



Deliverable W-2

Project Description and Evaluation of Potential
Projects in the Wahiawa/Whitmore Village Area
of the

Central Oahu Transportation Study

Prepared for

Oahu Metropolitan Planning Organization



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OVERVIEW OF THE CENTRAL OAHU TRANSPORTATION STUDY

The Central Oahu Transportation Study (COTS) will assess the multi-modal transportation needs of the region and identify key transportation system improvements, strategies and policies that can improve regional transportation mobility and access in a sustainable way. The strategies and system improvements will be technically feasible, financially realistic, sustainable, and meet regional transportation needs.

Previous work for the COTS included the development and analysis of projects in the Central Oahu area south of California Avenue in Wahiawa. These projects are regional in nature and will also benefit users in Wahiawa, Whitmore Village, and beyond.

During community review, it was decided to expand the study area to include all of Wahiawa and Whitmore Village. There will be four reports documenting the results of the study for the expanded study area. The reports include:

- W-1 Identification of the Trends and Issues impacting the COTS area. This report describes the demographics, economic, and land trends occurring in the study area, and it identifies the impacts of those trends.
- W-2 Presents the list of projects, their descriptions, and locations. This report provides an assessment of the Performance Measures and a Feasibility Assessment.**
- W-3 The Financial Assessment will be documented in this report. Financial assumptions and requirements including costs will be reviewed. The benefits and costs of the alternatives will be assessed and compared including any identified trade-offs.
- W-4 The Final Report on Prioritization and Recommendations for Implementation will summarize and prioritize strategies; identify recommendations; identify impacts of no implementation; recommend an implementation timeframe; and, identify any impacts if implementation is not accomplished within the recommended timeframe.

Upon completion of the review of the projects in the expanded study area and further review in the affected communities, the lists of projects for the original and expanded study area will be combined into a final report.

Deliverable W-2 is organized as follows:

- Overview of the COTS Project and this Deliverable
- Executive Summary
- Section 1: Introduction
- Section 2: Initial Project Evaluation
- Section 3: Project Scoring and Ranking
- Section 4: Performance Measures
- Section 5: Next Steps
- Section 6: Resources

EXECUTIVE SUMMARY

The purpose of this report is to identify potential projects within the expanded study area that includes all of Wahiawa and Whitmore Village. Twenty-four projects were identified, including five transit projects, four bicycle and pedestrian projects, and 15 roadway projects. After an initial evaluation, 18 projects are recommended for further evaluation as shown in **Table ES-1**.

Table ES-1. Summary of Project Recommendations

Number	Project	Location	Recommended for Further Evaluation?
700 Transit Projects			
701	Increase bus service to/from Whitmore Village and Wahiawa Transit Center	Whitmore Village and NCTAMS	Yes
702	Increase bus service to/from Schofield and Wahiawa	Schofield	Yes
703	Expanded Late Night Service, Routes 51/52	Wahiawa	Yes
704	Bus Rapid Transit to Pearl Highlands Rail Station	Wahiawa	Yes
705	Align Express Route 83 on proposed Leilehua High School-Kahelu Road Connection	Wahiawa	Yes
800 Bicycle and Pedestrian Projects			
801	New off-street bicycle and pedestrian paths connecting to schools and parks: <ul style="list-style-type: none"> • Kilani Avenue • Anoni Street • California Avenue • Rose Street • Whitmore Avenue • Ihiihi Avenue 	Wahiawa and Whitmore Village	Yes
802	New pedestrian/bicycle bridge connecting Wahiawa and Whitmore Village	Wahiawa and Whitmore Village	Yes
803	New bike and pedestrian connection between Wahiawa, Whitmore Village, and NCTAMS: <ul style="list-style-type: none"> • Wilikina Drive • Kamehameha Highway 	Wahiawa	Yes
804	New and upgraded bike lanes in Wahiawa Commercial District: <ul style="list-style-type: none"> • Kamehameha Highway • California Avenue • Lehua Street 	Wahiawa	Yes
900 Roadway and Traffic Operations Projects			
901	Whitmore Avenue widening from end of Saipan Drive to east of Ihiihi-Nani Ihi	Whitmore Village	Yes
902	Kamehameha Highway widening from north of Whitmore Avenue to Kilani Avenue	Whitmore Village	Yes
903	California Avenue Complete Streets Project from Kamehameha Highway to Wahiawa District Park	Wahiawa	Yes

Number	Project	Location	Recommended for Further Evaluation?
904	Muliwai Avenue extension between Neal Avenue and Higgins Road	Wahiawa	No
905	Leilehua High School-East Range Road connection between California Avenue and Higgins Road	Wahiawa	No
906	New roadway at Leilehua High School-Kahelu Road connection between California Avenue and Higgins Road	Wahiawa	Yes
907	Whitmore Avenue-Wahiawa Civic Center connection between Whitmore Avenue (opposite Saipan Drive) to Kilani Avenue (via Cane Street)	Wahiawa and Whitmore Village	No
908	Kamehameha Highway/California Avenue intersection modification (Blue Zone Project)	Wahiawa	No
909	Kamehameha Highway at Whitmore Avenue Intersection Improvements	Whitmore Village	Yes
910	Roundabout at Kamehameha Highway and California Avenue	Wahiawa	Yes
911	Kamehameha Highway between Kilani Avenue and Avocado Street Traffic Signal Timing	Wahiawa	Yes
912	California Avenue between Kamehameha Highway and Wahiawa District Park Traffic Signal Timing	Wahiawa	Yes
913	Two-way left turn on Kamehameha Highway between Kilani Avenue and Avocado Street	Wahiawa	No
914	Restrict mid-block left-turn movements on Kamehameha Highway from Kilani Avenue to Avocado Street	Wahiawa	No
915	Transit Signal Priority on Kamehameha Highway between Kilani Avenue and Avocado Street	Wahiawa	Yes

The 18 projects that were recommended for further evaluation were ranked based on an evaluation of seven key areas:

- Area of benefit
- Number of other modes enhanced
- Contributes to mode share goal
- Potential to reduce vehicle congestion
- Enhanced infrastructure condition
- Safety
- Deficiency status.

The results of the ranking are provided in **Table ES-2**.

Table ES-2. Projects Ranked by Total Points

PROJECT TITLE		General Location	Primary Mode or Program: B = Bicycle P = Pedestrian R = Roadway T = Traffic Operations	Potential COTS Benefit							
Number	Description			Areawide = 3 Local = 2 Program = 1	Number of Other Modes Enhanced	Potential to Reduce Vehicle Congestion Low = 0 High =3	Infrastructure Condition Low = 0 High =3	Safety Low = 0 High =3	Deficiency Status Near-Term = 3 Mid-Term = 2 Long-Term =1	Contributes to Mode Share Goal Low = 0 High = 3	Point Total
902	Kamehameha Highway widening from north of Whitmore Avenue to Kilani Avenue	Whitmore Village-Wahiawa	R	3	3	3	0	2	2	1	14
802	New pedestrian/bicycle bridge connecting Wahiawa and Whitmore Village	Wahiawa	B/P	3	1	0	1	3	1	3	12
803	New Bikeway Connection between Wahiawa, Whitmore Village, and NCTAMS: <ul style="list-style-type: none"> • Wilikina Drive • Kamehameha Highway 	Wahiawa	B/P	3	1	0	0	2	3	3	12
801	New off-street bicycle and pedestrian paths connecting to schools and parks: <ul style="list-style-type: none"> • Kilani Avenue • Anoni Street • California Avenue • Rose Street • Whitmore Avenue • Ihiihi Avenue 	Wahiawa	B/P	2	1	0	0	3	3	3	12
901	Whitmore Avenue widening from end of Saipan Drive to east of Ihiihi-Nani Ihi	Whitmore Village	R	2	3	1	1	2	2	1	12
903	California Avenue Complete Streets Project from Kamehameha Highway to Wahiawa District Park	Wahiawa	P	2	3	0	0	2	2	3	12
906	New roadway at Leilehua High School-Kahelu Road connection between California Avenue and Higgins Road	Wahiawa	R	3	3	2	1	1	1	1	12
703	Expanded Late Night Service, Routes 51/52	Wahiawa to Haleiwa	T	3	2	1	0	1	2	2	11
704	Bus Rapid Transit to Pearl Highlands Rail Station	Wahiawa to Pearl Highlands	T	2	2	1	0	1	2	3	11
705	Align Express Route 83 on proposed Leilehua High School-Kahelu Road Connection	Wahiawa to Pearl Highlands	T/R	3	2	1	0	1	2	2	11
701	Increase bus service to/from Whitmore Village and Wahiawa Transit Center	Whitmore Village	T	2	2	1	0	1	2	2	10

PROJECT TITLE		General Location	Primary Mode or Program: B = Bicycle P = Pedestrian R = Roadway T = Traffic Operations	Potential COTS Benefit							
Number	Description			Areawide = 3 Local = 2 Program = 1	Number of Other Modes Enhanced	Potential to Reduce Vehicle Congestion Low = 0 High =3	Infrastructure Condition Low = 0 High =3	Safety Low = 0 High =3	Deficiency Status Near-Term = 3 Mid-Term = 2 Long-Term =1	Contributes to Mode Share Goal Low = 0 High = 3	Point Total
702	Increase bus service to/from Schofield and Wahiawa	Wahiawa	T	2	2	1	0	1	2	2	10
911	Kamehameha Highway between Kilani Avenue and Avocado Street Traffic Signal Timing	Wahiawa	R	3	0	3	0	1	3	0	10
915	Transit Signal Priority on Kamehameha Highway between Kilani Avenue and Avocado Street	Wahiawa	T	3	0	0	0	1	3	2	9
804	New and upgraded bike lanes in Wahiawa Commercial District: • Kamehameha Highway • California Avenue • Lehua Street	Wahiawa	B	2	0	0	0	2	3	2	9
910	Roundabout at Kamehameha Highway and California Avenue	Wahiawa	R	2	1	1	0	2	1	1	9
912	California Avenue between Kamehameha Highway and Wahiawa District Park Traffic Signal Timing	Wahiawa	R	2	0	1	0	1	3	0	7
909	Kamehameha Highway at Whitmore Avenue Intersection Improvements	Whitmore Village	R	2	0	1	0	1	2	0	6

The next step in evaluating the potential projects was to apply the performance measures to the projects.

Transit Projects

Six performance measures were applied to the transit projects:

- **Performance Measure 2**, Change from baseline conditions in AM peak period transit travel time. This performance measure is shown as an overall travel time savings over current conditions
- **Performance Measure 6**, Amount of bus/rail transit service
- **Performance Measure 7**, Connectivity to rail transit and frequency of intermodal connections
- **Performance Measure 11**, Contributes to mode split shift away from single-occupant vehicle
- **Performance Measure 20**, Transit shelter availability
- **Performance Measure 21**, Transit shelter conditions and amenities

All five identified transit projects are recommended for further study. The exception would be Align Express Route 83 on proposed Leilehua High School-Kahelu Road Connection (Project 705) if New roadway at Leilehua High School-Kahelu Road connection between California Avenue and Higgins Road (Project 906) is dropped. Increasing bus service to/from Whitmore Village and Wahiawa Transit Center (Project 71) and increasing bus service to/from Schofield and Wahiawa (Project 702) will provide transit service more suited to the local community needs. The W-1 Report showed that Whitmore Village residents rely upon public transportation to commute to work. Adding trips on a more frequent schedule will allow residents more flexibility in their job choices or travel times. Adding transit trips to Schofield Barracks provides options for those station on base, their families, and those working on the base to reduce SOV travel and congestion during peak times providing relief to the Wilikina Drive and Kamehameha Highway area. Residents during community meetings consistently requested more frequent bus service and longer service hours.

Bicycle and Pedestrian Projects

Eight key performance measures were applied to the bicycle projects:

- **Performance Measure 5**, Change from baseline conditions in the AM peak period travel time between origins and destinations within the COTS area
- **Performance Measure 7**, Connectivity to rail transit and frequency of intermodal connections
- **Performance Measure 8**, Amount of pedestrian infrastructure
- **Performance Measure 9**, Amount of bicycle infrastructure
- **Performance Measure 10**, Improvements to existing bicycle and pedestrian system
- **Performance Measure 11**, Contributes to mode split shift away from single-occupant vehicle
- **Performance Measure 16**, Number of non-motorized fatalities and serious injuries
- **Performance Measure 19**, Sidewalk, bikeways, and multi-use path conditions

All shared-use path projects are recommended. Priority should be given to projects that increase safety and connectivity, can be constructed as part of future development projects, and provide substantive additions to the bikeway network in terms of lane-miles. These shared-use path facilities attract the greatest number of riders and typically provide the highest level of safety of all bike facility types if they are designed to the highest bicycle facility safety standards.

All proposed bike lane projects would enhance the bikeway network within the Wahiawa-Whitmore Village area and could reduce collisions if designed to the highest bicycle facility safety standards.

Expanding the network of dedicated bicycle facilities is key to increase the overall numbers of bicyclists and to increase driver awareness of bicyclists on the road. In two cases, the potential bicycle lane projects identified in the list address locations with multiple collisions.

New shared roadways should be the lowest priority of bicycle projects based solely on performance. Shared roadway provide the lowest level of safety enhancement and do not provide a dedicated right-of-way for bicyclists. Other considerations, such as ease of implementation, may elevate one or more of these projects.

Roadway and Traffic Operations Projects

Eleven performance measures were applied to the roadway projects:

- **Performance Measure 3**, Number of congested lane miles in Central Oahu
- **Performance Measure 4**, Change from baseline conditions in total AM peak period auto travel time between Wahiawa and other origins/destinations within the overall COTS area
- **Performance Measure 10**, Improvements to existing bicycle and pedestrian system
- **Performance Measure 11**, Contributes to mode split shift away from single-occupant vehicle
- **Performance Measures 12**, Number of annual fatalities from vehicle-vehicle collisions
- **Performance Measure 16**, Number of non-motorized fatalities and serious injuries
- **Performance Measure 17**, Roadway state of good repair
- **Performance Measures 18**, Bridges state of good repair
- **Performance Measure 19**, Sidewalk, bikeways, and multi-use path conditions

Based solely on performance measures associated with commuting, the most effective roadway projects in terms of reducing congestion in the Wahiawa/Whitmore Village area are the addition of the New roadway at Leilehua High School-Kahelu Road connection between California Avenue and Higgins Road (Project 906). Kamehameha Highway widening from north of Whitmore Avenue to Kilani Avenue (Project 902) is expected to have mixed results by itself because of its queue reduction benefits but potentially increased volumes through central Wahiawa. When packaged with Kamehameha Highway between Kilani Avenue and Avocado Street Traffic Signal Timing (Project 911), the installation of adaptive signals and optimization of the highway corridor through Wahiawa, Project 902 may minimize increased travel time. In addition, the optimization of signals along California Avenue (Project 912) would complement the California Avenue Complete Streets Project from Kamehameha Highway to Wahiawa District Park (Project 903), which would require re-timing of the signals if the proposed road diet was implemented.

Other projects that have notable local operational, safety, and multimodal benefits include Project 901 (Whitmore Avenue Widening from end of Saipan Drive to east of Ihiihi-Nani Ihi) and Project 915 (Transit Signal Priority on Kamehameha Highway between Kilani Avenue and Avocado Street), both of which directly address the project goals of encouraging non-automobile travel in the extended and overall COTS area.

1.0 INTRODUCTION

The Central Oahu Transportation Study (COTS) seeks to identify potential multi-modal transportation projects that would meet the three goals for the study area:

1. Reduce congestion experienced by travelers in Central Oahu
2. Create easy access to the HART Rail system
3. Create a multimodal system in Central Oahu

The purpose of this report is to identify potential projects within the expanded study area that includes all of Wahiawa and Whitmore Village. These projects are given a preliminary evaluation to determine if they are recommended for further study. Upon the identification of projects recommended for further study, the projects are scored and ranked based on a variety of factors discussed in **Section 3.0**, including their anticipated contribution towards the following performance measures: expanding multimodal travel opportunities, reducing congestion, enhancing safety, and improving infrastructure networks.

Potential transit projects were identified that would increase transit service in the Wahiawa and Whitmore Village area. This includes additional service on existing routes and bus rapid transit.

Potential bicycle and pedestrian projects were identified that would enhance safety, provide alternative routes for bicyclists and pedestrians, and reduce congestion on existing roads by providing an alternative mode of travel for bicyclists and pedestrians. Shared use paths were identified along the roadways adjacent to schools, which are expected to enhance safety for students as they are physically separated from road. Alternate routes provide additional capacity to service the existing traffic on the primary routes. Specifically, the projects list was developed to enhance safety for pedestrians as all other modes depend on walking.

Potential roadway and traffic operations projects were identified that would enhance vehicular travel and multi-modal safety for all users.

Inputs to the performance evaluation included qualitative assessments through project scoring and ranking (**Section 3.0**), quantitative findings through the evaluation of projects against the performance measures (**Section 4.0**), and adjustments to normalize the results (where feasible) for purposes of ranking each improvement project. Technical analyses were conducted as part of this evaluation to provide more detailed operational results. A comparative system was developed to prepare an initial ranking list using the criteria noted above.

Figure 1 shows all of the projects considered within the study area. **Table 1** provides a listing of projects organized by transportation mode or program.

