 20-minute bike ride of Waikīkī with a new canal crossing in the bicycle network.1 Particular focus is placed on the road segments of the five Ala Pono alternatives, where, on a typical day over 260,000 trips are made across the canal. Approximately 14,000 of these trips are walking and bicycling trips today.2 Over 52,000 daily car and motorcycle trips crossing the Ala Wai Canal are within Waikīkī's 20-minute bikeshed. These trips make up 17%-30% of the daily trips on each road crossing the canal today.

Conclusion

Key findings from the collision analysis are summarized in Table 2. All collisions are mapped in Figure 10, and collisions involving people walking or bicycling are shown in Figure 11.

- 90% of collisions on road segments of the five Ala Pono alternatives took place on Ala Moana Boulevard, Kalakaua Avenue, and McCully Street (77 out of 86 collisions).
- 30 of the 86 collisions in the five Ala Pono alternatives segments involved people walking or biking, between 2014 and 2018.
- Within the study area, King Street and Kapiolani Boulevard have had the most crashes involving people walking or bicycling.

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[1] A bikeshed or walkshed is an access shed "defined as the area around a focal point to which a person would reasonably travel" by bicycling or walking. In this context, references to the "bikeshed" or "20-minute bikeshed of Waikīkī" refer to the area that is within a 20-minute bicycle ride of a central point in Waikīkī, using existing road and non-motorized pathway networks. Similarly, references to the "walkshed" refer to the area that is within a 20-minute walk of a central point in Waikīkī, using sidewalks and pedestrian pathway networks. For this analysis, the area of analysis is the "expanded Waikīkī bikeshed," which includes the current bikeshed, plus the additional area that would be included in it, if the selected Ala Pono alignment was a new crossing. Using the expanded bikeshed broadens the area of analysis to include more road segments and intersections than the existing bikeshed; it does not assume or pre-determine any one Ala Pono alignment. For more on bike and walk access sheds, see Section 2 of FTA Report No.0111 (2017): https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/64496/ftareportno0111.pdf

[2] Airsage anonymous location data from mobile devices (2018).

- Collisions with people walking or biking are more common on the mauka side of the canal, in Ala Moana and Mōʻiliʻili, than on the makai side in Waikīkī.
- From collisions with people walking or biking, the proposed University Avenue alignment for Ala Pono is the lowest-crash link across the canal, with only two collisions in the past five years.
- Of the five Ala Pono alternatives segments, Kalakaua Avenue is the most dangerous for people walking or biking, with 12 collisions involving pedestrians or cyclists in the past 5 years.
- Despite bike lanes on the McCully Street bridge, it has experienced 10 collisions involving pedestrians or cyclists in the past 5 years.

Table 2 Summary of Collisions on Ala Pono Alternatives Segments (2014-2018)

Ala Pono Alternatives Segments	Collisions of All Types	% of All Collisions	Collisions with People Walking or Biking	% of Collisions With People Walking or Biking
Ala Moana Blvd	17	20%	3	10%
Kalakaua Ave	30	35%	12	40%
McCully St	30	35%	10	33%
University Ave	2	2%	2	7%
Golf Course Crossing (Seaside Ave)	7	8%	3	10%
Total	86	100%	30	100%

Source: Hawaii Department of Health

Figure 10 Collision Assessment: All Collisions (2014-20118)

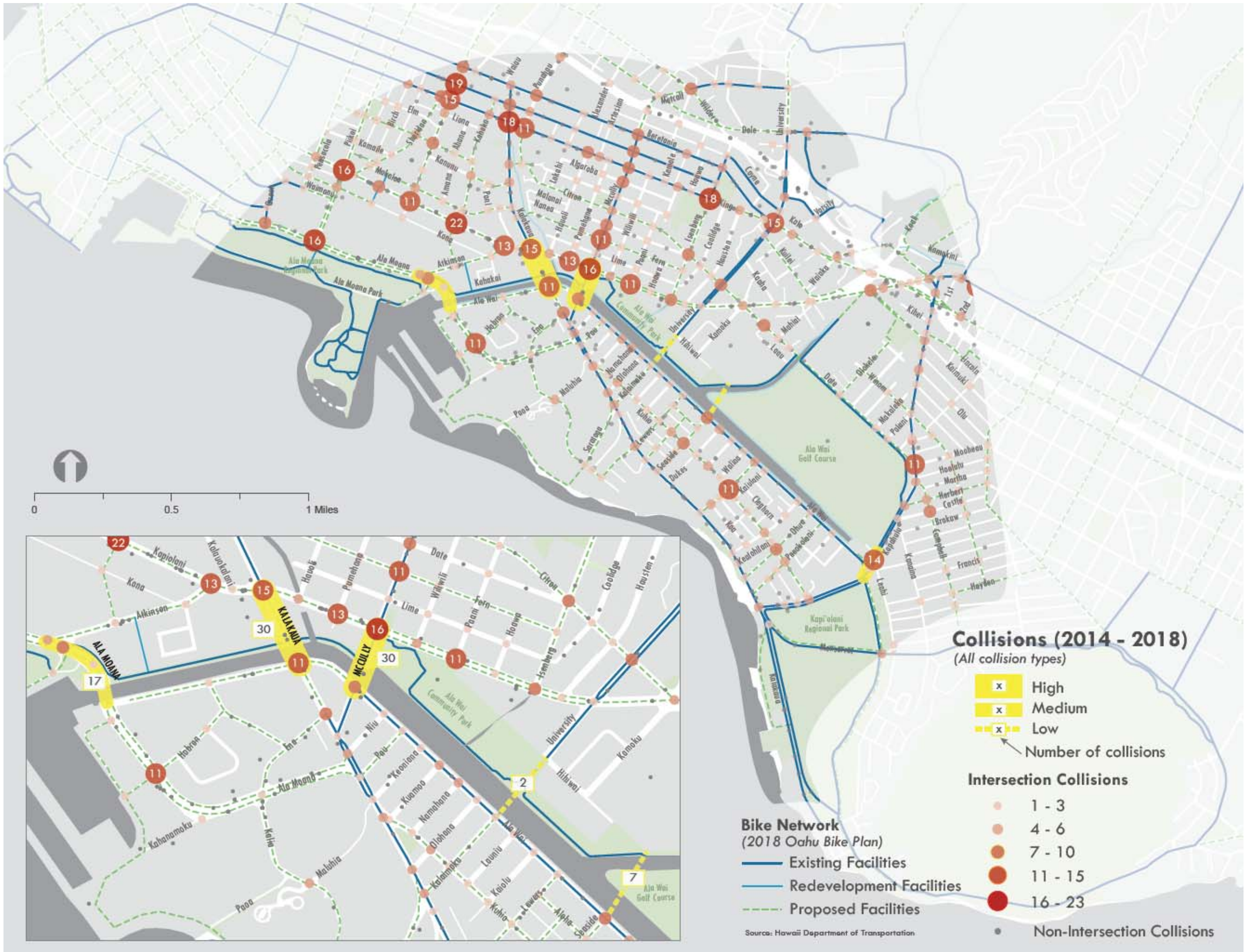


Figure 11 Collision Assessment: Collisions with People Walking or Bicycling (2014-20118)

EVACUATION MODELING AND PUBLIC SAFETY ANALYSIS

In the event of a tsunami, hurricane, or other emergency situation, people in Waikīkī have to cross the Ala Wai canal to evacuate to the nearest safe zone or safe site location. The project team evaluated walking travel times from Waikīkī to nearby tsunami safe zones to assess the relative evacuation safety offered by the proposed Ala Pono crossing alternatives. Due to the volume of people in Waikīkī and its urban built environment, it is assumed that walking would be chosen mode of travel for the most people in an emergency evacuation, as evacuating as many people by motor vehicle would create significant traffic congestion and delay.