Figure 1. Potential Projects Within the Wahiawa/Whitmore Village Study Area

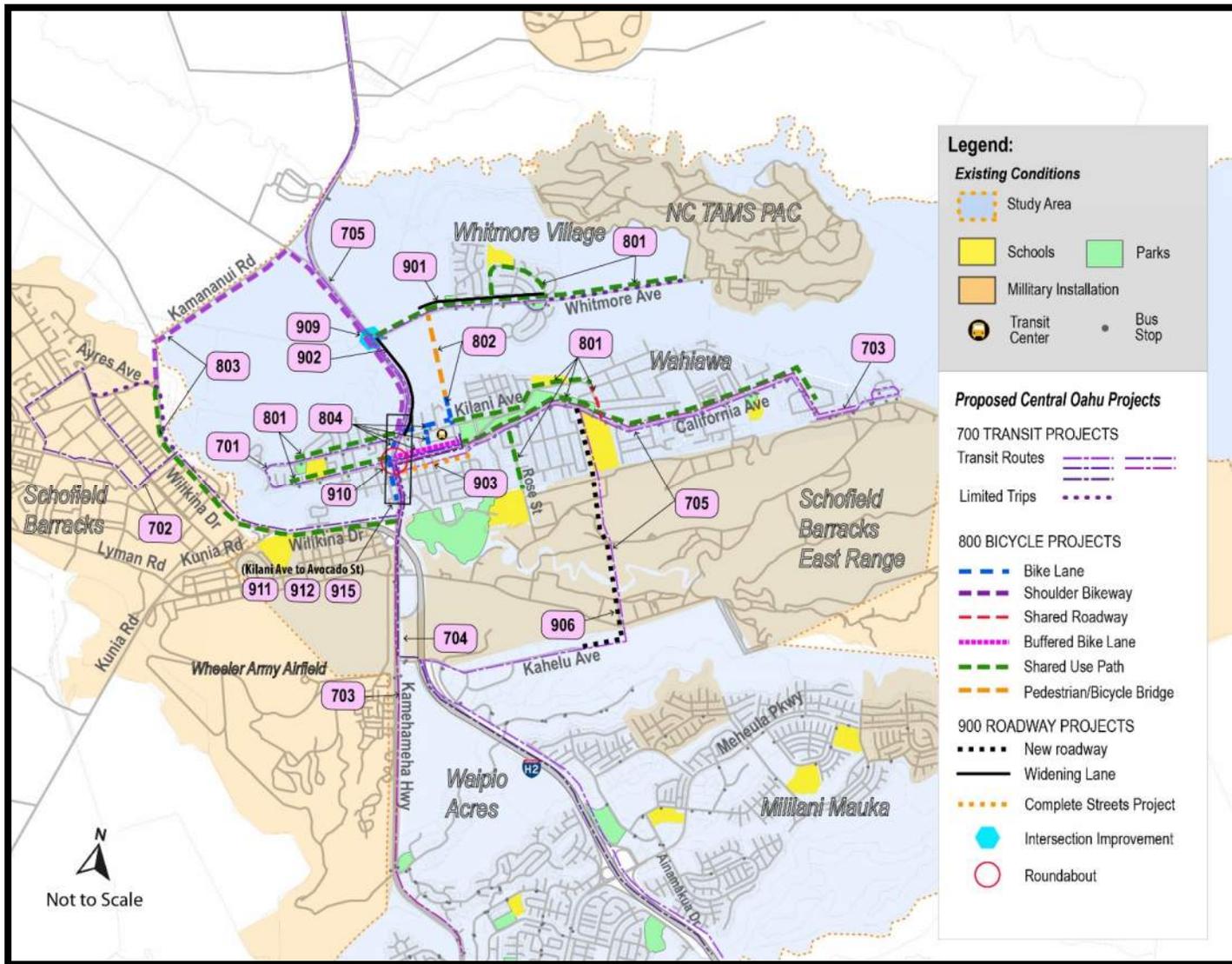


Table 1. List of Potential Projects in the Wahiawa/Whitmore Village Study Area

Number	Project	Description	Anticipated Effect/ Benefit	Location
700 Transit Projects				
701	Increase bus service to/from Whitmore Village and Wahiawa Transit Center	30-minute peak service to Wahiawa Transit Center. Add evening service.	<ul style="list-style-type: none"> • Provides additional trips for residents to/from Wahiawa and Whitmore Village • Provides new peak period service to NCTAMS to reduce single-occupant vehicle (SOV) use 	Whitmore Village and NCTAMS
702	Increase bus service to/from Schofield and Wahiawa	30-minute peak period service to Schofield. Add evening service.	<ul style="list-style-type: none"> • Provides additional trips to/from Schofield and Wahiawa 	Schofield
703	Expanded Late Night Service, Routes 51/52	Provides 24-hour service by adding three early morning trips. The early morning trips would continue to Haleiwa.	<ul style="list-style-type: none"> • Provides 24-hour service • Adds TheHandi-Van service 	Wahiawa
704	Bus Rapid Transit to Pearl Highlands Rail Station	Direct service from Armory Park & Ride to Pearl Highlands Rail Station.	<ul style="list-style-type: none"> • Reduces travel time • Provides a more direct connection to Pearl Highlands Rail Station 	Wahiawa
705	Align Express Route 83 on proposed Leilehua High School-Kahelu Road Connection	Add express bus service to the proposed new road (project 906).	<ul style="list-style-type: none"> • Avoids congestion on Kamehameha Highway • Reduces travel time 	Wahiawa
800 Bicycle Projects				
801	New off-street bicycle and pedestrian paths connecting to schools and parks: <ul style="list-style-type: none"> • Kilani Avenue • Anoni Street • California Avenue • Rose Street • Whitmore Avenue • Ihiihi Avenue 	Widen asphalt sidewalk where existing for shared use path for bicyclists and pedestrians. Where missing, construct or delineate space for path.	<ul style="list-style-type: none"> • Increases safety for bicyclists and pedestrians • Provides for alternate mode of travel as it connects to schools and parks in residential neighborhoods 	Wahiawa and Whitmore Village
802	New pedestrian/bicycle bridge connecting Wahiawa and Whitmore Village	Construct a new pedestrian and bicycle bridge that connects Wahiawa and Whitmore Village through North Cane Road.	<ul style="list-style-type: none"> • Increases safety and accessibility for bicyclists and pedestrians • Provides alternate/ direct access between Whitmore Village and Wahiawa 	Wahiawa and Whitmore Village

Number	Project	Description	Anticipated Effect/ Benefit	Location
803	New bike and pedestrian connection between Wahiawa, Whitmore Village, and NCTAMS: <ul style="list-style-type: none"> • Wilikina Drive • Kamehameha Highway 	Widen existing sidewalk on east side of Wilikina Drive to accommodate shared use path for bicyclists and pedestrians. Widen and pave shoulders along Kamehameha Highway and Kamananui Road.	<ul style="list-style-type: none"> • Increases safety and accessibility for bicyclists • Connects communities 	Wahiawa
804	New and upgraded bike lanes in Wahiawa Commercial District: <ul style="list-style-type: none"> • Kamehameha Highway • California Avenue • Lehua Street 	Restripe and install improved bike facilities on both sides of the road.	<ul style="list-style-type: none"> • Increases safety for bicyclists • Connects commercial/ business areas to residential areas • Provides connection for alternate mode of travel 	Wahiawa
900 Roadway and Traffic Operations Projects				
901	Whitmore Avenue widening from end of Saipan Drive to east of Ihihi-Nani Ihi	Widen to accommodate new center two-way left turn lane and pedestrian safety improvements.	<ul style="list-style-type: none"> • Increases capacity/reduces vehicle delays • Increases multimodal connectivity/safety • Provides opportunities for staged pedestrian crossings/medians 	Whitmore Village
902	Kamehameha Highway widening from north of Whitmore Avenue to Kilani Avenue	Widen highway and bridge from two to four lanes. This project may be combined with project 909.	<ul style="list-style-type: none"> • Increases capacity/reduces vehicle delays • Increases multimodal connectivity/safety 	Whitmore Village
903	California Avenue Complete Streets Project from Kamehameha Highway to Wahiawa District Park	Install safety improvements, including dedicated bicycle facilities, widened sidewalks, and expanded on-street parking.	<ul style="list-style-type: none"> • Enhances multimodal connectivity/safety, including bus stop access • Provides opportunities for staged pedestrian crossings/medians 	Wahiawa
904	Muliwai Avenue Extension between Neal Avenue and Higgins Road	Construct new two-lane roadway.	<ul style="list-style-type: none"> • Reduces volume on highway between H-2 interchange and California Avenue • Reduces delays 	Wahiawa

Number	Project	Description	Anticipated Effect/ Benefit	Location
			<ul style="list-style-type: none"> Increases multimodal connectivity 	
905	Leilehua High School-East Range Road connection between California Avenue and Higgins Road	Construct new two-lane roadway.	<ul style="list-style-type: none"> Reduces volume on highway between H-2 interchange and California Avenue Reduces delays Increases multimodal connectivity 	Wahiawa
906	New roadway at Leilehua High School-Kahelu Road connection between California Avenue and Higgins Road	Construct new two-lane roadway.	<ul style="list-style-type: none"> Reduces volume on highway between H-2 interchange and California Avenue Reduces delays Increases multimodal connectivity 	Wahiawa
907	Whitmore Avenue-Wahiawa Civic Center connection between Whitmore Avenue (opposite Saipan Drive) to Kilani Avenue (via Cane Street)	Construct new two-lane roadway.	<ul style="list-style-type: none"> Reduces volume on highway between Whitmore Avenue and Kilani Avenue Reduces delays Increases multimodal connectivity Provides emergency access 	Wahiawa and Whitmore Village
908	Kamehameha Highway/California Avenue intersection modification (Blue Zone Project)	Extend the length of the protected left-turn phase of the northbound approach and adjust signal timings as needed.	<ul style="list-style-type: none"> Reduces delay for northbound left-turning vehicles Could increase delay for other movements 	Wahiawa
909	Kamehameha Highway at Whitmore Avenue Intersection Improvements	Widen roadways to accommodate dual westbound left turns. This project may be combined with project 902.	<ul style="list-style-type: none"> Reduces delays for westbound left-turning vehicles and other movements 	Whitmore Village
910	Roundabout at Kamehameha Highway and California Avenue	Construct a two-lane roundabout to replace the existing traffic signal. Create gateway feature.	<ul style="list-style-type: none"> Reduces delays and number of stopped vehicles Reduces vehicle collision severity Creates a community gateway feature May increase delay for some movements Additional measures needed to enhance pedestrian and bicycle safety 	Wahiawa

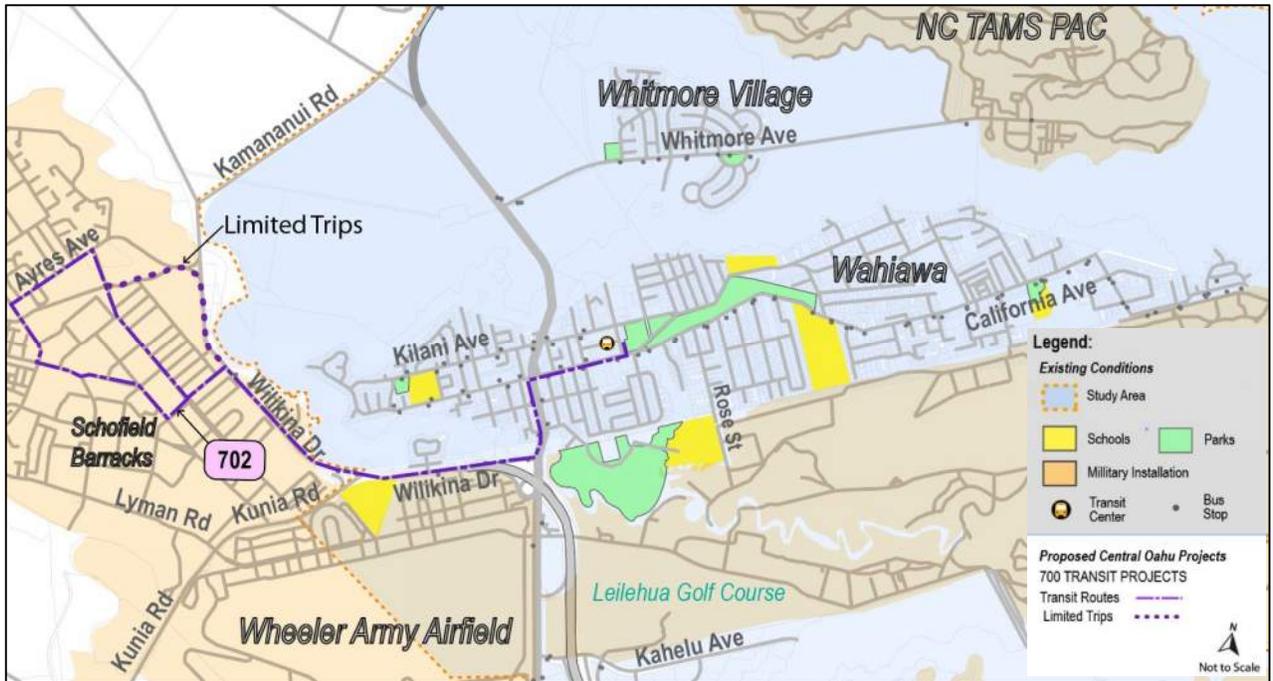
Number	Project	Description	Anticipated Effect/ Benefit	Location
911	Kamehameha Highway between Kilani Avenue and Avocado Street Traffic Signal Timing	Re-time traffic signals.	<ul style="list-style-type: none"> • Improves vehicle progression • Moderates speeds 	Wahiawa
912	California Avenue between Kamehameha Highway and Wahiawa District Park Traffic Signal Timing	Re-time traffic signals.	<ul style="list-style-type: none"> • Improves vehicle progression • Moderates speeds • Should be implemented as part of a Complete Streets project but could also be independent 	Wahiawa
913	Two-way left turn on Kamehameha Highway between Kilani Avenue and Avocado Street	Restripe left-turn pockets between signalized intersections to include a center two-way left-turn lane.	<ul style="list-style-type: none"> • Formalizes refuge area for vehicles turning into and out of fronting properties • Long queues at intersections would occupy a portion of lane during peak periods 	Wahiawa
914	Restrict mid-block left-turn movements on Kamehameha Highway from Kilani Avenue to Avocado Street	Prohibit left turns between signalized intersections using painted or raised medians and signage.	<ul style="list-style-type: none"> • Increases vehicle through capacity • Enhances safety by eliminating conflicts between intersections (all turning movements at driveways would be right-in/right-out) 	Wahiawa
915	Transit Signal Priority on Kamehameha Highway between Kilani Avenue and Avocado Street	Add transit signal bus prioritization on Kamehameha Highway.	<ul style="list-style-type: none"> • Reduces bus travel time • Encourages transit use 	Wahiawa

2.0 INITIAL PROJECT EVALUATIONS

2.1 Transit Projects

701	Increase bus service to/from Whitmore Village and Wahiawa Transit Center	\$865,000 for initial investment \$1,032,000 additional investment for replacement buses in 12 years
		
<p>Purpose: To increase the attractiveness of transit travel through increased visibility and convenience, as well as reduced wait and travel times. Hub and Spoke provides the community a network of routes that connect at a hub. Implementation of Hub and Spoke has been on-going in Honolulu. The home trunk route in this case Route 51 is anchored at a hub (Wahiawa Transit Center). The community circulator routes are identified by three digits; the first two numbers identify the home hub and route.</p> <p>Project Description: Current Route 72 provides service to Whitmore Village and Schofield Barracks via the Wahiawa Transit Center. Currently, the route can take 60 minutes to complete a cycle on the weekdays only during the first trip at 5:10 AM. Other trips can take 70 minutes, 80 minutes and more. Much of the time loss is due to traffic along Kamehameha Highway especially near the southern entrance to Wahiawa.</p> <p>Route 72 operates with one vehicle to serve both destinations even though the travel needs may be different for a residential community and a military base. This project together with project 702 would convert Route 72 into two routes. These routes would terminate at the Wahiawa Transit Center. This will require an additional vehicle but allow residents in Whitmore Village and Wahiawa residents ‘Ewa of Kamehameha Highway to have 45-minute peak period service during the weekdays. The increased frequency will provide more connections to Route 51 and COTS Bus Rapid Transit Project 704 and Bus Service Expansion Route D.</p> <p>New route would serve the Whitmore Village and ‘Ewa of Kamehameha Highway portion of Wahiawa – along Kilani Avenue and California Avenue. It is acknowledged that the planned expansion of the Naval Computer and Telecommunications Area Master Station may add hundreds of workers to the site when the project is completed. This expansion may provide an opportunity to reinstate service to the facility if demand warrants during the peak periods. This would be possible with the added vehicle serving Schofield.</p> <p>Route 512 to Whitmore Village would add 14 trips, more than doubling service. Expanded service would add approximately 8 weekday bus service hours with an approximate increase of 500 passenger boardings.</p> <p>Evaluation: Review of the W-1 Report shows that Whitmore Village residents are relying more upon public transportation for their commute trip. Intermittent, unpredictable schedules deter transit use. Consistent schedules are easy to understand and plan. Providing quick connections at the Wahiawa Transit Center to access longer distance routes with an almost direct trip to Pearl Highlands will promote increased transit demand.</p> <p>Recommended for Further Evaluation: Yes</p>		

702	Increase bus service to/from Schofield and Wahiawa	\$865,000 for initial investment \$1,032,000 additional investment for replacement buses in 12 years
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30-minute peak service to Schofield; add evening service.

Purpose: To increase the attractiveness of transit travel through increased visibility and convenience, as well as reduced wait and travel times.

Project Description: Current service to Schofield Barracks is not on a predictable schedule. There may be 70 minutes between trips, 80-minutes, 85-minutes and so on. As a companion to Project 701, new route would serve Schofield Barracks on a 30-minute schedule in the peak period. New route would add 10 trips for a total of 22 trips with an estimated 600 additional passenger boardings.

Evaluation: Increased Schofield Barracks transit service will provide options for those who work on the base, the personnel stationed on the base and their families.

Recommended for Further Evaluation: Yes

703	Expanded Late Night Service, Routes 51/52	\$0 for initial investment \$3,095,000 additional investment for replacement buses in 12 years
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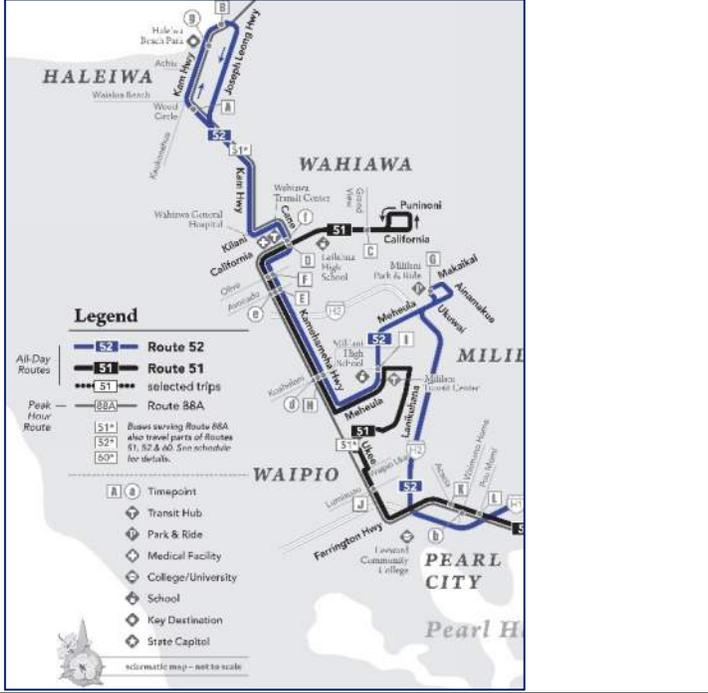
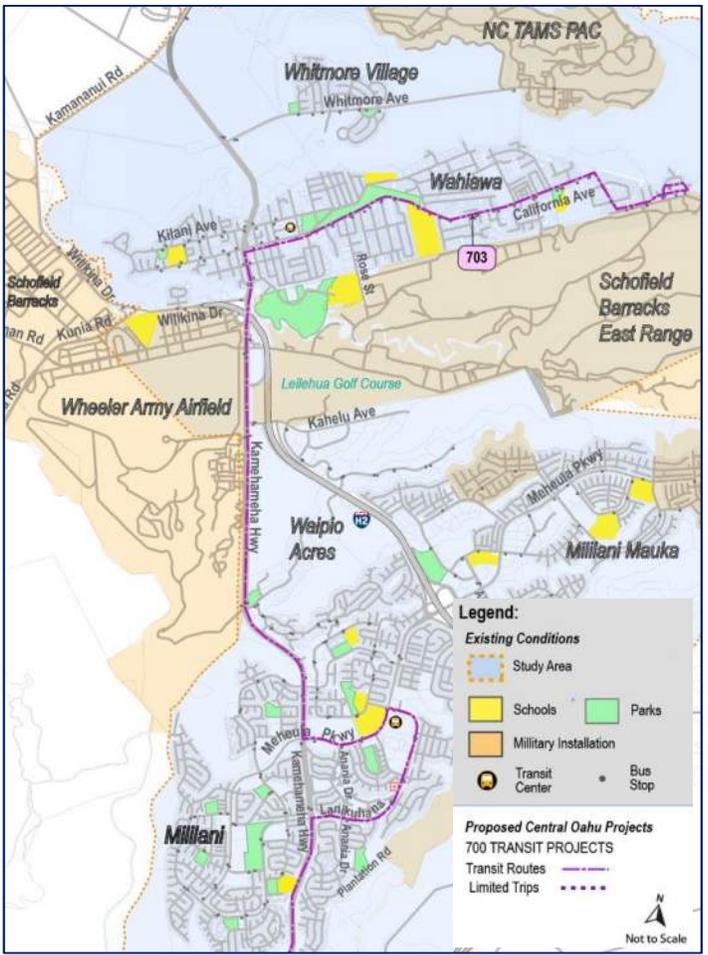
Provides 24-hour service by adding three early morning trips that continue to Haleiwa.

Purpose: To add service providing essentially 24-hour service for Wahiawa and Haleiwa residents.

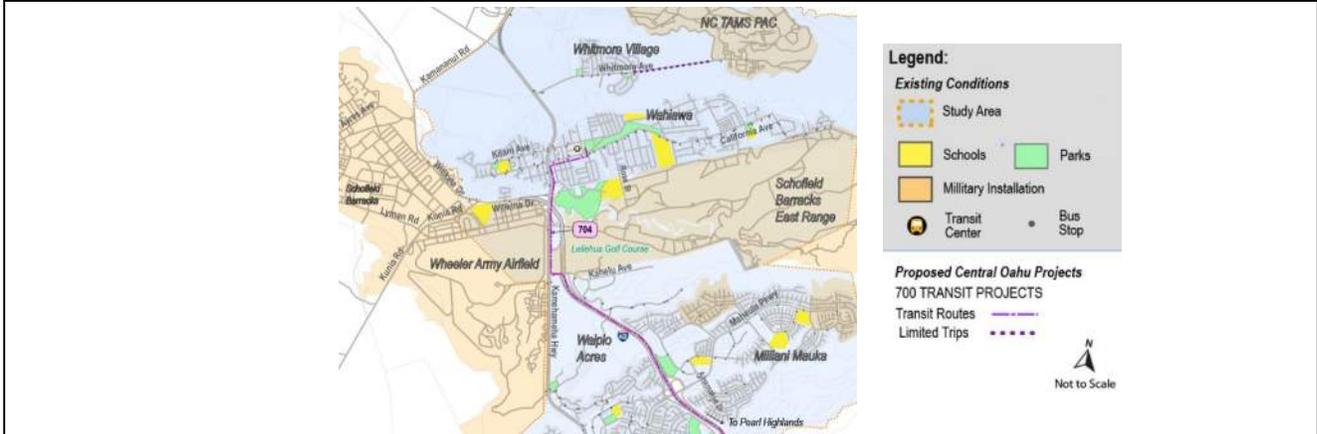
Project Description: Current Route 51's last trip to Wahiawa ends at 11:53 PM in Wahiawa Heights. The first trip out in the morning is 4:21 AM which is a 4 ½-hour gap in service. Current Route 52 last trip arrives in Haleiwa at 9:34 PM and the first morning trip is at 4:44 AM, which is a seven-hour gap in service. This project would add one Route 52 trip and three Route 51 trips. The Route 52 trip would be scheduled to arrive in Haleiwa about 11:30 PM. The three Route 51 trips would serve the Wahiawa Transit Center and continue to Haleiwa in about one-hour intervals. These four trips will provide approximately eight additional daily hours of service and provide about 450 additional passenger boardings. By increasing fixed route service hours, TheHandi-Van would provide complementary ADA paratransit service during the same service hours.

Evaluation: Many comments from both the Wahiawa and Haleiwa communities have requested added late night/early morning service. Many of the workers in these communities are service industry with variable working hours and times. Offering these additional trips may provide access to more job opportunities for these communities which have a higher unemployment rate than Oahu overall as shown in Deliverable W-1.

Recommended for Further Evaluation: Yes



704	Bus Rapid Transit to Pearl Highlands Rail Station	\$3,700,000 for initial investment for buses \$18,860,000 for construction of BRT treatments \$4,126,100 additional investment for replacement buses in 12 years
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Direct service from Armory Park & Ride to Pearl Highlands Rail Station.

Purpose: To provide faster bus transit service with some dedicated lanes through Wahiawa during the peak period accessing H-2 by the Armory Park-and-Ride lot to provide a more direct route to Pearl Highlands.

Project Description: This project revises COTS Project 102.3. The COTS Project 102.3 alignment is along Kamehameha Highway from the Wahiawa Transit Center, continuing to Mililani, serving the Mililani Transit Center and accessing H-2 to continue to the Pearl Highlands Rail Station. Treatments would include bus only lanes in the peak periods, which other bus routes would use to take advantage of increased speeds and avoid congestion. Bus Rapid Transit stops would be located at:

- Wahiawa Transit Center-terminus
- California and Makani
- Kamehameha Highway and Olive
- Kamehameha Highway and Ohai
- Armory Parking & Ride Lot
- COTS Project 408.4 Express Bus Stop on H-2 at Mililani
- COTS Project 102.5 H-2 Parking & Ride Lot
- Pearl Highlands Rail Station-terminus

Approximately 18 hours of additional bus service would be added to take advantage of BRT treatments in the peak periods; however, local routes that serve each stop would need to remain in service for passenger convenience and service area coverage. This service would serve approximately 1,750 passengers. BRT treatments would be dependent upon freeway express bus stops and associated pedestrian connections to maintain bus speed.

Evaluation: Avoiding Mililani would save approximately 8 minutes travel time. Passengers intending to travel to the Mililani Transit Center would use Route 51. Mililani passengers would access Pearl Highlands via Express Route 84.

Recommended for Further Evaluation: Yes

705	Align Express Route 83 on proposed Leilehua High School-Kahelu Road Connection	\$90,000 for construction of 6 bus stops \$3,220,200 for replacement buses in 12 years
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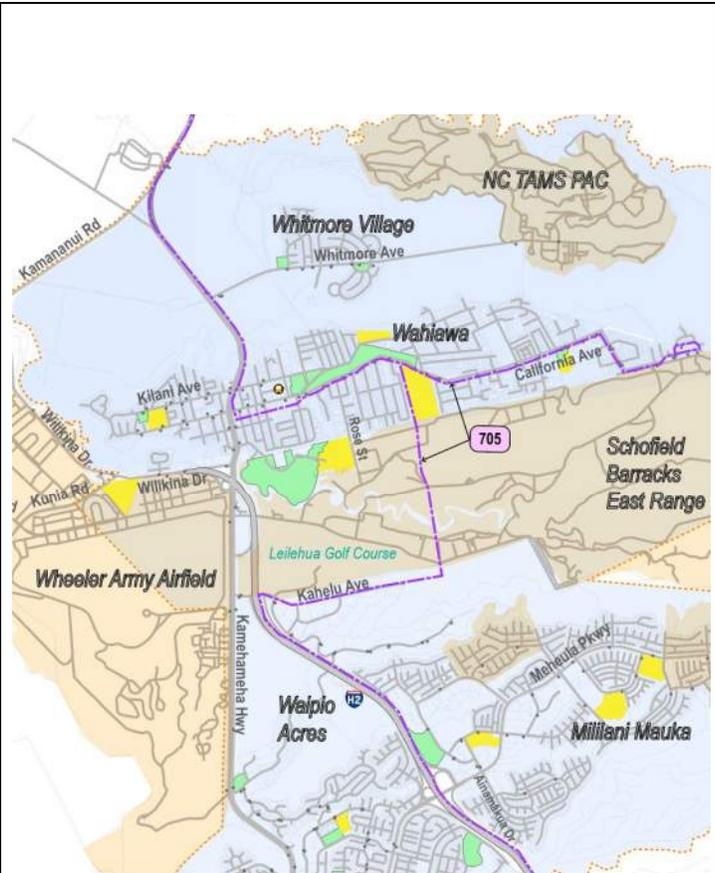
Add express bus service to proposed new road (Project 906).

Purpose: To reduced travel times and add additional connections.

Project Description: Current Route 83 serving Wahiawa Heights travels California Avenue to its turnaround point and retraces the route back to Wahiawa Transit Center. The route proceeds along Kamehameha Avenue to the Armory Park-and-Ride Lot accessing H-2 and continuing inbound. Project 705 takes advantage of Road Project 906 allowing Route 83 to avoid congestion along Kamehameha Highway and accessing H-2 via the Mililani Technology Park alignment.

Evaluation: This projected is expected to save 5 minutes per trip although no additional passenger boardings are expected. Report W-1 pointed to the high commute time for transit trips of more than double single occupant vehicle travel. This project shaves travel time, while providing access to Mililani Technology Park businesses.

Recommended for Further Evaluation: Yes



2.2 Bicycle and Pedestrian Projects

801	New off-street bicycle and pedestrian paths connecting to schools and parks: Kilani Ave, Anoni St, California Ave, Rose St, Whitmore Ave, Ihihi Ave	\$23,181,900
<p>Widen asphalt sidewalk (or construct new) for shared use path for people walking and biking.</p> <p>Purpose: To provide dedicated off-street shared-use paths in Wahiawa and Whitmore Village which connect the residential neighborhoods to schools and parks, thereby enhancing connectivity and safety for active transportation.</p> <p>Project Description: This project includes the widening of sidewalks within the existing right-of-way to obtain nearly 7.5 miles of 10-foot wide shared use paths along primary streets in Wahiawa and Whitmore Village. Facilities are proposed along the north side of Kilani Avenue (Anoni Street to Kamehameha Highway and North Cane Street to Uuku Street), the south side of California Avenue (Anoni Street to Kamehameha Highway and North Cane Street to Karsten Drive), the north side of Whitmore Avenue (Kamehameha Highway to NCS), and the west side of Rose Street (California Ave to Wahiawa Middle School) and the outside curve along Ihihi Avenue (Whitmore Avenue to Whitmore Avenue). Each of these facilities are proposed for implementation through the widening of sidewalks within the existing right-of-way. In addition, shared roadway would be proposed on Uuku Street (Glen Avenue to California Avenue) to connect the shared use paths on the eastern end of Wahiawa.</p> <p>Evaluation: Shared roadways exist in places along portions of Kilani Avenue and California Avenue, between Anoni Street and North Cane Street, passing by Kaala Elementary School, Wahiawa District Park, and a large number of residential homes. Shared roadways also exist on Whitmore Avenue, from Kamehameha Highway to NCS Wahiawa. Shared use paths are proposed to be installed in tandem with these shared roadways, providing an off-street alternative better suited for less confident cyclists. Bus transit stops along Kilani and California Avenue provides additional opportunities for multimodal connections. A connection from California Ave to Wahiawa Middle School along Rose Street would complete the network of shared use paths for accessing neighborhood schools.</p> <p>Adequate right-of-way appears available to widen existing sidewalks for use as shared use paths. Construction of these shared-use paths that connect to schools and parks encourages a modal shift away from personal vehicles to active transportation.</p> <p>Recommended for Further Evaluation: Yes</p>		

802	New pedestrian/bicycle bridge connecting Wahiawa and Whitmore Village	\$4,364,600
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Construct new pedestrian-bicycle bridge that connects Whitmore Village to Wahiawa.

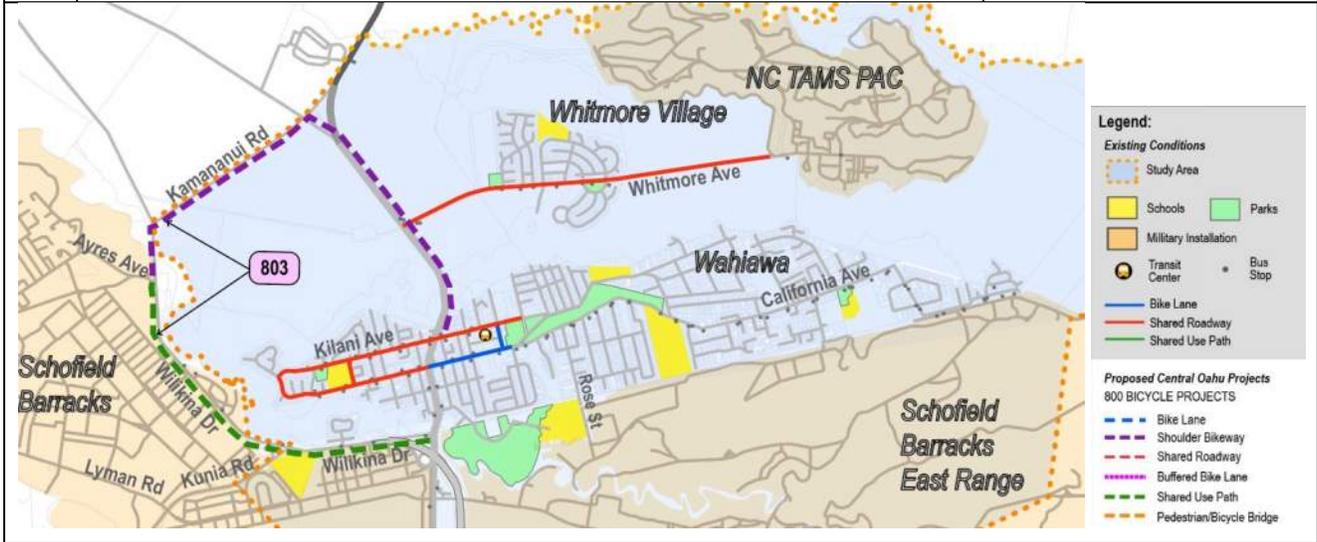
Purpose: To provide an alternative access for bicyclists and pedestrians by constructing a shared-use path bridge over the gulch connecting Wahiawa and Whitmore Village. A bike lane would also be installed along North Cane Street, from Kilani Ave to the bridge, connecting to existing facilities in Wahiawa town.

Project Description: Proposed project include the construction of a shared-use path bridge over the gulch north of North Cane Street connecting to Whitmore Avenue. In addition, a bike lane would be installed along North Cane Street, from Kilani Avenue to the bridge. The total extent of the project is 0.70 miles. The bridge is anticipated to be approximately 500-feet long and 12-feet wide.

Evaluation: Dedicated, safe, bicycle/pedestrian facilities do not exist between Wahiawa and Whitmore Village. The proposed project would provide a direct, alternative access between the communities, enhancing the safety and encouraging active transportation use.

Recommended for Further Evaluation: Yes

803	New Bike and Pedestrian Connection between Wahiawa, Whitmore Village, and NCTAMS: Wilikina Drive and Kamehameha Highway	\$6,356,900
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Widen sidewalks on Wilikina Drive; widen/pave shoulders on Kamehameha Hwy.

Purpose: To enhance bicycle travel and safety between Wahiawa, Whitmore Village and Schofield Barracks.

Project Description: This project includes the construction of 1.9 miles of 10-foot wide shared-use paths along Wilikina Drive, from Kamehameha Highway to Ayres Avenue, providing an off-street path from Schofield Barracks to Wahiawa town. In addition, the project includes 2.6 miles of shoulder bikeway along Wilikina Drive, Kamananui Road, and Kamehameha Avenue, providing a bicycle connection between communities.