Overview

Honolulu's Department of Emergency Management (DEM) maps tsunami safe zones and designates emergency safe site locations (Figure 12). This analysis assesses the evacuation safety of Ala Pono alternatives by comparing walking travel times from Waikīkī to the nearest safe site, in safe zones on the mauka side of the canal. DEM advised the project team on optimal walking routes to safe zones, based on the proposed Ala Pono alternatives.

The evacuation modeling was informed by the USGS Pedestrian Evacuation Analyst tool, a raster-based ArcGIS extension for estimating travel time by foot from hazardous areas to safety. The project team determined that the vector-based Network Analyst extension of ArcGIS was better suited for an assessment of evacuation routes and travel times in the urban built environment of the Ala Wai Canal area.

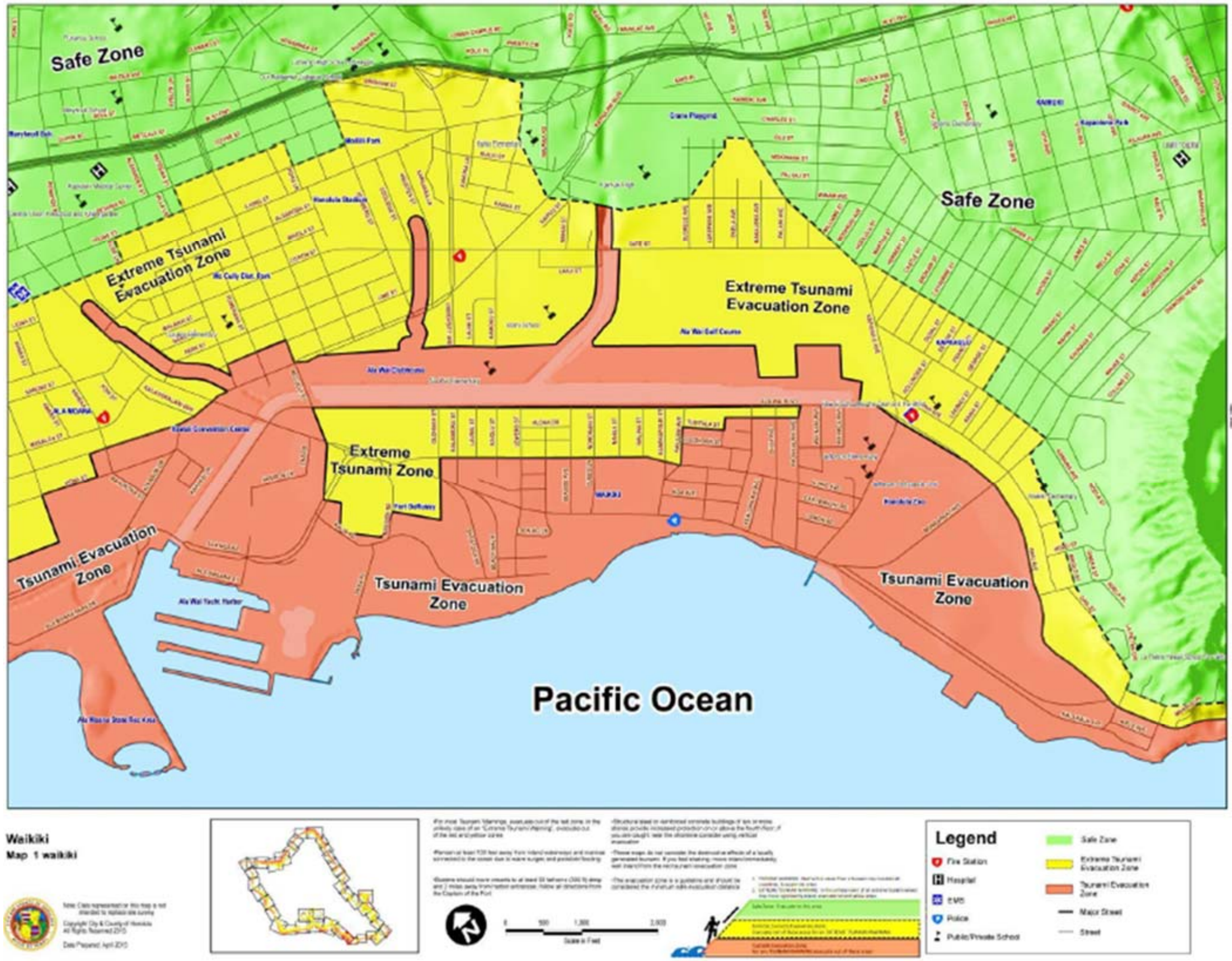
Climate change is causing the global mean sea level to rise, and "higher sea levels will exacerbate the extent of coastal inundation from a tsunami."[3] In July 2018, Honolulu Mayor Kirk Caldwell signed his Directive on Actions to Address Climate Change and Sea Level Rise (No. 18-01), instructing the City and County to incorporate guidance to set 3.2 feet of sea level rise exposure area (3.2SLR-XA) as a planning benchmark (Figure 13).[4,5] The project team incorporated 3.2 feet of sea level rise (SLR) into the network analyst model to identify the Ala Pono crossing alternative that would provide the most resilience in coastal flood emergencies.

[3] Hawaiʻi Emergency Management Agency, State Of Hawai'i Hazard Mitigation Plan (2018) https://dod.hawaii.gov/hiema/files/2018/06/Draft-2018-State-of-Hawai%E2%80%99i-Hazard-Mitigation-Plan.pdf

[4] Mayor's Directive No. 18-01: City and County of Honolulu Actions to Address Climate Change and Sea Level Rise.

[5] Letter from Climate Change Commission to Mayor and City Council, City and County of Honolulu Climate Change Commission (2018).

Figure 12 Tsunami Evacuation Zone Map



Source: Ala Wai Canal Dredging and Improvements, Draft Environmental Impact Statement (2017)

Figure 13 Land Area Change Under 3.2 Feet of Sea Level Rise Conditions

Source: Pacific Islands Ocean Observing System

Methodology

The project team reviewed guidance for using the USGS Pedestrian Evacuation Analyst tool, to inform assembly of a Network Analyst model in ArcGIS to estimate walking travel time from hazardous areas to safety. With input from DEM and the ArcGIS Network Analyst tool, the project team identified the shortest path from each census block on the makai side of the canal to the closest emergency safe site, located in Tsunami Evacuation Safe Zones.