Evaluation: Bicycle facilities do not exist between Wahiawa, Whitmore Village and Schofield Barracks. The proposed project provides a direct off-street path connection between Schofield Barracks and Wahiawa town with additional bicycle access to Whitmore Village. This provides alternative access that enhances the safety and accessibility for bicyclists. Adequate right-of-way is apparent along Wilikina Drive for construction of the shared use path. Along Kamananui Road, which has posted speed limit of 45 mph, the existing shoulders should be widened and paved on both sides to allow use by bikes. Along Kamehameha Avenue, which has posted speed limit of 25 mph, the existing shoulders should be widened and paved on both sides. The bridge on Kamehameha Highway over the gulch north of Kilani Avenue is narrow with separated sidewalks on either side of the travel way separated by guardrail. This segment is constrained but may suffice due to the low volumes existing/expected.

The shoulder bikeways are proposed in place of bike lanes on northern connection, Kamehameha Highway, Kamananui Road between Wahiawa, Whitmore Village and Schofield Barracks. The shared use path is proposed on southern connection, Wilikina Drive which enhances safety for pedestrians and bike. Majority of the pedestrian and bike trips for utilitarian purposes are expected off of southern connections. Northern connection is expected to serve as alternative access for multimodal travel.

Recommended for Further Evaluation: Yes

804	New and upgraded bike lanes in Wahiawa Commercial District: Kamehameha Highway, California Avenue, and Lehua Street	\$893,000
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Restripe and install bike lanes on both sides of the road.

Purpose: To provide upgraded dedicated bike facilities through the Wahiawa commercial district that separate bicycles from vehicles, enhancing bicycle travel and safety.

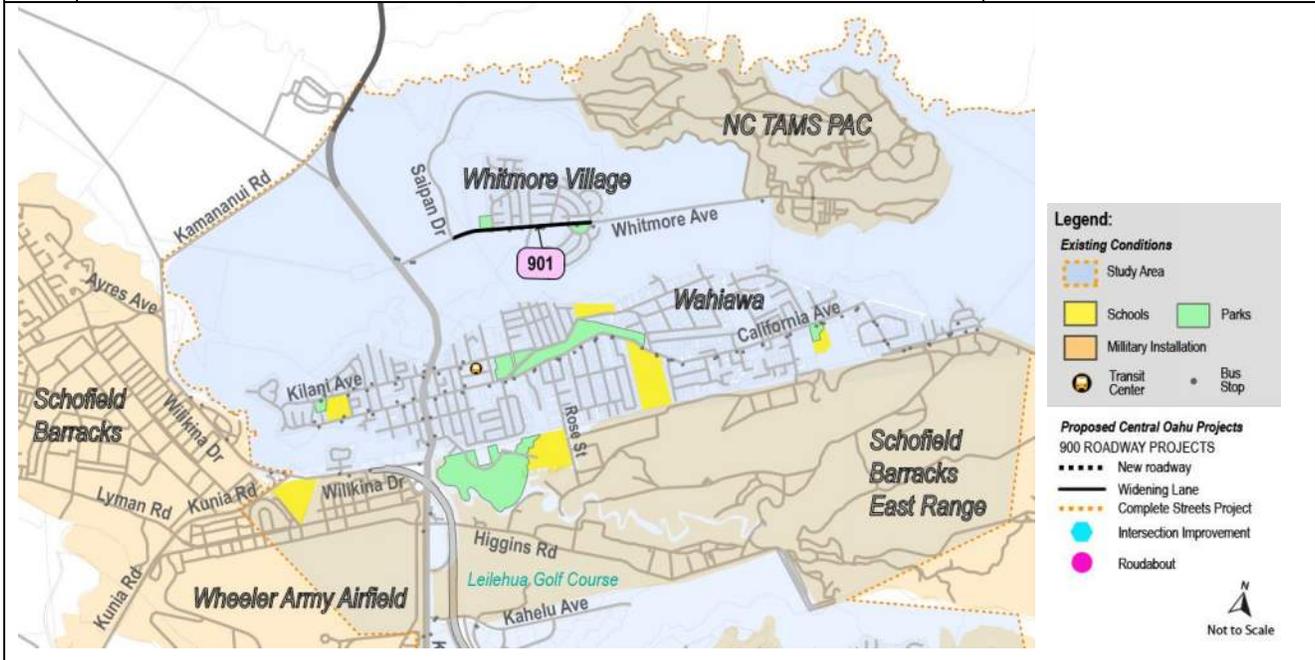
Project Description: This project would install bicycle lanes on Kamehameha Highway, between Avocado Street and Kilani Avenue, Kilani Avenue, between Kamehameha Highway and North Cane Street, and Lehua Street, between Kilani Avenue and California Avenue. The project would also widen existing bike lanes on California Avenue, between Kamehameha Highway and North Cane Street.

Evaluation: Upgraded bike lanes through the commercial district will connect the dense neighborhoods west of Kamehameha Highway and east of North Cane Street. Existing bike lanes/shared roadways on California Avenue and Kilani Avenue are being enhanced to improve the safety for bicyclists. These changes are being proposed through reconfiguring use of the travel way through restriping. Kamehameha Hwy has a curb-to-curb width of 68 feet. As a primary arterial, with off-street parking available, on-street parking is not mandatory and therefore is proposed for removal. This would allow for five 11-foot wide lanes with 6.5-foot wide bike lanes on either side. California Ave, east of Kamehameha Hwy, has a curb-to-curb width of 64-feet and 12,400-18,300 vehicles use the road per day. A road diet is proposed for this segment to include three 11-foot wide lanes, 8-foot wide parking, and 6-foot wide buffered bike lanes on either side. Kilani Ave, east of Kamehameha Hwy, has a curb-to-curb width of 40-feet. On-street parking is proposed for removal on one side, resulting in two 10-foot wide lanes, 8-foot wide parking on one side, and 6-foot wide bike lanes.

Recommended for Further Evaluation: Yes

2.3 Roadway and Traffic Operations Projects

901	Whitmore Avenue widening from end of Saipan Drive to east of Ihiihi - Nani Ihi	\$3,519,700
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Widen to accommodate new center two-way left turn lane and pedestrian safety improvements.

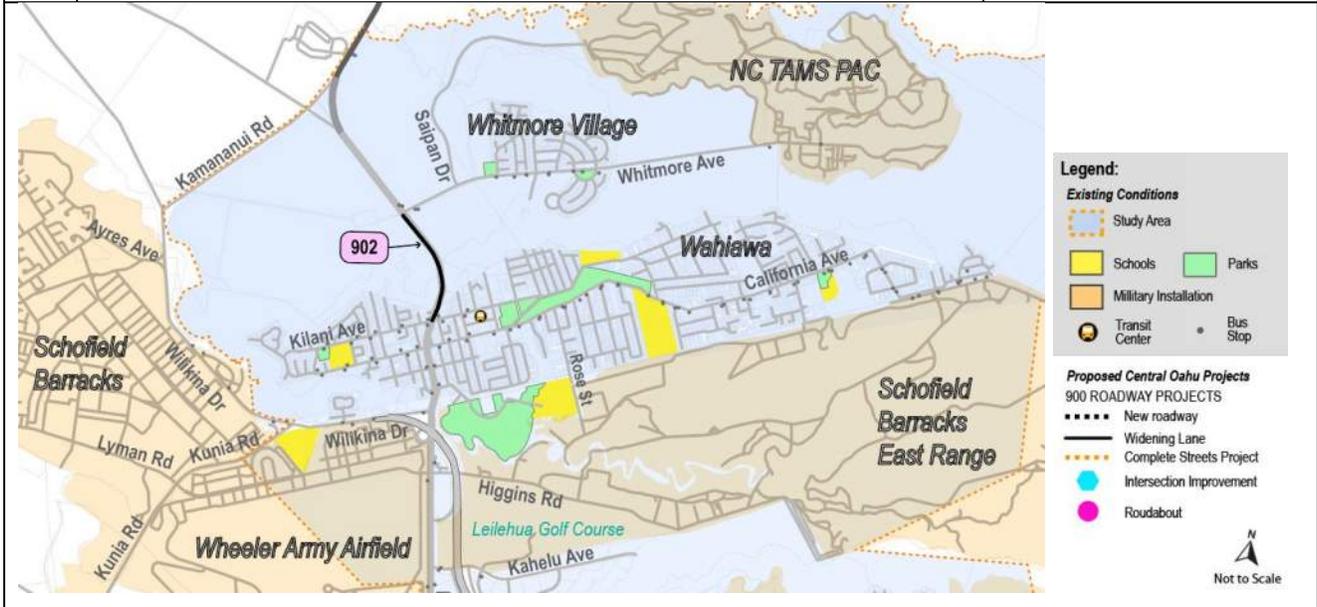
Purpose: To enhance capacity and reduce delays along Whitmore Avenue and to provide opportunities for safer pedestrian crossings (e.g. pedestrian refuge islands).

Project Description: Widen the existing two-lane pavement section from east of Saipan Drive to east of Ihiihi Avenue-Nani Ihi Avenue to for 0.66 miles to provide an 11-foot center two-way left-turn lane plus a 10-foot shared use path (plus buffer) on the north side of the roadway.

Evaluation: Currently, eastbound through vehicles must stop behind vehicles turning left into the neighborhoods located on the mauka side of the road. The daily volume is currently more than 11,000 vehicles per day between Saipan Drive and Uakanikoo Street, which makes it difficult for pedestrians to cross to access the adjacent transit stops in the area. In addition, the Navy has plans to increase employment levels (resulting in higher traffic volumes) using the entire length of this street. By providing left-turn pockets and refuge lanes, traffic operations will be enhanced, and the additional width in the middle of the street will provide opportunities for two-stage pedestrian crossings.

Recommended for Further Evaluation: Yes

902	Kamehameha Highway widening from north of Whitmore Avenue to Kilani Avenue	\$17,999,000
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Widen highway and bridge from two-lanes to four-lanes; project may be combined with project 909.

Purpose: To provide additional capacity for traffic and reduce vehicle delays on the highway between Wahiawa and Whitmore Avenue.

Project Description: Widen the existing two-lane pavement section to four through lanes (two in each direction) plus a 10-foot wide shared use path with buffer on the east side of the street. The widening would be made from north of Whitmore Avenue to Kilani Street and would be 0.8 miles long. This would require widening the existing roadway by at least 22-feet including the approximate 300-foot long Karsten Thot bridge section just north of Kilani Avenue.

Evaluation: The existing volume on this section of roadway is roughly 27,500 vehicles per day and this volume is expected to increase to nearly 31,000 vpd by 2040. These volumes far exceed the typical capacity of a two-lane roadway by more than 50%. Existing congestion extends back to where the highway meets Kamananui Road during the PM peak period, and the additional capacity would also reduce delays at the Whitmore Avenue intersection, where a dual westbound left-turn lane could be installed with this segment capacity enhancement. A construction challenge for this improvement are the adjacent ground slopes that may require retaining walls to accommodate the roadway widening.

Recommended for Further Evaluation: Yes

903	California Avenue Complete Streets Project from Kamehameha Highway to Wahiawa District Park	\$7,303,048
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Install safety improvements, including dedicated bicycle facilities and widened sidewalks.

Purpose: To better balance the mobility options amongst all modes and enhance safety for all road users on California Avenue in Wahiawa.

Project Description: The project includes implementing complete streets improvements on California Avenue with the intent of moderating vehicle speeds, providing dedicated bicycle facilities, widening sidewalks and waiting areas at intersections, shortening pedestrian crossing distances, and expanding the on-street parking supply. The improvements would be made for a 0.45-mile long segment between Kamehameha Highway and Wahiawa District Park.

Evaluation: The City & County of Honolulu Department of Transportation Services (DTS) has developed several plans for implementing projects that are driven by complete streets policies established in 2012. Improvements are often implemented during regularly schedules repaving projects, but can sometimes include additional and more substantive improvements that may include curb extensions, road diets, provision of on-street parking, bike lanes, enhanced transit stops, etc. The end result of these types of projects is increased pedestrian and bicycle activity, increased transit patronage (where applicable), often increased economic activity for adjacent businesses, and most importantly, improved safety and convenience for all travelers.

Recommended for Further Evaluation: Yes

904	Muliwai Avenue Extension
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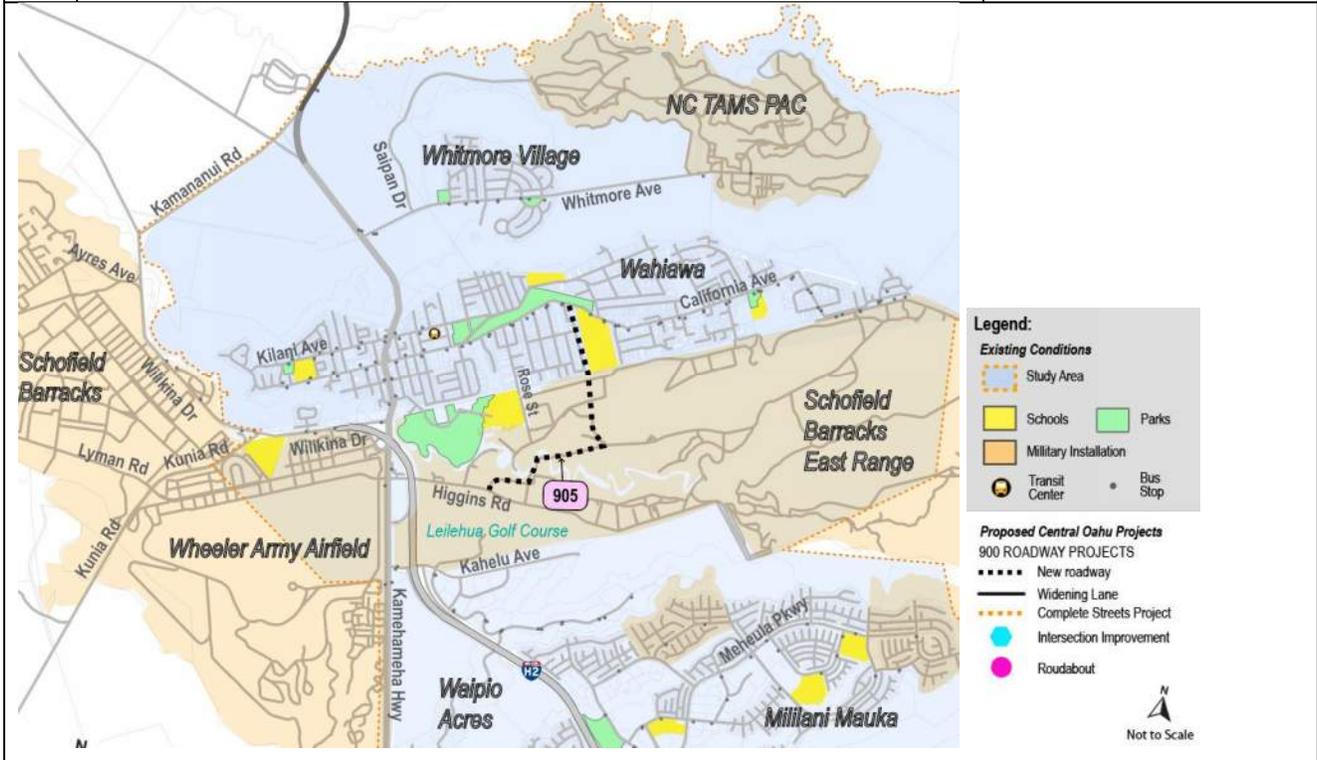
Purpose: To increase connectivity between Wahiawa and the adjacent community to the south and increase accessibility to Wahiawa east of Kamehameha Highway, thus reducing the traffic volume on Kamehameha Highway immediately north of the H-2 freeway.

Project Description: Extend Muliwai Avenue from Neal Avenue to Higgins Road approximately 1,000 feet east of the H-2 freeway alignment. This would involve constructing a new roadway roughly 0.5 miles in length that would include a 22-foot wide pavement section and a 10-foot wide shared use path with buffer on the east side of the street. This roadway would have to be constructed along the eastern edge of the existing electrical substation located at the southern/makai terminus of Muliwai Avenue, would include a new 500-foot-long bridge across the South Fork of Kaukonahua Stream, and would extend across existing military property.

Evaluation: The connection between Higgins Road and Neal Avenue would have limited benefit since the connection between the freeway and the Muliwai Avenue/Neal Avenue neighborhood would be circuitous. A preliminary assessment shows that this new extension would serve fewer than 500 vpd. In addition, this connection would also add traffic to existing local streets with front-on housing that were not designed to operate as collector streets with higher traffic volumes. Lastly, the additional traffic would exacerbate conditions for bicyclists and pedestrians where no separate facilities on existing streets are available.

Recommended for Further Evaluation: No

905	Leilehua High School – East Range Connection	
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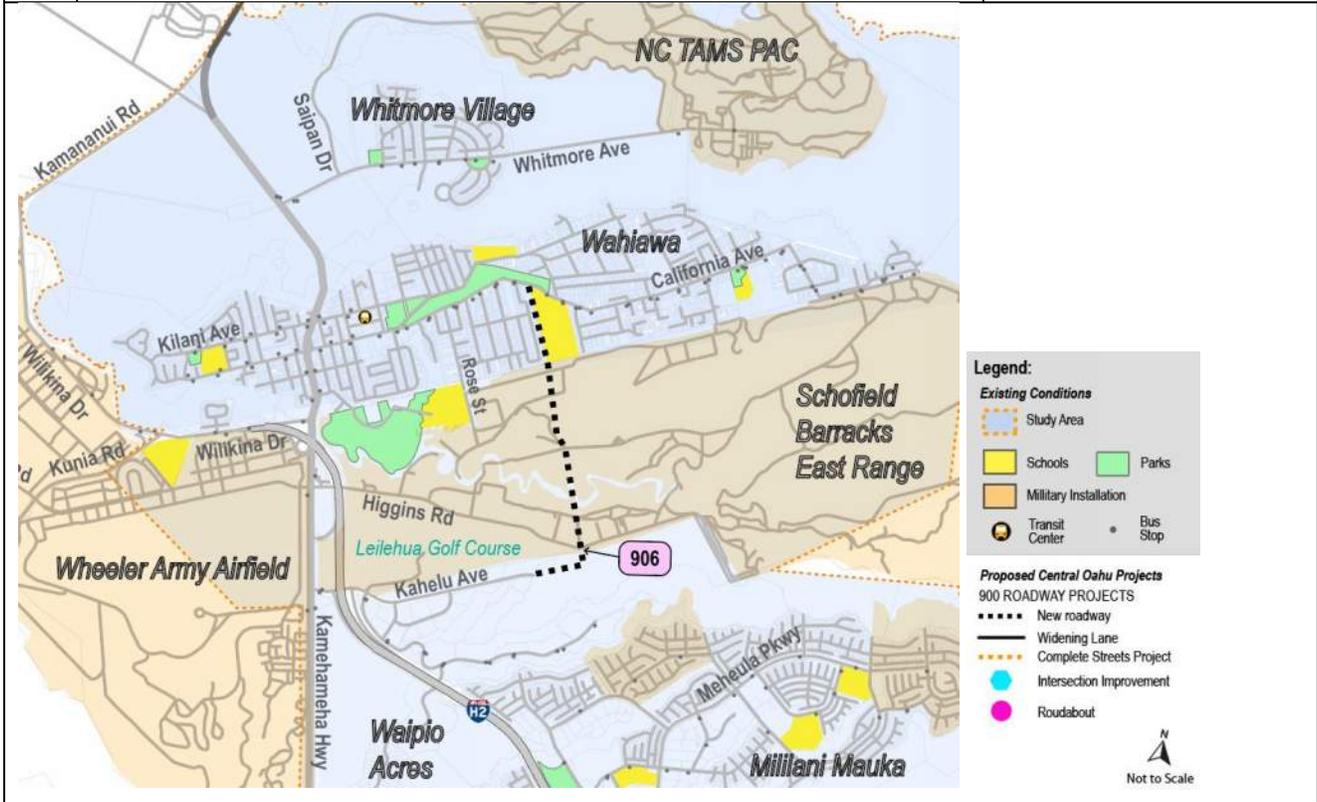
Purpose: To increase connectivity between Wahiawa and the adjacent community to the south and increase accessibility to Wahiawa east of Kamehameha Highway, thus reducing the traffic volume on Kamehameha Highway immediately north of the H-2 freeway.

Project Description: Construct a new 1.75-mile long roadway linking California Avenue to East Range Road and ultimately Higgins Road. This would involve constructing a new roadway that would include a 22-foot wide pavement section and a 10-foot wide shared use path with buffer on the east side of the street. This roadway would be constructed from California Avenue along the western edge of the high school property and connect to East Range Road across military property south of the high school. An existing bridge over the South Fork of Kaukonahua Stream would have to be widened and or replaced, additional grade issues would require longer roadway sections and/or additional bridges, and the new road would be located on the East Range Road alignment (adjacent to existing military buildings). The western terminus of this new roadway would connect to Higgins Road approximately 2,250 feet east of the H-2 freeway alignment.

Evaluation: This connection would have greater benefit than Project 904 but a preliminary assessment shows that this new roadway would still serve fewer than 1,000 vpd. Construction of the roadway along the high school property would require elimination of a substantial number of parking spaces. This would not provide a substantial benefit to Kamehameha Highway and would not justify construction of a new roadway with multiple complex design issues.

Recommended for Further Evaluation: No

906	New roadway at Leilehua High School-Kahelu Road connection between California Avenue and Higgins Road	\$30,289,000
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Construct new two-lane road.

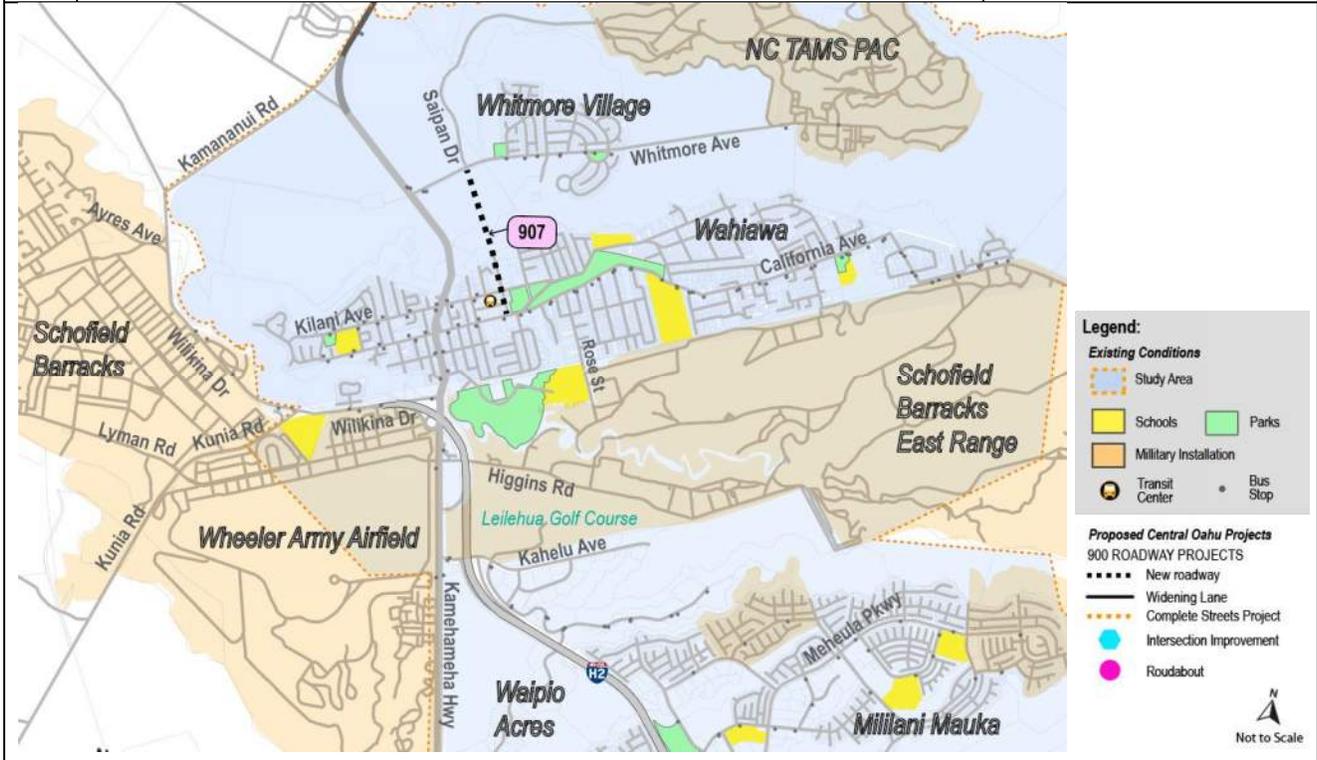
Purpose: To increase connectivity between Wahiawa and the adjacent community to the south and increase accessibility to Wahiawa east of Kamehameha Highway, thus reducing the traffic volume on Kamehameha Highway immediately north of the H-2 freeway.

Project Description: Construct a new 1.75-mile long roadway linking California Avenue to the eastern terminus of Kahelu Avenue. This would involve constructing a new roadway that would include a 22-foot wide pavement section and a 10-foot wide shared use path with buffer on the east side of the street. This roadway would be constructed from California Avenue along the western edge of the high school property and extend across East Range Road and military property south of the high school. An existing bridge over the South Fork of Kaukonahua Stream would have to be widened and or replaced, and additional grade issues may require longer roadway sections and/or additional bridges.

Evaluation: The specific benefit of this project compared to Project 905 is that Kahelu Avenue provides direct access to the H-2 freeway, and a preliminary assessment shows that this new roadway could serve as many as 3,000 to 4,000 vpd. Construction of the roadway along the high school property would require elimination of a substantial number of school parking spaces and there are not immediately obvious areas to replace this parking. Although this project still includes multiple complex design issues, this connection would provide the most substantial benefit to Kamehameha Highway and to improved access to eastern Wahiawa neighborhoods.

Recommended for Further Evaluation: Yes

907 Whitmore Avenue – Wahiawa Civic Center Connection



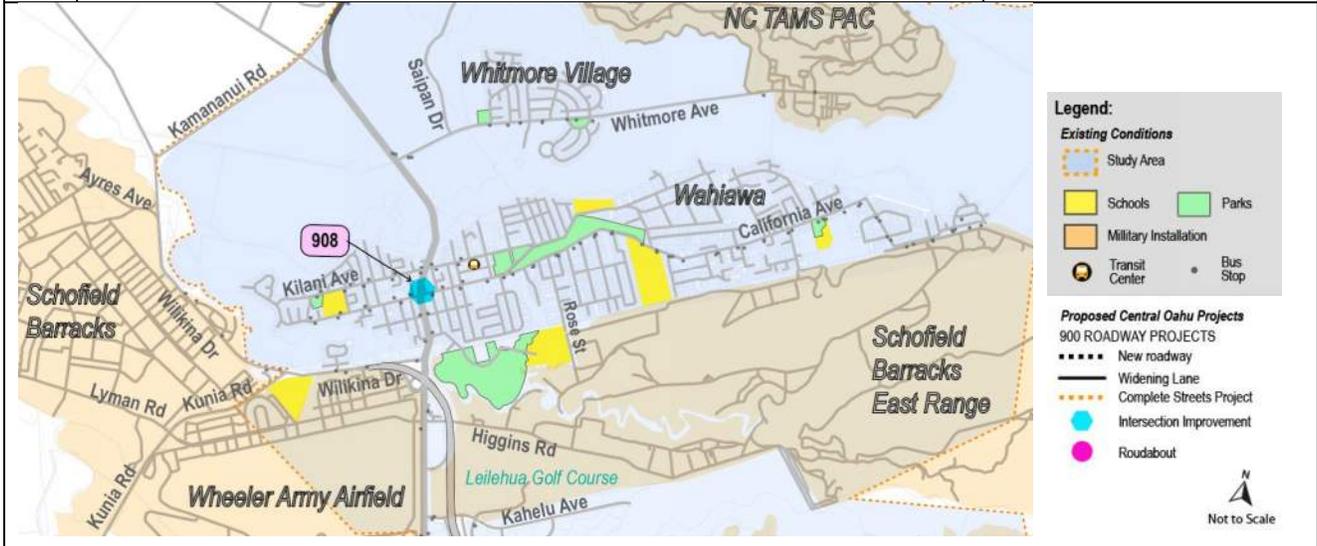
Purpose: To increase connectivity between Wahiawa and Whitmore Village and to reduce traffic demand on Kamehameha Highway between the two communities.

Project Description: Construct a new 0.5-mile long roadway linking Whitmore Avenue opposite Saipan Drive to the mauka terminus of N. Cane Street adjacent to the Wahiawa Civic Center. This would involve constructing a new roadway that would include a 22-foot wide pavement section and a 10-foot wide shared use path with buffer on the east side of the street. This roadway would be constructed through existing agricultural land mauka of the river and would include an approximate 700-foot bridge (depending on the alignment) across the North Fork of Kaukonahua Stream.

Evaluation: Based on a preliminary assessment, this new roadway would serve between 1,500 and 2,000 vpd. Adding traffic to Cane Street would be more acceptable from a traffic engineering perspective since it includes a limited number of driveways and is fronted entirely by non-residential uses on the west side of the street. This connection would also provide a second multimodal access point to Whitmore Village that would enhance emergency access. However, the potential commensurate reduction in traffic on Kamehameha Highway would not be substantial enough to avoid additional capacity enhancements on the highway. In addition, secondary emergency access would be more beneficial further east, but a reasonable connecting point in Wahiawa (to Kilani Avenue or Glen Avenue) could not be identified without adding substantial traffic to a local street with front-on-housing, as well requiring the taking of a home to make a connection.

Recommended for Further Evaluation: No

908	Kamehameha Highway/California Avenue intersection modification (Blue Zone Project)	
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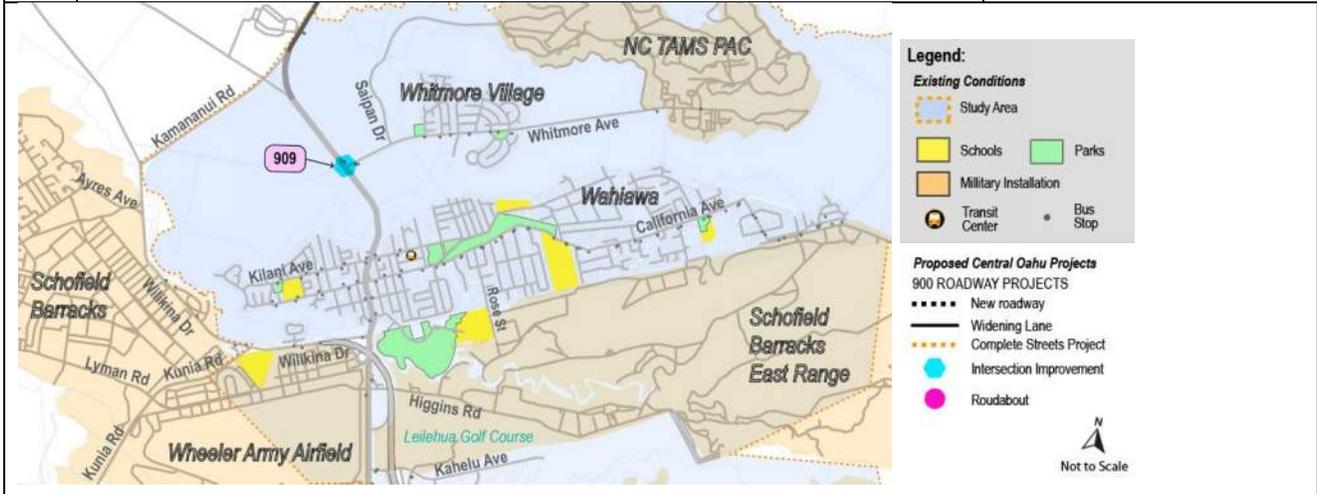
Purpose: To reduce vehicle delays for northbound vehicles turning left from Kamehameha Highway onto California Avenue.

Project Description: Increase the length of the protected phase for the northbound left-turn and optimize the signal within the corridor.

Evaluation: Currently, HDOT, which has jurisdiction over Kamehameha Highway, controls the signal timing at this intersection, and it is optimized for giving priority to northbound and southbound traffic on the highway. By increasing the length of the left-turn phase, time from other phases (likely those serving the California Avenue approaches) would have to be shortened to minimize impacts to highway flow. This would result in increases in delays for vehicles on California Avenue. While this project could be studied further and implemented as a local improvement project, it would have a limited community and regional benefit for Wahiawa and the remainder of the COTS area. In addition, Project 911, which addresses signal timing for the entire length of the highway through Wahiawa will provide greater area-wide benefit.

Recommended for Further Evaluation: No

909	Kamehameha Highway at Whitmore Avenue Intersection Improvements	\$1,974,000
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Widen roadway to accommodate dual westbound turns. This project may be combined with project 902.

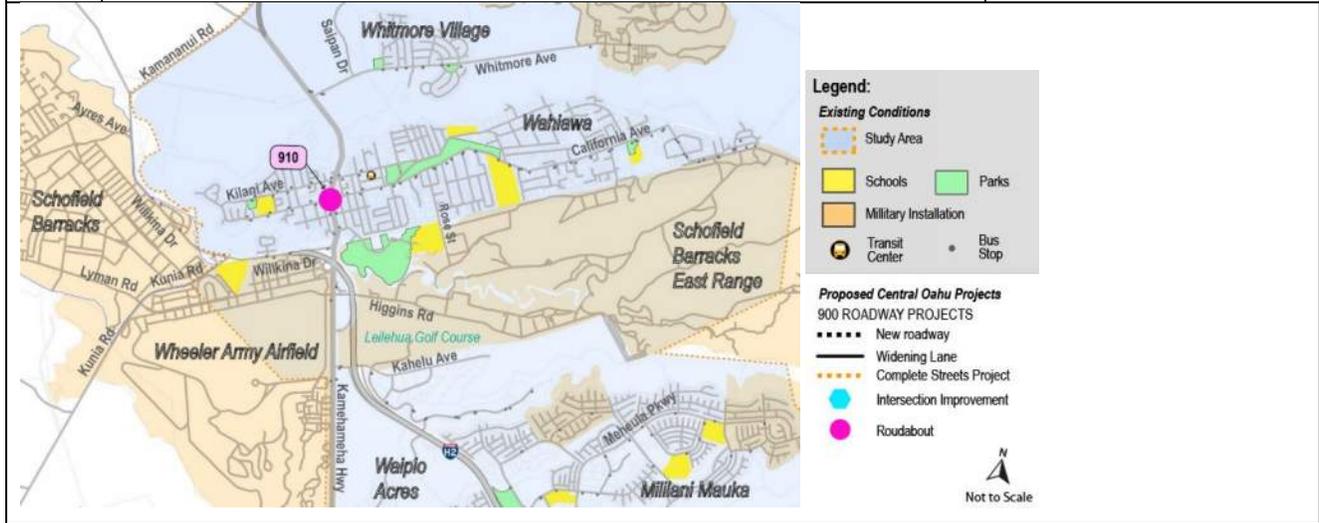
Purpose: To increase intersection capacity and reduce delays for all vehicles at the intersection.

Project Description: Widen the westbound approach and southbound departure legs to accommodate a second westbound left-turn lane on Whitmore Avenue. This would involve widening the subject road sections for a total of approximately 750 feet to include an additional 11 feet of pavement and modifying the signal accordingly.