Three scenarios were evaluated:

- No New Crossing Scenario: Evacuees cross the Ala Wai Canal using Kapahulu Avenue or pedestrian crossing enhancements on one of the three existing canal bridges.
- University Avenue New Crossing Scenario: Evacuees cross the Ala Wai Canal using Kapahulu Avenue, one of the three existing canal bridges, or a new crossing at University Avenue.
- Golf Course New Crossing Scenario: Evacuees cross the Ala Wai Canal using Kapahulu Avenue, one of the three existing canal bridges, or a new crossing via the Ala Wai Golf Course.

The project team calculated the total number of residents and employees based in. Data on resident and employee totals are sourced from 2017 American Community Survey data[6] and 2015 Longitudinal Employer-Household Dynamics data,[7] both from the U.S. Census Bureau to calculate the total number of residents and employees based in Waikīkī that are closest to the crossings available in each scenario. The quickest travel time from each census block on the makai side of the canal was calculated, using an average walking speed of 2 miles per hour.

Existing Evacuation Route Model Results

- In this scenario, two routes provide the quickest walking time from Waikīkī to safe site locations in Tsunami Evacuation Safe Zones: the McCully Street bridge and Kapahulu Avenue (Figure 14).
- Evacuation travel times from Waikīkī to nearby safe sites range from 45 to 50 minutes.
- Of the three proposed Ala Pono alternatives that apply active transportation enhancements to an existing bridge, McCully street offers the most direct path to a safe site or safety zone, for the most people.
- Approximately 21,500 people would take 45 to 50 minutes to cross the canal via the McCully Street bridge.
- Approximately 13,900 people would take 50 minutes to cross around the canal via Kapahulu Avenue.

[6] American Community Survey, 2017 five-year estimates, Table B01003.

[7] Longitudinal Employer-Household Dynamics, 2015 LEHD Origin-Destination Employment Statistics, Workplace Area Characteristics.

Figure 14 Pedestrian Evacuation Across Ala Wai Canal, No New Crossing

New Crossing Evacuation Route Model Results

New Crossing at University Avenue

- A new crossing at University Avenue offers a 15-minute travel time reduction for approximately 18,300 people evacuating to a Tsunami Evacuation Safe Zone, compared to the other two scenarios (Figure 15).
- Of the five routes across the canal in this scenario, three are the most likely options for walking to safe site locations in Tsunami Evacuation Safe Zones: the McCully Street bridge, a new University Avenue bridge, and Kapahulu Avenue. The other two crossings are less optimal options, as they provide less direct paths to safety.
- Evacuation travel times from Waikīkī to nearby safe sites range from 35 to 50 minutes.
- A new University Avenue bridge offers the most direct path to a safe site or safety zone for the most people, compared to the three existing canal bridges and Kapahulu Avenue. This new crossing also offers the quickest walk time for the most people in the three scenarios in this evacuation modeling analysis.
- Approximately 8,700 people would take 45 minutes to cross the canal via the McCully Street bridge.
- Approximately 18,300 people would take 35 minutes to cross the canal via a new University Avenue bridge.
- Approximately 8,400 people would take 50 minutes to cross around the canal via Kapahulu Avenue.

New Crossing at the Ala Wai Golf Course

- Of the five routes across the canal in this scenario, three are the most likely options for walking to safe site locations in Tsunami Evacuation Safe Zones: the McCully Street bridge, a new golf course bridge, and Kapahulu Avenue (Figure 16). The other two crossings are less optimal options, as they provide less direct paths to safety.
- Evacuation travel times from across Waikīkī to nearby safe sites are approximately even, at 45 minutes.
- In this scenario, the McCully Street bridge offers the most direct path to a safe site or safety zone for the most people, compared to the other existing bridges, Kapahulu Avenue, and a new bridge via the golf course.
- Approximately 17,800 people would take 45 minutes to cross the canal via the McCully Street bridge.
- Approximately 9,100 people would take 45 minutes to cross the canal via a new University Avenue bridge.
- Approximately 8,400 people would take 45 minutes to cross around the canal via Kapahulu Avenue.

Figure 15 Pedestrian Evacuation Across Ala Wai Canal, With Proposed New Crossing at University Avenue

Figure 16 Pedestrian Evacuation Across Ala Wai Canal, With Proposed New Crossing at the Ala Wai Golf Course

Evacuation Analysis Conclusion

- New canal crossings provide a more direct route with quicker travel times for people to reach the nearest Tsunami Evacuation Safe Zone.
- A new crossing at University Avenue, offers the largest benefit for evacuation, such that 15-minute travel time reduction would be available for approximately 18,300 people evacuating to a Tsunami Evacuation Safe Zone.

- A new crossing at University Avenue would be the shortest path out of Waikīkī in the event of an emergency for one third of Waikīkī residents and 70% of employees based in Waikīkī.

CONCLUSION

MultiModal Transportation Assessment Summary

The findings of the Multimodal Transportation Assessment illustrate the Level of Service, parking, collision and evacuation impacts of the Ala Pono alternatives.

For all alternatives, the expected Level of Service for people walking and bicycling is one (1), highest quality. However it should be noted that the Level of Service method fails to account for the complete elimination of traffic. With respect to parking, no alternative is expected to have an impact in the study area, due to the exceptional utilization within the area currently. A new crossing at University Avenue clearly provides the safest path of travel due to reduced exposure to motor vehicles and historically low collision rates. Finally, a new University crossing arises as the optimal alignment in the event of an evacuation situation.

The findings in this memo should be considered within the context of other assessments undertaken in the Ala Pono Alternatives Analysis.

Other Considerations

The following are additional bridge design considerations that should be explored:

- **The Multimodal Transportation Assessment Fits into the Larger Context of the Ala Pono Evaluation Matrix.** In each of the Ala Pono crossing alternatives, the future facilities proposed will result in a safe and comfortable connection for bicyclists and pedestrians. Other factors included in the larger evaluation matrix such as cost, network connectivity, and public input are not considered in this method.
- **Delineation of Space for Walking and Bicycling Along Ala Pono.** Paint markings or differing surface materials can be used to dedicate space for people walking and people bicycling on Ala Pono. This can reduce potential conflicts between people traveling by different modes, and at different speeds. By reducing these conflicts people will feel more comfortable and safe when crossing the canal by foot or bike.
- **Intersection Treatments.** To make the best use of and grow existing bicycle and pedestrian networks, the selected Ala Pono alignment will also need intersection treatments for people to safely access the bridge from adjacent sidewalks or bike lanes. The design and spatial requirements for these intersection treatments will need further consideration after the crossing alignment is selected.
- **Canal Crossing Options During an Emergency.** All existing canal crossing options are located within the tsunami evacuation zone (Figure 12), and are forecast to experience some flooding at 3.2 feet for SLR (Figure 13). Design considerations should explored to enable Ala Pono to withstand flood conditions, and maintain safe passage for evacuation out of Waikīkī in an emergency.
- **Continued Integration with DEM on Design.** With this project's intent to create new access for pedestrian, bicycle, and/or emergency use, it will be important to continue to engage the Department of Emergency Management to ensure Ala Pono's design accounts for it serving as an evacuation route, and provides efficient connectivity toward safe zones and safe sites.

- **Coordination with USACE on Design.** The USACE has produced conceptual renderings of new Ala Wai Canal floodwalls that incorporate pedestrian pathways into the floodwalls. It will be important to engage the USACE in any designing any new or enhanced crossing to ensure Ala Pono connects to any new pedestrian pathways along the canal, in fulfillment of its Complete Streets connectivity goal.

A. APPENDIX

Multimodal Level of Service (MMLOS) Methodology and Detailed Results

Pedestrian Environmental Quality Index

The Pedestrian Environmental Quality Index (PEQI) was used to assess the quality and safety of the physical environment for people walking and inform pedestrian improvement planning. PEQI measures 36 different indicators to evaluate the pedestrian environment in six categories: intersection safety, traffic, street design, perception of walkability, land use, and perception of safety.

As each indicator is entered into the PEQI tool, the raw inputs are assigned a weight to generate a total score ranging between 0 and 100. The score range, shown in Table 1, categorizes street segments and intersections based on the quality of the environment for people walking; the right column assigns each PEQI score range to a uniform multimodal score representing relative pedestrian comfort on a scale of one through four.

Table A-1 PEQI 2.0 Output Score Range, and 1-4 Scale

Score	Description	Pedestrian Comfort, Scale 1-4
0-20	Environment not suitable for pedestrians	4
21-40	Poor pedestrian conditions exist	3
41-60	Basic pedestrian conditions exist	2
61-80	Reasonable pedestrian conditions exist	1
81-100	Ideal pedestrian conditions exist	

Since the existing conditions for the new crossing alternatives were established measuring the alternative route necessary to cross the Ala Wai Canal today, these segments are comprised of multiple blocks, some with different pedestrian facilities on each side of the street. In these cases, the segment scores were based on the worst of the calculated PEQI scores for any given segment, to capture the presence of gaps in comfortable walking infrastructure.

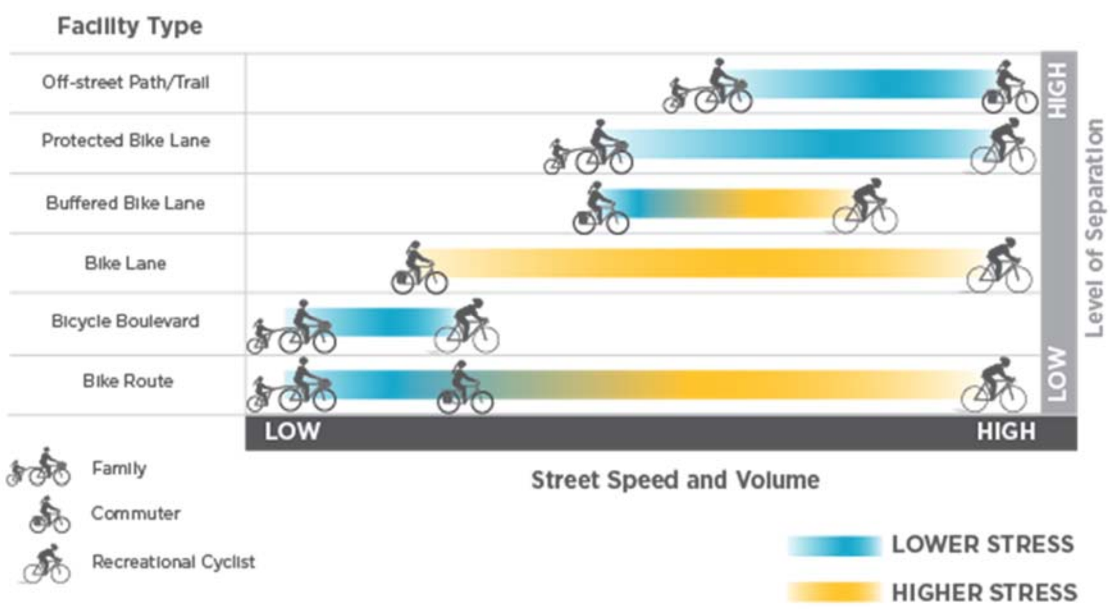
Bicycle Level of Traffic Stress

The Level of Traffic Stress (LTS) tool is the standard method used to evaluate bicycle comfort on roads and at intersections. LTS uses an objective, data-driven approach to evaluate bicycling conditions using metrics such as traffic volumes, vehicle speeds, and roadway design.

Bicyclists experience different levels of stress depending on the type of infrastructure present on the street. Figure A-1 shows the range of stress by facility type, taking into account vehicle speed and vehicle volume, and the type of rider. As the graphic illustrates, fully separated facilities such as protected bike lanes and off-street paths provide the lowest stress environment for all types of bicyclists. These factors contribute to the four levels of traffic stress outlined in the LTS tool:

- LTS 1 is the lowest level of traffic stress. All types of bicyclists feel comfortable at this level. Facility types include protected bike lanes and off-street paths.
- LTS 2 is the second lowest level of traffic stress. Families and less experienced bicyclists may not feel comfortable on these facilities. Facility types include buffered bike lanes.
- LTS 3 is a higher level of traffic stress. Fewer bicyclists are comfortable on this roadway type. Facility examples include narrow bike lanes or a shoulder on a busy street.
- LTS 4 is the highest level of traffic stress. Only the most experienced bicyclists are willing to use these roadways. Examples include busy four lane roads with no bike lane.

Figure A-1 Level of Stress by Bicycle Facility Type, and Vehicle Speed and Volume