Evaluation: The existing westbound turning movement volume is approximately 500 vehicles in each of the AM and PM peak hours. This volume far exceeds the would typically warrant two left-turn lanes and the additional capacity would allow for more “green time” for through traffic on Kamehameha Highway. This improvement would also be a companion project with Project 902 (Kamehameha Highway widening) if they are both constructed.

Recommended for Further Evaluation: Yes

910	Roundabout at Kamehameha and California Avenue	\$3,134,000
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Construct a two-lane roundabout to replace existing traffic signal. Create gateway feature.

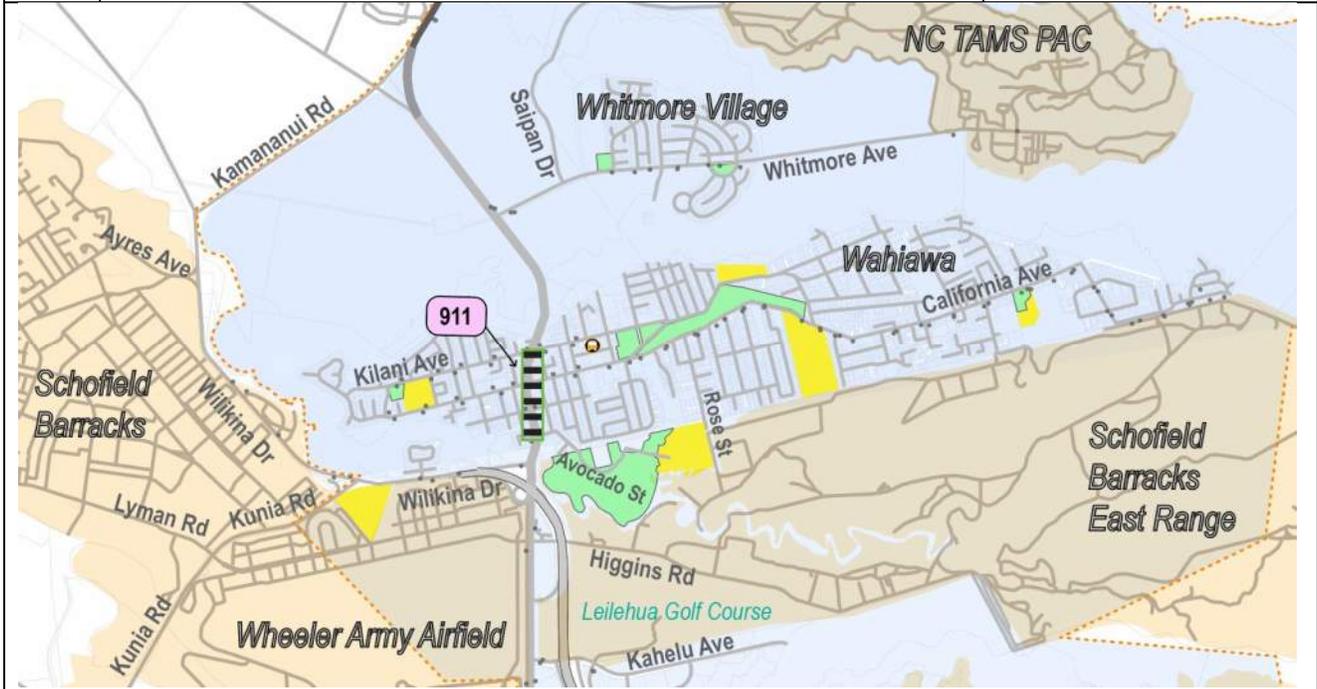
Purpose: To reduce vehicle delays, the number of vehicles required to stop, and the potential severity of vehicle collisions at this location.

Project Description: Construct a two-lane roundabout to facilitate vehicle movement. This would involve realigning each of the intersection approaches to provide adequate deflection that would reduce the speed of vehicles entering and existing the roundabout. The required inscribed diameter would be between 150 and 180 feet for an urban two-lane roundabout. Additional treatments would include pedestrian crossings and bike ramps.

Evaluation: The existing traffic volumes on the approaches to this intersection range from roughly 4,000 to 45,000 vehicles per day, the latter of which is at the upper limit of a two-lane roundabout capacity. In addition, the wide range of volume will affect the ability for some traffic to find adequate gaps to enter the intersection. Roundabouts are beneficial in that they require fewer vehicle stops (benefiting driver convenience and air quality), they result in reduced vehicle collision severity, have lower overall maintenance costs compared to a traffic signal, and can improve traffic flow in many situations.

Recommended for Further Evaluation: Yes

911	Kamehameha Highway between Kilani Avenue and Avocado Street Traffic Signal Timing	\$60,000
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Re-time traffic signals.

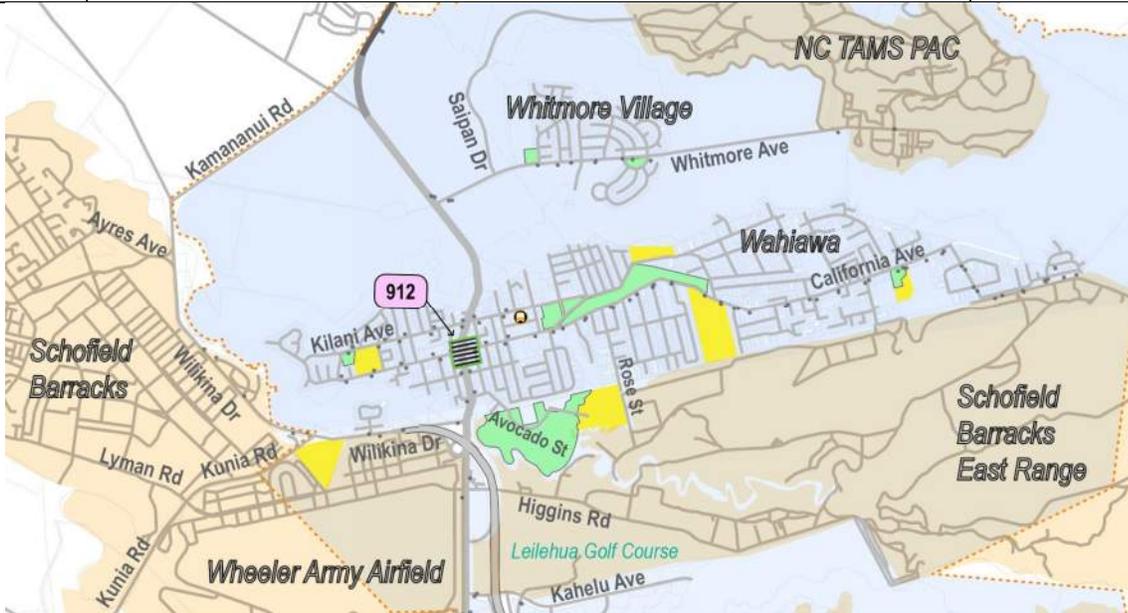
Purpose: To increase arterial throughput, reduce congestion along the highway, and manage travel speeds.

Project Description: Conduct new traffic counts and queuing observations at and analyze signal operations to identify initial timing modifications at the four signalized intersections in Wahiawa between Kilani Avenue and the H-2 southbound off-ramp to Kamehameha Highway. Install adaptive signals at all locations and conduct field observations after initial timing is implemented and refine timings accordingly.

Evaluation: According to the Federal Highways Administration (FHWA), adaptive signals have been shown to increase capacity along corridors by 5% to 15% based on studies in other jurisdictions and reduce travel time by an average of 10%. Overall, adaptive signals have been implemented nationally at less than 1% of candidate sites according to the same source. Timings can also be adjusted to maintain desired travel speed along a corridor to enhance safety.

Recommended for Further Evaluation: Yes

912	California Avenue between Kamehameha Highway and Wahiawa District Park Traffic Signal Timing	\$45,000
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Re-time traffic signals.

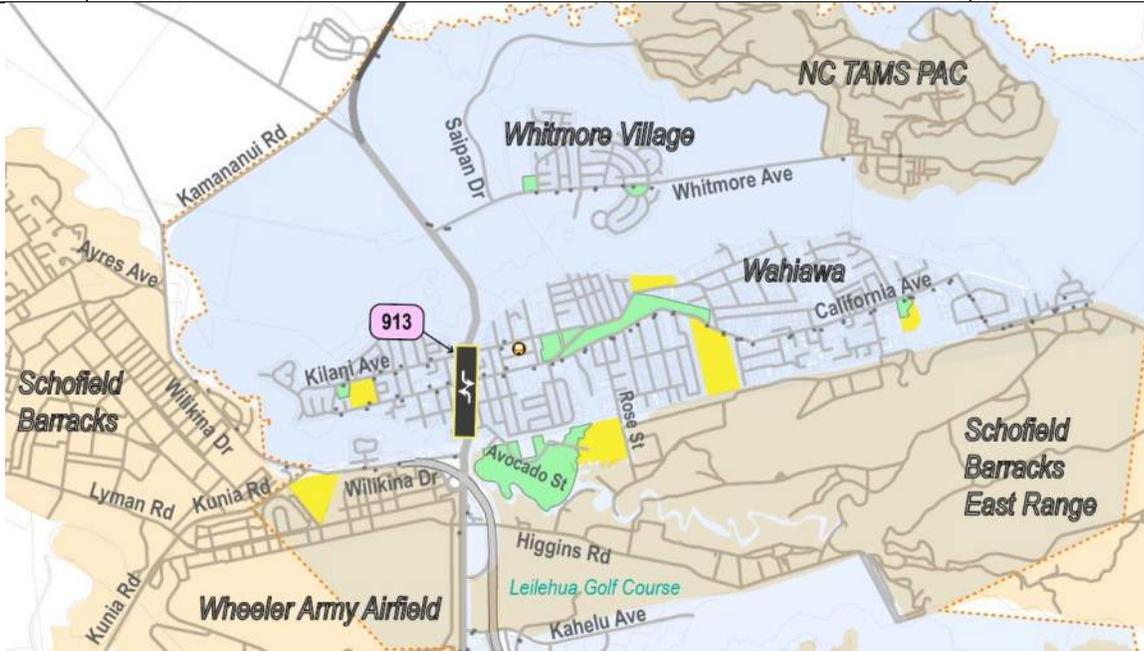
Purpose: To increase arterial throughput, reduce congestion along the street, and manage travel speeds.

Project Description: Conduct new traffic counts and queuing observations at and analyze signal operations to identify initial timing modifications at the three signalized intersections in Wahiawa east of Kamehameha Highway to N Cane Street. Install adaptive signals at all locations and conduct field observations after initial timing is implemented and refine timings accordingly.

Evaluation: According to the Federal Highways Administration (FHWA), adaptive signals have been shown to increase capacity along corridors by 5% to 15% based on studies in other jurisdictions and reduce travel time by an average of 10%. Overall, adaptive signals have been implemented nationally at less than 1% of candidate sites according to the same source. Timings can also be adjusted to maintain desired travel speed along a corridor to enhance safety.

Recommended for Further Evaluation: Yes

913	Two-Way Left-Turn Lane on Kamehameha Hwy in Wahiawa	\$96,000
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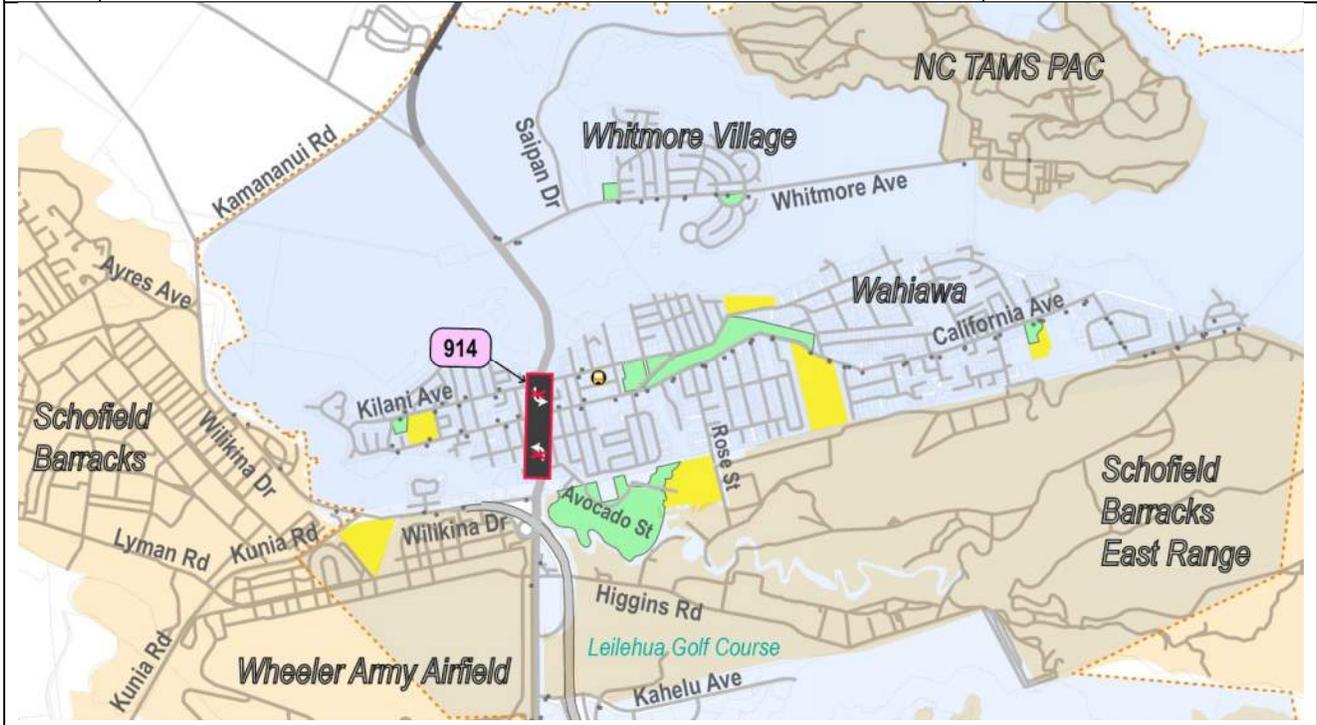
Purpose: To formalize access to fronting properties by providing a dedicated area for left-turning vehicles along the highway.

Project Description: Re-stripe the roadway to provide a center two-way left-turn lane (TWLTL) between signalized intersections along the highway. Currently, a TWLTL is only provided between Olive Avenue and Avocado Street, primarily because left-turns from Kamehameha Highway are prohibited at Avocado Street. Between the other intersections located mauka of Olive Avenue, left-turn pockets are striped for the entire length of each segment to accommodate the vehicle queues that occur during the peak hours.

Evaluation: During lower demand times, some vehicles use the left-turn pockets as de facto TWLTL and drivers of through vehicles generally allow waiting vehicles to merge or turn (as though turning vehicles were in a TWLTL). Formalizing this area would primarily provide a benefit during off-peak times but would not impact the ability of left-turning vehicles at the signals from extending back into the pockets.

Recommended for Further Evaluation: No

914	Eliminate Left-Turns from Kamehameha Hwy between Signalized Intersections in Wahiawa	
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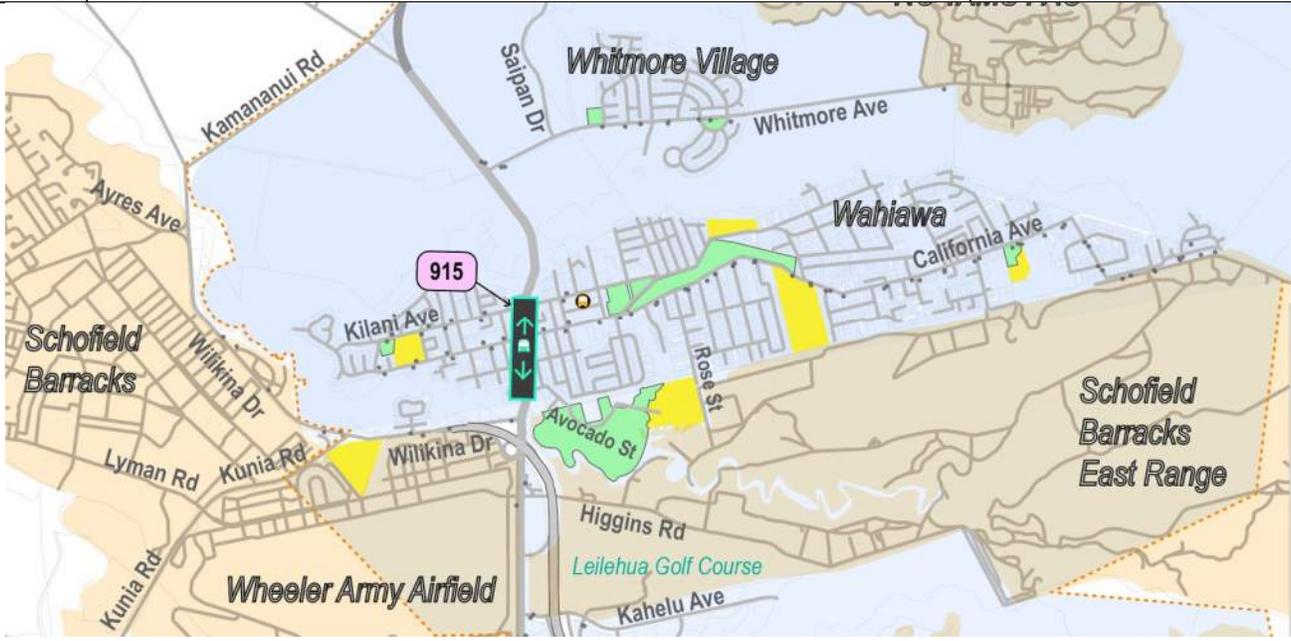
Purpose: To reduce conflicts and arterial throughput along the highway.

Project Description: Prohibit left turns between signalized intersections using painted or raised medians and signage. If only striping is used, then no changes to the cross section would likely be required. However, installation of a raised median separating directions of travel may require elimination of parking on one side of street to provide adequate median width. In addition, U-turns would ideally be permitted at each signalized intersection to minimize impacts to access of fronting properties on the highway.