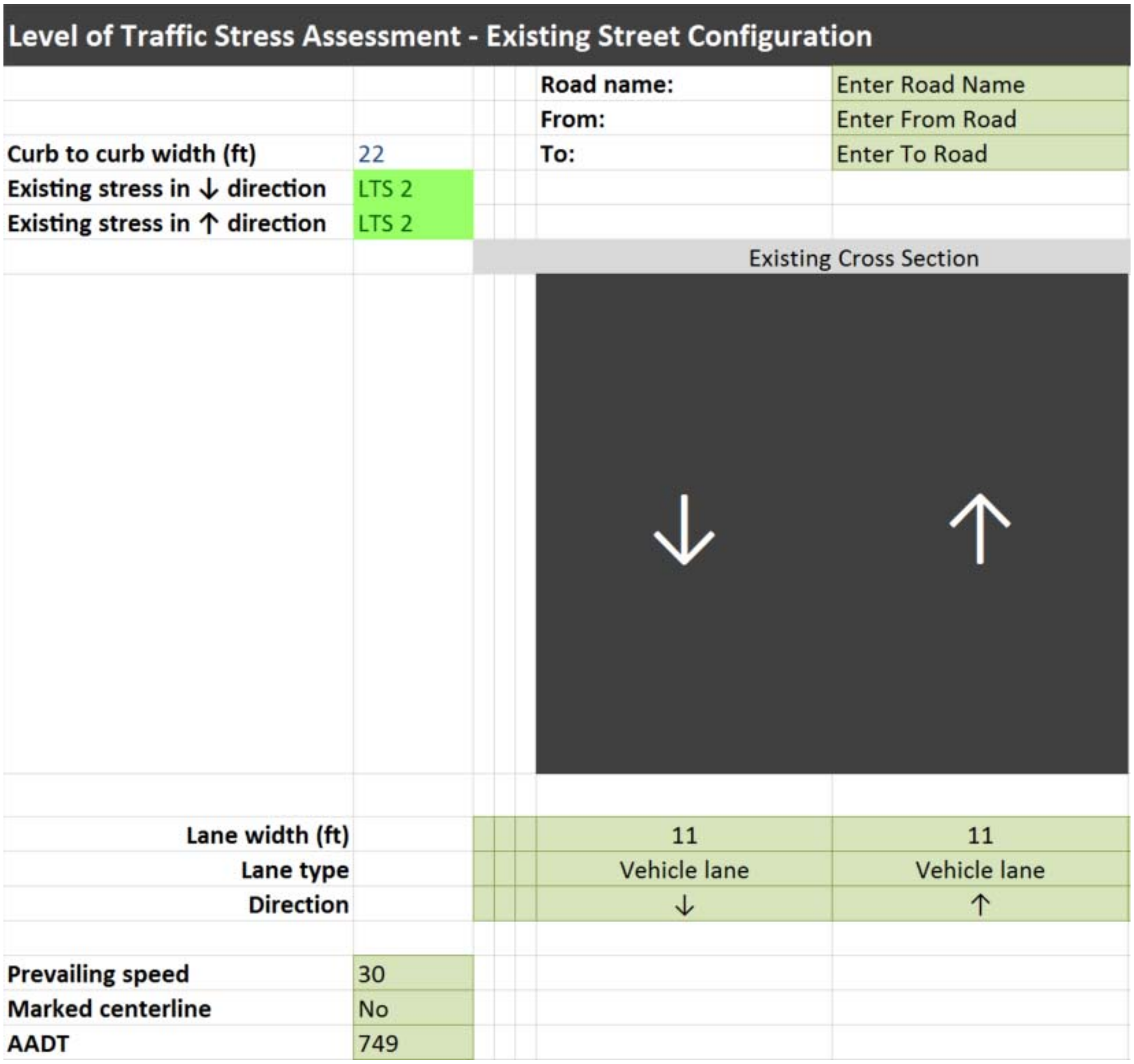
The metrics that comprise LTS scores include traffic volumes, vehicle speed, type of bicycle infrastructure, and overall roadway design. The inputs are calculated for each street segment and intersection. The inputs used to generate LTS scores are shown in Table A-2.

Table A-2 Level of Traffic Stress Inputs

LTS Components	Inputs
Roadway/Intersection	Prevailing Speed
	Marked Centerline
	Average Annual Daily Traffic (AADT)
	Lane Width
	Lane Type

Once each of the inputs is collected for a street segment or intersection, an LTS score of one through four is generated. An example of the LTS tool outputs is shown in Figure A-2.

Figure A-2 Level of Traffic Stress Tool



Source: Spreadsheet developed by Toole Design Group

Since the existing conditions for the new crossing alternatives were established measuring the alternative route necessary to cross the Ala Wai Canal today, these segments are comprised of multiple blocks, some with different pedestrian facilities on each side of the street. In these cases, the segment scores were based on the worst of the calculated LTS scores for any given segment, to capture the presence of gaps in comfortable bicycling infrastructure.

Vehicular LOS

Vehicular LOS is calculated for street segments based on the HCM 2010 Generalized Daily Service Volumes for Urban Street Facilities. This approach provides a high-level scoring of auto conditions based roadway capacity across multiple segments. Vehicular LOS is determined based on vehicular volumes and number of lanes. This method assumes LOS C as the best possible score. Table A-3 summarizes definitions of LOS C through F for street segments based on total number of lanes. The right column translates each Vehicular LOS score into a uniform multimodal score representing relative vehicle operations on a scale of one through four.

Table A-3 Level of Service Definitions for Street Segments

Level of Service	Average Daily Vehicle Volume			Vehicle Operations, Scale 1-4
	2-Lane Road	4-Lane Road	6-Lane Road	
C	0-5,900	0-11,300	0-16,300	1
D	5,901-15,400	11,301-31,400	16,300-46,400	2
E	15,401-19,900	31,401-37,900	46,401-54,300	3
F	>19,900	>37,900	>54,300	4

Existing Conditions: Multimodal Transportation Assessment Existing Crossings of the Canal

Figure A-3 Multimodal Transportation Assessment: Existing Canal Crossings

Improvements to the Existing Ala Moana Boulevard Crossing

This alternative explores whether specific improvements to the existing crossing of the Ala Wai Canal at Ala Moana Boulevard are feasible, avoid environmental impacts, and meet the project's purpose and need. The improvements to this existing structure could range from structural solutions such as the cantilevering of additional walking and bicycling space off the existing bridge to the reallocation of existing the curb-to-curb right-of-way or widening the existing sidewalks for expanded walking and bicycling space. The segment of Ala Moana Boulevard evaluated extends from Atkinson Drive to Holomoana Street.

Pedestrian Environmental Quality Index

The Ala Moana Boulevard crossing includes sidewalks for pedestrians in both directions to connect major shopping destinations in Waikīkī and Ala Moana Center. Based on existing conditions for pedestrians that include wide sidewalks not buffered from vehicular traffic, both sides of the Ala Moana Boulevard bridge crossing receive a PEQI score of 2 indicating that a basic level of pedestrian amenities exist.

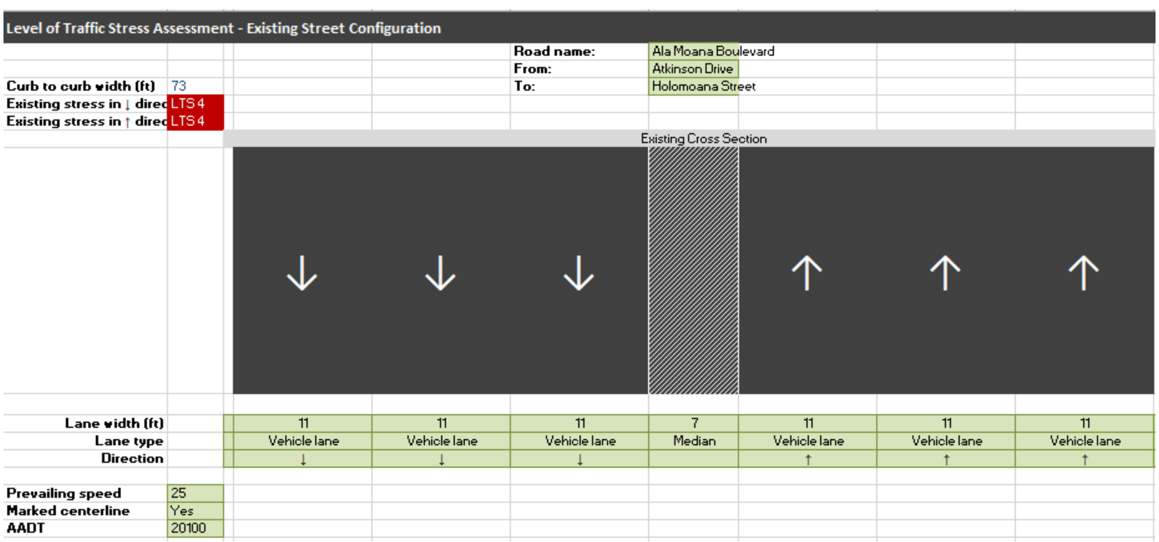
Table A-4 Ala Moana Boulevard Crossing PEQI

Segment Start	Segment End	Direction	Score	Pedestrian Comfort, Scale 1-4
Atkinson Drive	Holomoana Street	Ewa	53	2
		Diamond Head	53	2

Bicycle Level of Traffic Stress

The Ala Moana Boulevard crossing as currently designed accommodates three lanes of traffic in each direction with a concrete median barrier. The lack of bicycle infrastructure on the highly trafficked boulevard contributes to a score of LTS 4. LTS 4 is the highest level of traffic stress for people bicycling. Only the most experienced bicyclists are willing to use this roadway.

Figure A-4 Bicycle Level of Traffic Stress: Ala Moana Boulevard, Existing Street Configuration



Vehicular LOS

The current Ala Moana Boulevard crossing is composed of three lanes in each direction as part of a six-lane road. As of September 2018, 24-hour count data showed 73,000 vehicle trips in this road segment. This high volume of trips results in a LOS F or a score of 4 which translates to jammed conditions with back-ups occurring regularly. Proposed improvements for people walking and bicycling forecasts 250 daily trips would shift from vehicles to walking or bicycling trips. However, this shift in mode choice would not meaningfully affect the conditions vehicles experience currently. Improvements that reduce lanes on the bridge crossing to less than a six-lane road results in the same LOS F and score of 4 for vehicle operations.

Table A-5 Ala Moana Boulevard Crossing Vehicular LOS

Scenario	Segment Start	Segment End	ADT	Level of Service	Vehicle Operations, Scale 1-4
Existing	Atkinson Drive	Holomoana Street	73,000	F	4
Improvement	Atkinson Drive	Holomoana Street	72,750	F	4

Source: 24-hour count data recorded on road segments in the study area (September 2018)

Improvements to the Existing Kalakaua Avenue Crossing

This alternative explores whether specific improvements specific improvements to the existing crossing of the Ala Wai Canal at Kalakaua Avenue are feasible, avoid environmental impacts, and meet the project's purpose and need. The improvements to this existing structure could range from structural solutions such as the cantilevering of additional walking and bicycling space off the existing bridge to the reallocation of existing the curb-to-curb right-of-way or widening the existing sidewalks for expanded walking and bicycling space. The segment of Kalakaua Avenue evaluated extends from Kapiolani Boulevard to Ala Wai Boulevard.

Pedestrian Environmental Quality Index

The Kalakaua Avenue bridge crossing includes sidewalks for pedestrians in both directions to connect major destinations in Waikīkī and the Hawai'i Convention Center. Based on existing conditions for people walking that include wide sidewalks not buffered from vehicular traffic, both sides of the Kalakaua Avenue crossing receive a PEQI score of 2. This means that a basic level of pedestrian amenities exist.

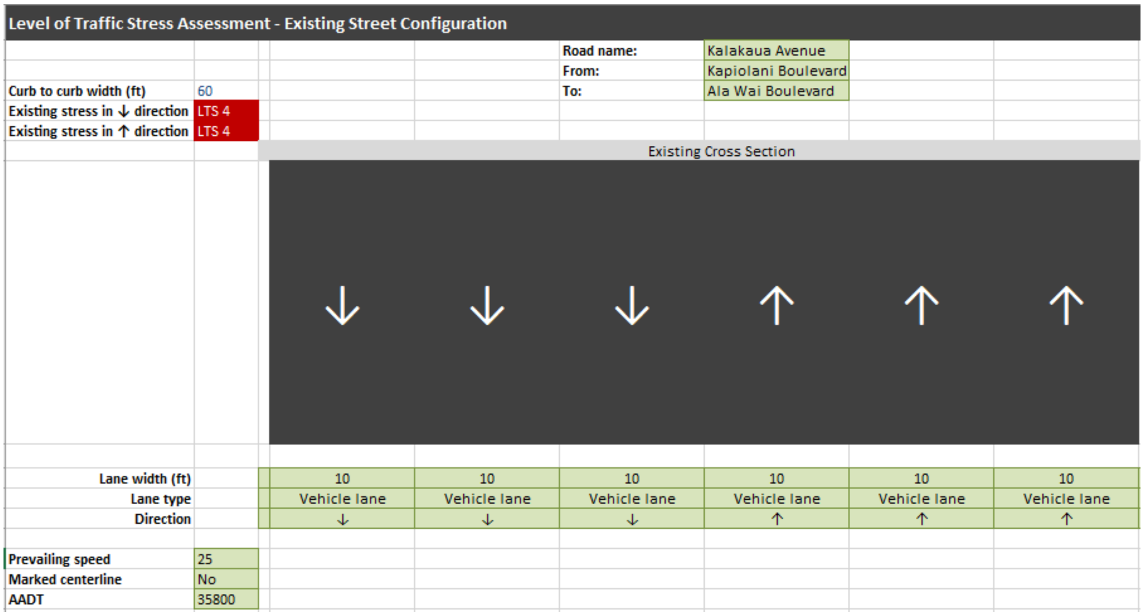
Table A-6 Kalakaua Avenue Crossing PEQI

Segment Start	Segment End	Direction	Score	Pedestrian Comfort, Scale 1-4
Kapiolani Boulevard	Ala Wai Boulevard	Makai	48	2
		Mauka	48	2

Bicycle Level of Traffic Stress

The Kalakaua Avenue crossing is comprised of three lanes of traffic in each direction with high traffic volumes throughout the day. There are no bicycle lanes or other forms of bicycling infrastructure on this segment of Kalakaua Avenue, which results in a score of LTS 4. LTS 4 is the highest score, which discourage most potential riders from bicycling on the corridor.