Evaluation: Observations indicate that lengthy queues form in most left-turn pockets on the highway during peak periods, with the greatest congestion occurring during the PM peak period. All of the left-turn movements are single lanes, and increasing the number of U-turns would subsequently result in reduced capacity at the intersection. Given the need to continue to provide access to fronting properties and the need to maximize capacity at the intersections, this project is not considered feasible at this time.

Recommended for Further Evaluation: No

915	Transit Signal Priority on Kamehameha Highway between Kilani Avenue and Avocado Street	\$175,000
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Add transit signal bus prioritization on Kamehameha Highway.

Purpose: To reduce delays for buses and increase the convenience and attractiveness of transit.

Project Description: Install transit signal priority (TSP) or signal preemption at all signalized intersections on Kamehameha Highway and California Avenue (between the transit center and the highway) in Wahiawa. This will allow signal phases on the highway or on cross-streets to be extended to expedite flow for buses and reduce delay for these vehicles.

Evaluation: Signal preemption for buses will reduce travel times by up to two minutes or more through Wahiawa depending on the level of priority assigned and the arrival time of a bus at a signal. This project could be integrated with the adaptive signals identified in Project 1001 (Signal Timing Optimization), although the priority would be for buses instead of all vehicles under this project. TSP works best for far-side bus stops so that impacts to other vehicle movements are minimized. When bus service is ultimately provided to the Pearl Highlands rail transit station, minimizing bus delays will be paramount to making transit more attractive to riders and making it a competitive mode with driving alone.

Recommended for Further Evaluation: Yes

2.4 Summary of Initial Evaluation

Each project in **Table 1** was evaluated to determine whether a project is recommended for further evaluation. **Table 2** provides a summary of these recommendations. In summary, out of 24 initial projects, 18 are recommended for further evaluation. The 18 individual projects are scored and ranked in **Section 3.0**.

Table 2. Summary of Project Recommendations

Number	Project	Location	Recommended for Further Evaluation?
700 Transit Projects			
701	Increase bus service to/from Whitmore Village and Wahiawa Transit Center	Whitmore Village and NCTAMS	Yes
702	Increase bus service to/from Schofield and Wahiawa	Schofield	Yes
703	Expanded Late Night Service, Routes 51/52	Wahiawa	Yes
704	Bus Rapid Transit to Pearl Highlands Rail Station	Wahiawa	Yes
705	Align Express Route 83 on proposed Leilehua High School-Kahelu Road Connection	Wahiawa	Yes
800 Bicycle and Pedestrian Projects			
801	New off-street bicycle and pedestrian paths connecting to schools and parks: <ul style="list-style-type: none"> • Kilani Avenue • Anoni Street • California Avenue • Rose Street • Whitmore Avenue • Ihihi Avenue 	Wahiawa and Whitmore Village	Yes
802	New pedestrian/bicycle bridge connecting Wahiawa and Whitmore Village	Wahiawa and Whitmore Village	Yes
803	New bike and pedestrian connection between Wahiawa, Whitmore Village, and NCTAMS: <ul style="list-style-type: none"> • Wilikina Drive • Kamehameha Highway 	Wahiawa	Yes
804	New and upgraded bike lanes in Wahiawa Commercial District: <ul style="list-style-type: none"> • Kamehameha Highway • California Avenue • Lehua Street 	Wahiawa	Yes
900 Roadway and Traffic Operations Projects			
901	Whitmore Avenue widening from end of Saipan Drive to east of Ihihi-Nani Ihi	Whitmore Village	Yes
902	Kamehameha Highway widening from north of Whitmore Avenue to Kilani Avenue	Whitmore Village	Yes
903	California Avenue Complete Streets Project from Kamehameha Highway to Wahiawa District Park	Wahiawa	Yes

Number	Project	Location	Recommended for Further Evaluation?
904	Muliwai Avenue extension between Neal Avenue and Higgins Road	Wahiawa	No
905	Leilehua High School-East Range Road connection between California Avenue and Higgins Road	Wahiawa	No
906	New roadway at Leilehua High School-Kahelu Road connection between California Avenue and Higgins Road	Wahiawa	Yes
907	Whitmore Avenue-Wahiawa Civic Center connection between Whitmore Avenue (opposite Saipan Drive) to Kilani Avenue (via Cane Street)	Wahiawa and Whitmore Village	No
908	Kamehameha Highway/California Avenue intersection modification (Blue Zone Project)	Wahiawa	No
909	Kamehameha Highway at Whitmore Avenue Intersection Improvements	Whitmore Village	Yes
910	Roundabout at Kamehameha Highway and California Avenue	Wahiawa	Yes
911	Kamehameha Highway between Kilani Avenue and Avocado Street Traffic Signal Timing	Wahiawa	Yes
912	California Avenue between Kamehameha Highway and Wahiawa District Park Traffic Signal Timing	Wahiawa	Yes
913	Two-way left turn on Kamehameha Highway between Kilani Avenue and Avocado Street	Wahiawa	No
914	Restrict mid-block left-turn movements on Kamehameha Highway from Kilani Avenue to Avocado Street	Wahiawa	No
915	Transit Signal Priority on Kamehameha Highway between Kilani Avenue and Avocado Street	Wahiawa	Yes

3.0 PROJECT SCORING AND RANKING

The ranking of projects was established by synthesizing an extensive amount of technical data and qualitative information to create a ranking system that will be used as input to the recommended program of short-term, mid-term, and long-term COTS area improvements. The ranking system is based on individual scores for each potential benefit. The scoring process by which this was accomplished is presented in the sections below.

3.1 Approach and Methodology

The intent of this effort was to use a systematic process to initially rank individual projects that would enhance mobility within the COTS area. Projects were evaluated based on their merit through an evaluation of traffic operating conditions, the benefits they are expected to provide, and the potential impacts resulting from their implementation. This process will be used to guide the development of a phased implementation program. The results of the ranking process are not intended to be absolute, but merely one method of comparing a wide variety of improvements against a uniform baseline of criteria.

The criteria used in the project ranking matrix process were based on several sources including: the overarching transportation goals of OahuMPO, the specific COTS study goals, the community values expressed by stakeholders and participants in the public outreach process, and industry practice. The use of all-encompassing metrics to initially prioritize and rank projects would have been cumbersome, complex, and not meaningful in terms of distinguishing projects from one another. For example, comparing a local bicycle pathway project with a new roadway or congestion pricing was not possible using a single set of measures for all projects. Instead, key performance metrics were used to evaluate comparable projects and a separate “project score” was determined for ranking purposes. The key areas for comparison scoring are:

- Area of benefit
- Number of other modes enhanced
- Contributes to mode share goal
- Potential to reduce vehicle congestion
- Enhanced infrastructure condition
- Safety
- Deficiency status.

3.1.1 Area of Benefit

This study includes a wide variety of improvements. Each of the proposed improvements has a different range of impact or area of benefit. For example, a bicycle path will help to expand the bikeway network within the overall study area but by itself may have a very localized impact relative to the rest of the COTS region. Other projects, such as HOV lanes, may provide substantial additional lane capacity that will likely change regional travel in and through multiple communities. Lastly, TDM measures and other programs can be applied across a wide geographic area and have less of a local impact. However, these measures may require additional elements or projects to be effective.

The area of benefit scoring is as follows:

- *Regional = 3*
- *Local = 2*
- *Program-Level = 1, where regional projects are deemed to have the highest value.*

3.1.2 Number of Other Modes Enhanced

A primary goal of the COTS project is to identify mobility improvements and programs that result in a sustainable transportation system and ultimately require less reliance on single-occupant travel. To that end, one of the key performance measures is the reduction in the use of single occupant vehicles by commuters from an existing level of 75% of all commute trips to a future level of 60% by 2040. A key metric in accomplishing this goal is to identify which projects will enhance or increase use of more than one of the

four primary travel modes (i.e., auto, bike, walk, and transit). For example, providing a fixed guideway transit system would increase the use of biking and walking to stations instead of someone driving the entire length of a trip. Hence, most transit projects will enhance two (2) other modes. Similarly, a bicycle pathway that will be constructed as a shared use path that allows for pedestrian travel would enhance one other mode. Roadway projects are generally expected to enhance one other mode (transit) in addition to benefiting auto travel. However, some roadway projects involving the construction of brand new facilities are expected to include separate bicycle and pedestrian facilities that would provide new connections for these modes; thus, they may receive a score of 2 or 3 in this category.

Scoring is based on number of other modes of travel enhanced:

- *No other modes enhanced = 0*
- *1 other mode enhanced = 1*
- *2 other modes enhanced = 2*
- *3 other modes enhanced = 3*

3.1.3 Contributes to Mode Share Goal

A key aspect of this study is the goal of reducing the proportion of single-occupant vehicle (SOV) trips to other modes including carpooling, bicycling, walking, and transit. While the ultimate goal is to reduce all types of trips, some of the greatest reductions can be accomplished by focusing on commute trips to work and school. For this criterion, projects that do not include the addition of vehicle capacity and also provide the highest quality facilities/services and benefit for non-auto-related modes received the highest score of 3. Projects receive a score of 2 if they provide additional medium quality capacity for transit, biking and walking; help to shift SOV trips to HOV trips; or include policies to reduce vehicle traffic.

These projects include bus transit projects (with lower capacities and higher travel times than rail transit), bike lanes (requiring mixing with traffic), HOV/HOT lane projects (still requiring auto travel), and TDM projects that incentivize the use of other modes and manage demand (but don't provide actual multi-modal facilities). Projects receive a score of 1 if they include the construction of a new road with bike/ped facilities (but still add new vehicle capacity), involve ITS, or include minor improvements focused on traffic operations. Projects that do not fall into any of the above-referenced categories receive a score of 0.

The scale for this scoring is generally as follows:

- *High-capacity transit, bike path/bikesharing, and Complete Streets projects = 3*
- *Bus transit, bike lane, HOV/HOT lane, TDM projects = 2*
- *New road with bike/ped facilities, bike route, ITS, and minor vehicle-focused projects = 1*
- *All other projects = 0*

3.1.4 Potential to Reduce Vehicle Congestion

The primary goal of reducing single occupant vehicle travel in the COTS area notwithstanding, minimizing excessive traffic congestion is still a major focus for mobility studies that take a balanced approach to circulation. Reducing congestion helps to reduce greenhouse gas emissions, typically reduces collisions, stimulates economic activity and enhances quality of life by reducing commute times and wasted time in vehicles. Accordingly, projects that will provide additional roadway capacity were looked upon favorably in terms of minimizing delays, enhancing travel time reliability, and providing additional options for vehicular access.

The scale for this scoring is generally as follows:

- *New roadways providing areawide or regional benefit = 3*
- *High-capacity/high-quality transit projects = 2*
- *Projects that increase bus transit ridership or provide local vehicle capacity enhancements = 1*
- *Bicycle and pedestrian projects or Complete Streets projects = 0*

3.1.5 Enhanced Infrastructure Condition

A key issue for all public agencies is the on-going maintenance of existing transportation infrastructure and the dwindling resources available to adequately maintain facilities. The construction of brand new facilities generally adds to that burden, but the minor expansion of some existing facilities will help to extend the life of said infrastructure to varying degrees. In addition, new facilities or widenings also reduces the impact of vehicles on roadways by better distributing the traffic load. Some projects such as a bridge rehabilitation are obviously the most effective in this regard, but other improvements such as repaving or resurfacing also contribute to enhancing the condition of infrastructure.

The scale for this scoring is generally as follows:

- *Rehabilitation-specific = 3*
- *Major resurfacing = 2*
- *New facilities that better distribute traffic = 1*
- *All other projects = 0*

3.1.6 Enhanced Safety

A substantial benefit from some projects is enhanced safety that will reduce the potential for collisions or minimizes the level of severity of a collision(s). These reductions could be across some or all modes depending on the project description.

With any mobility improvement, it is not possible to accurately predict the specific reduction in collisions or collision rate that might occur once that project has been constructed. However, improvements that are designed to industry standards typically have lower collision rates than those that are not. For purposes of assessing the safety benefit of each project, consideration was given to whether it would generally provide safer conditions from a collision perspective in terms of likelihood of occurrence, whether a roadway facility design would be improved over existing conditions, if separated bicycle or pedestrian paths would be provided where they do not currently exist, etc. The scoring for this potential benefit varies by mode as shown in **Table 3**.

Table 3. Safety Scoring by Mode

Score	Travel Mode			
	Roadway	Transit	Bicycling	Walking
3	New roadway that would reduce collision potential	Grade-separated system	Off-street or protected path	New sidewalk or path
2	Merging improvements	At-grade fixed guideway	On-street bicycle lanes	New crosswalk
1	New roadway that would reduce congestion	Increased bus ridership	N/A	N/A
0	No significant effect	No significant effect	No significant effect (e.g., bicycle route)	No significant effect

3.1.7 Deficiency Status

Another factor in determining the potential benefit of a project to the COTS area is the timing of the deficiency that the project is addressing. In some cases, projects may have several potential mobility-related benefits, but the need for an improvement is not immediate. For purposes of this assessment, near term is defined to be needed within roughly a 1 to 2-year timeframe, mid-term is 3 to 5 years, and long-term is beyond 5 years.

The scale for this scoring is generally as follows:

- Near-term projects = 3
- Mid-term projects = 2
- Long-term projects = 1

3.2 Project Ranking

Table 4 shows the project scores by Project Number. **Table 5** ranks the projects by total points. **Table 6** ranks the projects by Primary Mode or Program (i.e., bicycle, pedestrian, roadway, transit, program).

Table 4. Projects Scored and Listed by Project Number

PROJECT TITLE		General Location	Primary Mode or Program: B = Bicycle P = Pedestrian R = Roadway T = Transit Pr = Program	Potential COTS Benefit							
Number	Description			Areawide = 3 Local = 2 Program = 1	Number of Other Modes Enhanced	Potential to Reduce Vehicle Congestion Low = 0 High =3	Infrastructure Condition Low = 0 High =3	Safety Low = 0 High =3	Deficiency Status Near-Term = 3 Mid-Term = 2 Long-Term =1	Contributes to Mode Share Goal Low = 0 High = 3	Point Total
700 TRANSIT PROJECTS											
701	Increase bus service to/from Whitmore Village and Wahiawa Transit Center	Whitmore Village	T	2	2	1	0	1	2	2	10
702	Increase bus service to/from Schofield and Wahiawa	Wahiawa	T	2	2	1	0	1	2	2	10
703	Expanded Late Night Service, Routes 51/52	Wahiawa to Haleiwa	T	3	2	1	0	1	2	2	11
704	Bus Rapid Transit to Pearl Highlands Rail Station	Wahiawa to Pearl Highlands	T	2	2	1	0	1	2	3	11
705	Align Express Route 83 on proposed Leilehua High School-Kahelu Road Connection	Wahiawa to Pearl Highlands	T/R	3	2	1	0	1	2	2	11
800 BICYCLE AND PEDESTRIAN PROJECTS											
801	New off-street bicycle and pedestrian paths connecting to schools and parks • Kilani Avenue • Anoni Street • California Avenue • Rose Street • Whitmore Avenue • Ihiihi Avenue	Wahiawa	B/P	2	1	0	0	3	3	3	12
802	New pedestrian/bicycle bridge connecting Wahiawa and Whitmore Village	Wahiawa	B/P	3	1	0	1	3	1	3	12
803	New Bikeway Connection between Wahiawa, Whitmore Village, and NCTAMS: • Wilikina Drive • Kamehameha Highway	Wahiawa	B/P	3	1	0	0	2	3	3	12
804	New and upgraded bike lanes in Wahiawa Commercial District: • Kamehameha Highway • California Avenue • Lehua Street	Wahiawa	B	2	0	0	0	2	3	2	9
900 ROADWAY AND TRAFFIC OPERATIONS PROJECTS											
901	Whitmore Avenue widening from end of Saipan Drive to east of Ihiihi-Nani Ihi	Whitmore Village	R	2	3	1	1	2	2	1	12

PROJECT TITLE		General Location	Primary Mode or Program: B = Bicycle P = Pedestrian R = Roadway T = Transit Pr = Program	Potential COTS Benefit							
Number	Description			Areawide = 3 Local = 2 Program = 1	Number of Other Modes Enhanced	Potential to Reduce Vehicle Congestion Low = 0 High =3	Infrastructure Condition Low = 0 High =3	Safety Low = 0 High =3	Deficiency Status Near-Term = 3 Mid-Term = 2 Long-Term =1	Contributes to Mode Share Goal Low = 0 High = 3	Point Total
902	Kamehameha Highway widening from north of Whitmore Avenue to Kilani Avenue	Whitmore Village-Wahiawa	R	3	3	3	0	2	2	1	14
903	California Avenue Complete Streets Project from Kamehameha Highway to Wahiawa District Park	Wahiawa	P	2	3	0	0	2	2	3	12
906	New roadway at Leilehua High School-Kahelu Road connection between California Avenue and Higgins Road	Wahiawa	R	3	3	2	1	1	1	1	12
909	Kamehameha Highway at Whitmore Avenue Intersection Improvements	Whitmore Village	R	2	0	1	0	1	2	0	6
910	Roundabout at Kamehameha Highway and California Avenue	Wahiawa	R	2	1	1	0	2	1	1	9
911	Kamehameha Highway between Kilani Avenue and Avocado Street Traffic Signal Timing	Wahiawa	R	3	0	3	0	1	3	0	10
912	California Avenue between Kamehameha Highway and Wahiawa District Park Traffic Signal Timing	Wahiawa	R	2	0	1	0	1	3	0	7
915	Transit Signal Priority on Kamehameha Highway between Kilani Avenue and Avocado Street	Wahiawa	T	3	0	0	0	1	3	2	9