Figure A-5 Bicycle Level of Traffic Stress: Kalakaua Avenue, Existing Street Configuration



Vehicular LOS

The current Kalakaua Avenue crossing is composed of three lanes in each direction as part of a six-lane road. As of September 2018, 24-hour count data showed 71,000 vehicle trips in this segment. This high volume of trips results in a LOS F or a score of 4 which translates to jammed conditions with back-ups occurring regularly. Proposed improvements for people walking and bicycling forecast 350 daily trips would shift from vehicles to walking or bicycling trips. However, this shift in mode choice would not meaningfully affect the conditions vehicles experience currently. Improvements that reduce lanes on the bridge crossing to less than a six-lane road results in the same LOS F and score of 4 for vehicle operations.

Table A-7 Kalakaua Avenue Crossing Vehicular LOS

Scenario	Segment Start	Segment End	ADT	Level of Service	Vehicle Operations, Scale 1-4
Existing	Kapiolani Boulevard	Ala Wai Boulevard	71,000	F	4
Improvement	Kapiolani Boulevard	Ala Wai Boulevard	70,650	F	4

Source: 24-hour count data recorded on road segments in the study area (September 2018)

Improvements to the Existing McCully Street Crossing

This alternative explores whether specific improvements to the existing crossing of the Ala Wai Canal at McCully Street are feasible, avoid environmental impacts, and meet the project's purpose and need. The improvements range from structural solutions such as the cantilevering of additional walking and bicycling space off the existing bridge to the reallocation of existing the curb-to-curb right-of-way or widening the existing sidewalks for expanded walking and bicycling space. The segment of McCully Street evaluated extends from Kapiolani Boulevard to Ala Wai Boulevard.

Pedestrian Environmental Quality Index

The McCully Street crossing includes sidewalks for pedestrians in both directions to connect major destinations in Waikīkī and the McCully – Mōʻiliʻili neighborhood. Based on existing conditions for people walking that include sidewalks not buffered from vehicular traffic, both sides of the McCully Street bridge crossing receive a PEQI score of 2. This means that only a basic level of pedestrian amenities exist.

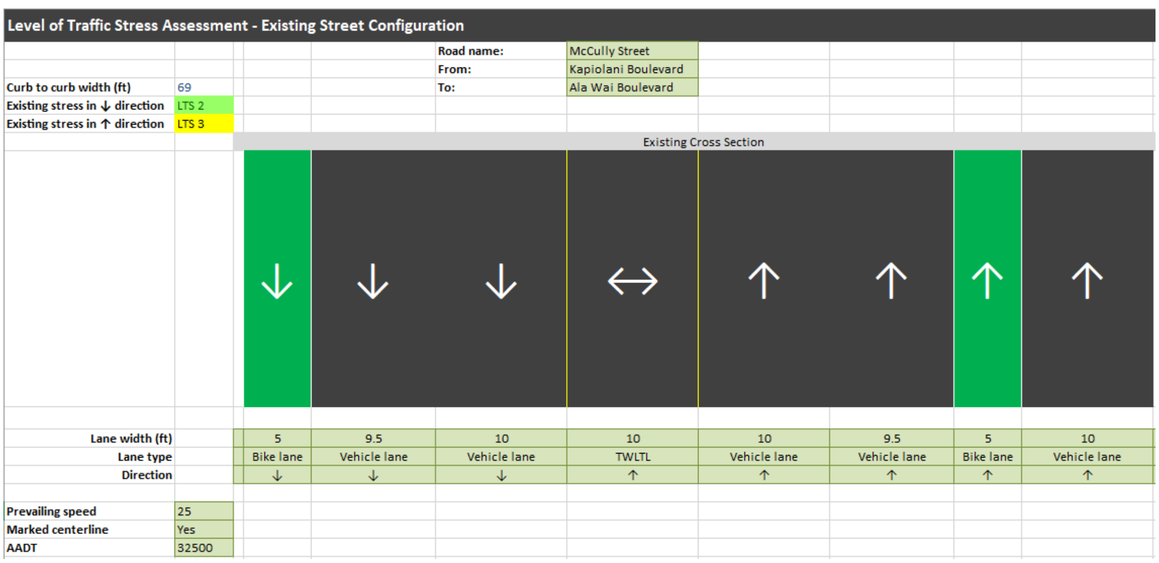
Table A-8 McCully Street Crossing PEQI

Segment Start	Segment End	Direction	Score	Pedestrian Comfort, Scale 1-4
Ala Wai Boulevard	Kapiolani Boulevard	Makai	48	2
		Mauka	52	2

Bicycle Level of Traffic Stress

The McCully Street crossing is comprised of two vehicle lanes in the makai direction and three vehicle lanes in the mauka direction with a center turn lane. Painted bicycle lanes in both directions provide some space for bicyclists, but the placement of the bicycle lane in the mauka direction results in a higher stress level for people bicycling. The score in the makai direction is LTS 2 and the score in the mauka direction is LTS 3.

Figure A-6 Bicycle Level of Traffic Stress: McCully Street, Existing Street Configuration



Vehicular LOS

The current McCully Street crossing is a six-lane road comprised of three lanes in mauka direction and two lanes in the makai direction with a center turn lane. As of September 2018, 24-hour count data showed 71,000 vehicle trips in this road segment. This high volume of trips results in a LOS F or a score of 4 which translates to jammed conditions with back-ups occurring regularly. Proposed improvements for people walking and bicycling forecast 250 daily trips would shift from vehicles to active transportation modes. However, this shift in mode choice would not meaningfully affect the conditions vehicles experience currently. Improvements that reduce lanes on the bridge crossing to less than a six-lane road results in the same LOS F and score of 4 for vehicle operations.

Table A-9 McCully Street Crossing Vehicular LOS

Scenario	Segment Start	Segment End	ADT	Level of Service	Vehicle Operations, Scale 1-4
Existing	Ala Wai Boulevard	Kapiolani Boulevard	73,500	F	4
Improvement	Ala Wai Boulevard	Kapiolani Boulevard	73,250	F	4

Source: 24-hour count data recorded on road segments in the study area (September 2018)

Multimodal Transportation Assessment of New Crossing Alternatives

New Crossing at University Street

This alternative explores whether construction of a clear-span, bicycle- and pedestrian-only crossing of the Ala Wai Canal at University Street is feasible, avoids environmental impacts, and meets the project's purpose and need. Currently, the nearest existing canal crossing for people walking and bicycling in the vicinity of University Street is the existing McCully Street crossing. This alternative at University currently requires people walking and bicycling to travel on the Ala Wai Park Trail and connect to McCully Street bike lanes or sidewalk. The lowest scoring segment of this path of travel forms the baseline conditions for this alternative.

Pedestrian Environmental Quality Index

The path of travel from University Street to the McCully Street crossing includes a fully separated path through the Ala Wai Park, sidewalks on both sides of the McCully Street and along the full length of the McCully crossing. The segment of the McCully Street crossing is the lowest scoring area with a PEQI score of 2. This means that only a basic level of pedestrian amenities exist currently for people walking across the Ala Wai Canal in the vicinity of University St.

Table A-10 McCully Street Bridge Crossing PEQI

Segment Start	Segment End	Direction	Score	Pedestrian Comfort, Scale 1-4
Ala Wai Boulevard	Kapiolani Boulevard	Makai	48	2
		Mauka	52	2

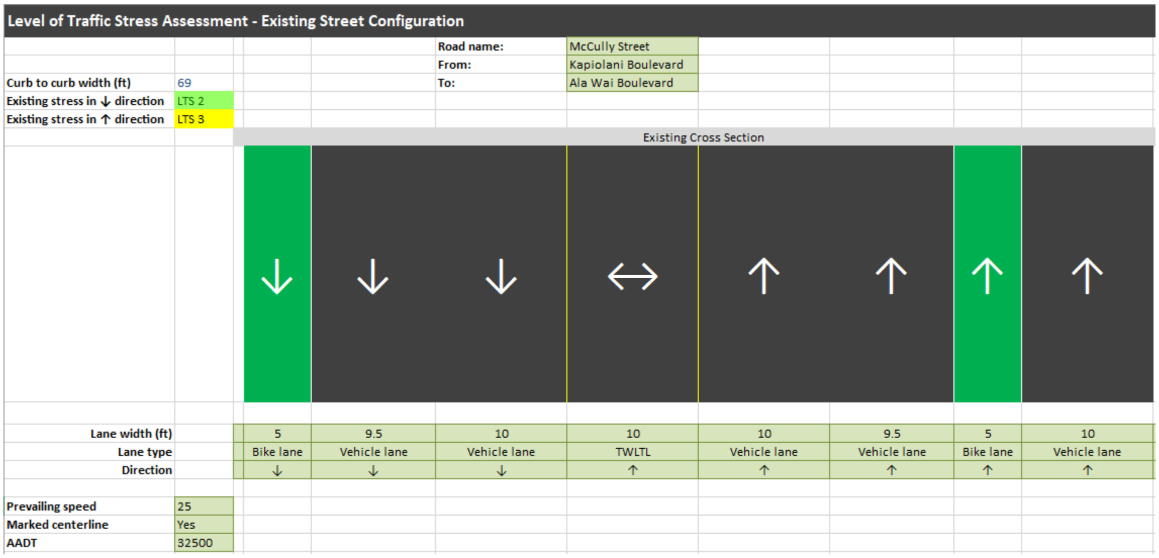
Bicycle Level of Traffic Stress

The Ala Wai Park Trail provides a separate off-street facility for people bicycling, which is comfortable for the widest range of bicyclists. However, the connection across Ala Wai Canal on the McCully Street includes painted in-street bicycle lanes on street without physical separation from traffic. This street segment is composed of two vehicle lanes in the makai direction and three vehicle lanes in the mauka direction. Painted bicycle lanes in both directions provide some space for people bicycling, but the placement of the bicycle lane in the mauka direction results in a higher stress level for roadway users. The score in the makai direction is LTS 2 and the score in the mauka direction is LTS 3.

Vehicular LOS

Due to the new crossing at University Street being a bicycle- and pedestrian-only crossing, baseline conditions for vehicular LOS were not evaluated for this alternative.

Figure A-7 Bicycle Level of Traffic Stress: McCully Street Proxy for University Avenue Alignment, Existing Street Configuration



New Crossing at Ala Wai Golf Course

This alternative explores whether construction of a clear-span, bicycle- and pedestrian-only crossing of the Ala Wai Canal at the Ala Wai Golf Course is feasible, avoids environmental impacts, and meets the project's purpose and need. Currently, the nearest existing canal crossing for people walking and bicycling in the vicinity of the Ala Wai Golf Course is Kapahulu Avenue. This alternative at the Golf Course requires people walking and bicycling to travel on Kapahulu Avenue to access destinations in Waikīkī. The lowest scoring segment of this path of travel forms the baseline conditions for this alternative.

Pedestrian Environmental Quality Index

The path of travel from the Ala Wai Golf Course around the canal includes sidewalks along both Date Street and Kapahulu Avenue. While the PEQI score does not take into account out-of-direction travel for someone walking around the Golf Course to cross the canal, the street segments along this path of travel include sidewalks on both sides of Date Street and Kapahulu Avenue. However, the narrow conditions and blockages in the walking path result in a PEQI score of 2, meaning that only a basic level of pedestrian amenities exist.

Table A-11 Date Street/Kapahulu Avenue PEQI

Segment Start	Segment End	Direction	Score	Pedestrian Comfort, Scale 1-4
Laau Street	Ala Wai Boulevard	Makai	51	2
		Mauka	51	2

Bicycle Level of Traffic Stress

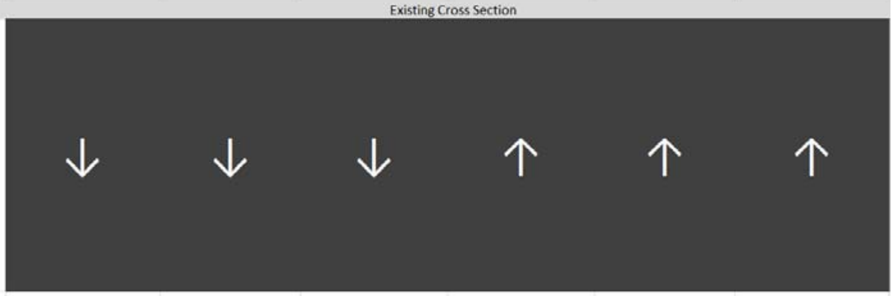
People riding bicycles around the Ala Wai Canal via Kapahulu Avenue benefit from a bi-directional off-street bicycle path between Date Street and Waikīkī-Kapahulu Avenue. However, the path ends at the Waikīkī-Kapahulu library and bicyclists are forced either onto a narrow sidewalk with pedestrians or onto busy roadway without bicycle facilities to connect to Ala Wai Boulevard. This segment of Kapahulu Avenue is the most stressful section of the entire path of travel with a score of LTS 4. LTS 4 is the worst score, which discourages most potential riders from bicycling on the corridor.

Figure A-8 Bicycle Level of Traffic Stress: Kapahulu Avenue Proxy for Golf Course Alignment, Existing Street Configuration

Level of Traffic Stress Assessment - Existing Street Configuration

		Road name:	Kapahulu Avenue
		From:	Waikiki-Kapahulu Library
Curb to curb width (ft)	63	To:	Ala Wai Boulevard
Existing stress in ↓ direction	LTS 4		
Existing stress in ↑ direction	LTS 4		

Existing Cross Section



Lane width (ft)	11	10	10.5	10.5	10	11
Lane type	Vehicle lane	Vehicle lane	Vehicle lane	Vehicle lane	Vehicle lane	Vehicle lane
Direction	↓	↓	↓	↑	↑	↑

Prevailing speed	25
Marked centerline	Yes
AADT	25000

Vehicular LOS

Due to the new crossing at the Ala Wai Golf Course being a bicycle- and pedestrian-only crossing, baseline conditions for vehicular LOS were not evaluated for this alternative.