Table 5. Projects Ranked by Total Points

PROJECT TITLE		General Location	Primary Mode or Program: B = Bicycle P = Pedestrian R = Roadway T = Traffic Operations	Potential COTS Benefit							
Number	Description			Areawide = 3 Local = 2 Program = 1	Number of Other Modes Enhanced	Potential to Reduce Vehicle Congestion Low = 0 High =3	Infrastructure Condition Low = 0 High =3	Safety Low = 0 High =3	Deficiency Status Near-Term = 3 Mid-Term = 2 Long-Term =1	Contributes to Mode Share Goal Low = 0 High = 3	Point Total
902	Kamehameha Highway widening from north of Whitmore Avenue to Kilani Avenue	Whitmore Village- Wahiawa	R	3	3	3	0	2	2	1	14
802	New pedestrian/bicycle bridge connecting Wahiawa and Whitmore Village	Wahiawa	B/P	3	1	0	1	3	1	3	12
803	New Bikeway Connection between Wahiawa, Whitmore Village, and NCTAMS: <ul style="list-style-type: none">• Wilikina Drive• Kamehameha Highway	Wahiawa	B/P	3	1	0	0	2	3	3	12
801	New off-street bicycle and pedestrian paths connecting to schools and parks: <ul style="list-style-type: none">• Kilani Avenue• Anoni Street• California Avenue• Rose Street• Whitmore Avenue• Ihiihi Avenue	Wahiawa	B/P	2	1	0	0	3	3	3	12
901	Whitmore Avenue widening from end of Saipan Drive to east of Ihiihi-Nani Ihi	Whitmore Village	R	2	3	1	1	2	2	1	12
903	California Avenue Complete Streets Project from Kamehameha Highway to Wahiawa District Park	Wahiawa	P	2	3	0	0	2	2	3	12
906	New roadway at Leilehua High School-Kahelu Road connection between California Avenue and Higgins Road	Wahiawa	R	3	3	2	1	1	1	1	12
703	Expanded Late Night Service, Routes 51/52	Wahiawa to Haleiwa	T	3	2	1	0	1	2	2	11
704	Bus Rapid Transit to Pearl Highlands Rail Station	Wahiawa to Pearl Highlands	T	2	2	1	0	1	2	3	11
705	Align Express Route 83 on proposed Leilehua High School-Kahelu Road Connection	Wahiawa to Pearl Highlands	T/R	3	2	1	0	1	2	2	11
701	Increase bus service to/from Whitmore Village and Wahiawa Transit Center	Whitmore Village	T	2	2	1	0	1	2	2	10

PROJECT TITLE		General Location	Primary Mode or Program: B = Bicycle P = Pedestrian R = Roadway T = Traffic Operations	Potential COTS Benefit							Point Total
Number	Description			Areawide = 3 Local = 2 Program = 1	Number of Other Modes Enhanced	Potential to Reduce Vehicle Congestion Low = 0 High =3	Infrastructure Condition Low = 0 High =3	Safety Low = 0 High =3	Deficiency Status Near-Term = 3 Mid-Term = 2 Long-Term =1	Contributes to Mode Share Goal Low = 0 High = 3	
702	Increase bus service to/from Schofield and Wahiawa	Wahiawa	T	2	2	1	0	1	2	2	10
911	Kamehameha Highway between Kilani Avenue and Avocado Street Traffic Signal Timing	Wahiawa	R	3	0	3	0	1	3	0	10
915	Transit Signal Priority on Kamehameha Highway between Kilani Avenue and Avocado Street	Wahiawa	T	3	0	0	0	1	3	2	9
804	New and upgraded bike lanes in Wahiawa Commercial District: • Kamehameha Highway • California Avenue • Lehua Street	Wahiawa	B	2	0	0	0	2	3	2	9
910	Roundabout at Kamehameha Highway and California Avenue	Wahiawa	R	2	1	1	0	2	1	1	9
913	Two-Way Left-Turn on Kamehameha Highway	Wahiawa	R	2	0	1	0	2	3	0	8
912	California Avenue between Kamehameha Highway and Wahiawa District Park Traffic Signal Timing	Wahiawa	R	2	0	1	0	1	3	0	7
909	Kamehameha Highway at Whitmore Avenue Intersection Improvements	Whitmore Village	R	2	0	1	0	1	2	0	6

Table 6. Projects Ranked by Total Points by Mode

PROJECT TITLE		General Location	Primary Mode or Program: B = Bicycle P = Pedestrian R = Roadway T = Traffic Operations	Potential COTS Benefit							
Number	Description			Areawide = 3 Local = 2 Program = 1	Number of Other Modes Enhanced	Potential to Reduce Vehicle Congestion Low = 0 High =3	Infrastructure Condition Low = 0 High =3	Safety Low = 0 High =3	Deficiency Status Near-Term = 3 Mid-Term = 2 Long-Term =1	Contributes to Mode Share Goal Low = 0 High = 3	Point Total
700 TRANSIT PROJECTS											
703	Expanded Late Night Service, Routes 51/52	Wahiawa to Haleiwa	T	3	2	1	0	1	2	2	11
704	Bus Rapid Transit to Pearl Highlands Rail Station	Wahiawa to Pearl Highlands	T	2	2	1	0	1	2	3	11
705	Align Express Route 83 on proposed Leilehua High School-Kahelu Road Connection	Wahiawa to Pearl Highlands	T/R	3	2	1	0	1	2	2	11
701	Increase bus service to/from Whitmore Village and Wahiawa Transit Center	Whitmore Village	T	2	2	1	0	1	2	2	10
702	Increase bus service to/from Schofield and Wahiawa	Wahiawa	T	2	2	1	0	1	2	2	10
800 BICYCLE AND PEDESTRIAN PROJECTS											
802	New pedestrian/bicycle bridge connecting Wahiawa and Whitmore Village	Wahiawa	B/P	3	1	0	1	3	1	3	12
803	New Bikeway Connection between Wahiawa, Whitmore Village, and NCTAMS: <ul style="list-style-type: none"> • Wilikina Drive • Kamehameha Highway 	Wahiawa	B/P	3	1	0	0	2	3	3	12
801	New off-street bicycle and pedestrian paths connecting to schools and parks: <ul style="list-style-type: none"> • Kilani Avenue • Anoni Street • California Avenue • Rose Street • Whitmore Avenue • Ihiihi Avenue 	Wahiawa	B/P	2	1	0	0	3	3	3	12
804	New and upgraded bike lanes in Wahiawa Commercial District: <ul style="list-style-type: none"> • Kamehameha Highway • California Avenue • Lehua Street 	Wahiawa	B	2	0	0	0	2	3	2	9

PROJECT TITLE		General Location	Primary Mode or Program: B = Bicycle P = Pedestrian R = Roadway T = Traffic Operations	Potential COTS Benefit							Point Total
Number	Description			Areawide = 3 Local = 2 Program = 1	Number of Other Modes Enhanced	Potential to Reduce Vehicle Congestion Low = 0 High =3	Infrastructure Condition Low = 0 High =3	Safety Low = 0 High =3	Deficiency Status Near-Term = 3 Mid-Term = 2 Long-Term =1	Contributes to Mode Share Goal Low = 0 High = 3	
900 ROADWAY AND TRAFFIC OPERATIONS PROJECTS											
902	Kamehameha Highway widening from north of Whitmore Avenue to Kilani Avenue	Whitmore Village-Wahiawa	R	3	3	3	0	2	2	1	14
901	Whitmore Avenue widening from end of Saipan Drive to east of Ihiihi-Nani Ihi	Whitmore Village	R	2	3	1	1	2	2	1	12
903	California Avenue Complete Streets Project from Kamehameha Highway to Wahiawa District Park	Wahiawa	P	2	3	0	0	2	2	3	12
906	New roadway at Leilehua High School-Kahelu Road connection between California Avenue and Higgins Road	Wahiawa	R	3	3	2	1	1	1	1	12
909	Kamehameha Highway at Whitmore Avenue Intersection Improvements	Whitmore Village	R	2	0	1	0	1	2	0	6
911	Kamehameha Highway between Kilani Avenue and Avocado Street Traffic Signal Timing	Wahiawa	R	3	0	3	0	1	3	0	10
915	Transit Signal Priority on Kamehameha Highway between Kilani Avenue and Avocado Street	Wahiawa	T	3	0	0	0	1	3	2	9
910	Roundabout at Kamehameha Highway and California Avenue	Wahiawa	R	2	1	1	0	2	1	1	9
913	Two-Way Left-Turn on Kamehameha Highway	Wahiawa	R	2	0	1	0	2	3	0	8
912	California Avenue between Kamehameha Highway and Wahiawa District Park Traffic Signal Timing	Wahiawa	R	2	0	1	0	1	3	0	7

4.0 PERFORMANCE MEASURES

This chapter describes the performance measures and how they were measured and the unit scale of measurement and then applies the performance measures to the set of projects by type in a table.

The methodology follows a review of best practices for measuring performance and the selection of measures for COTS projects. This is documented in Deliverable B-2 of this study.

4.1 Performance Measure Assessment

4.1.1 Transit Projects

Six performance measures were applied to the transit projects. The six performance measures are as follows:

- **Performance Measure 2**, Change from baseline conditions in AM peak period transit travel time. This performance measure is shown as an overall travel time savings over current conditions
- **Performance Measure 6**, Amount of bus/rail transit service
- **Performance Measure 7**, Connectivity to rail transit and frequency of intermodal connections
- **Performance Measure 11**, Contributes to mode split shift away from single-occupant vehicle
- **Performance Measure 20**, Transit shelter availability
- **Performance Measure 21**, Transit shelter conditions and amenities

Table 7 provides the results of the application of the performance measures to transit projects.

Table 7. Results of Application of Performance Measures to Transit Projects

TRANSIT PROJECTS		APPLICABLE PERFORMANCE MEASURES					
Project Number	Project Description	2	6	7	11	20	21
701	Increase bus service to/from Whitmore Village and Wahiawa Transit Center	N/A	8 added weekday revenue hours	Yes	Yes	N/A	Yes
702	Increase bus service to/from Schofield and Wahiawa	N/A	7 added weekday revenue hours	Yes	Yes	N/A	Yes
703	Expanded Late Night Service, Routes 51/52	N/A	8 added weekday revenue hours	Yes	Yes	N/A	Yes
704	Bus Rapid Transit to Pearl Highlands Rail Station	-8 min	18 added weekday service hours	Yes	Yes	Shelter(s) at each stop/station	Yes
705	Align Express Route 83 on proposed Leilehua High School-Kahelu Road Connection	-5 min	N/A	Yes	Yes	N/A	Yes

4.1.2 Bicycle and Pedestrian Projects

Eight key Performance Measures were applied to the bicycle projects. These 10 Performance Measures are as follows:

- **Performance Measure 5**, Change from baseline conditions in the AM peak period travel time between origins and destinations within the COTS area
- **Performance Measure 7**, Connectivity to rail transit and frequency of intermodal connections
- **Performance Measure 8**, Amount of pedestrian infrastructure
- **Performance Measure 9**, Amount of bicycle infrastructure
- **Performance Measure 10**, Improvements to existing bicycle and pedestrian system
- **Performance Measure 11**, Contributes to mode split shift away from single-occupant vehicle
- **Performance Measure 16**, Number of non-motorized fatalities and serious injuries
- **Performance Measure 19**, Sidewalk, bikeways, and multi-use path conditions

The quality of the proposed bicycle facility determined which measures should be applied. Since multi-use paths/trails serve both bicyclists and pedestrians, some pedestrian-only measures (e.g., Measure 8) were applied to bicycle path projects. In the case of shared roadway, which include only signs and striping (but require cyclists to share the travel lane with vehicles), only Measures 9 through 11 and 19 applied to those types of projects.

The bicycle projects Performance Measure results are shown in **Table 8**. All shared use path projects have the added benefit of also adding an equivalent length of pedestrian infrastructure facilities. As shown, the new shared use pathway in Wahiawa and Whitmore Village will provide the greatest increase in both bicycle and pedestrian infrastructure by adding 7.25 and 7.0 miles, respectively. Additionally, project 802 will provide a more direct access between Wahiawa and Whitmore Village and will reduce bicycle travel time by approximately 10 minutes and pedestrian travel time by approximately 27 minutes.

Table 8. Results of Application of Key Performance Measures to Bicycle and Pedestrian Projects

BICYCLE PROJECTS		APPLICABLE PERFORMANCE MEASURES							
Project Number	Project Description	5	7	8	9	10	11	16	19
801	New off-street bicycle and pedestrian paths connecting to schools and parks: <ul style="list-style-type: none"> • Kilani Avenue • Anoni Street • California Avenue • Rose Street • Whitmore Avenue • Ihiihi Avenue 	0 min	No	7.0 mi	7.25 mi	Yes	Yes	2 collisions	New
802	New pedestrian/bicycle bridge connecting Wahiawa and Whitmore Village	-10 min	No	0.5 mi	0.7 mi	Yes	Yes	0	New
803	New Bikeway Connection between Wahiawa, Whitmore Village, and NCTAMS: <ul style="list-style-type: none"> • Wilikina Drive • Kamehameha Highway 	0 min	No	1.9 mi	4.5 mi	Yes	Yes	1 collision	New

BICYCLE PROJECTS		APPLICABLE PERFORMANCE MEASURES							
Project Number	Project Description	5	7	8	9	10	11	16	19
804	New and upgraded bike lanes in Wahiawa Commercial District <ul style="list-style-type: none"> • Kamehameha Highway • California Avenue • Lehua Street 	0 min	No	0 mi	0.5 mi	Yes	Yes	0	New

4.1.3 Roadway and Traffic Operations Projects

The key performance measures for roadway projects:

- **Performance Measure 3**, Number of congested lane miles in Central Oahu
- **Performance Measure 4**, Change from baseline conditions in total AM peak period auto travel time between Wahiawa and other origins/destinations within the overall COTS area
- **Performance Measure 10**, Improvements to existing bicycle and pedestrian system
- **Performance Measure 11**, Contributes to mode split shift away from single-occupant vehicle
- **Performance Measures 12**, Number of annual fatalities from vehicle-vehicle collisions
- **Performance Measure 16**, Number of non-motorized fatalities and serious injuries
- **Performance Measure 17**, Roadway state of good repair
- **Performance Measures 18**, Bridges state of good repair
- **Performance Measure 19**, Sidewalk, bikeways, and multi-use path conditions

The ability to apply Performance Measures to the projects within the Wahiawa/Whitmore Village communities is limited given that several of the measures: 1) do not include origins or destinations within the extended study area (re: Performance Measures 1 and 2), and/or 2) are too localized or focused to be reasonably assessed using a travel demand model. Because of the local nature of some projects, they would not necessarily benefit regional travel across multiple Central Oahu communities, but would provide benefits within their specific influence area.

Table 9 presents the results of the application of the Performance Measures to roadway projects. The results of this evaluation and the preliminary volume assessments show that Project 906 (New roadway at Leilehua High School-Kahelu Road connection between California Avenue and Higgins Road) and Project 911 (Kamehameha Highway between Kilani Avenue and Avocado Street Traffic Signal Timing) would provide the greatest benefit towards vehicle travel time and transit travel time reduction within the extended COTS area. These projects would reduce delay for vehicles entering, exiting and traveling through Wahiawa and enhance overall access to the community. Project 902 (Kamehameha Highway widening from north of Whitmore Avenue to Kilani Avenue) has mixed results with reduced queuing and departure times for traffic traveling between Whitmore Avenue and Kilani Avenue. However, the additional capacity is expected to attract traffic to the highway corridor through Wahiawa, which would increase travel times during the peak commute periods. Most of the other roadway projects are not expected to substantially benefit regional vehicle delay, although they will provide some localized congestion relief benefits (e.g., Projects 901, and 908).

Performance Measure 17 shows the measure of the current pavement condition of existing roadways. Data was taken from the Hawaii Department of Transportation (HDOT) *Highway Condition Database*

(2016a) or field observations (in the case of California Avenue in Wahiawa). As shown in **Table 9**, the majority of the existing roadways have a “fair” pavement condition.

Performance Measure 18 shows the measure of bridge conditions. The data was taken from HDOT’s *Bridge Condition Database* (2016b). There is only one existing public bridge within the extended COTS area for which a project has been identified, so Performance Measure 18 was only applied to one project. Kamehameha Highway widening from north of Whitmore Avenue to Kilani Avenue (902) has a bridge rating of “fair” but is listed with a priority ranking of 10 in the top 50 bridges in the State Highway System in need of upgrades or repair. The priority ranking uses a weighted value that considers bridge condition, mobility and risk with a ranking of one as the highest priority location.

Performance Measure 19 assesses the current conditions of bicycle and pedestrian facilities, which was determined by the project team through the completion of a bicycle and pedestrian facilities review conducted in April 2019. The only existing separate bicycle facilities (i.e., non-shared roadway) are located on along California Avenue between the highway and N. Cane Street, while sidewalks that might be affected by a project are found on the same section of roadway. **Table 9** provides the results of the application of the performance measures to roadway and traffic operations projects.

Table 9. Results of Application of Key Performance Measures to Roadway and Traffic Operations Projects

ROADWAY AND TRAFFIC OPERATIONS PROJECTS		APPLICABLE PERFORMANCE MEASURES								
Project Number	Project Description	3	4	10	11	12	16	17	18	19
901	Whitmore Avenue widening from end of Saipan Drive to east of Ihiihi -Nani Ihi	N/A	N/A	0.66 mi shared use path	Yes (with path)	N/A	1 collision	Fair	N/A	N/A
902	Kamehameha Highway widening from north of Whitmore Avenue to Kilani Avenue	1 more congested lane-mile in AM	+4 min	0.8 mi shared use path	Yes (with path)	N/A	2 collisions	Fair	Fair (high priority for repair or upgrade)	N/A
903	California Avenue Complete Streets Project from Kamehameha Highway to Wahiawa District Park	N/A	N/A	0.45 mi bike lane	Yes	2	6 collisions	Fair	N/A	Fair
906	New roadway at Leilehua High School-Kahelu Road connection between California Avenue and Higgins Road	1 less congested mile in PM	-2 min	1.75 mi shared use path	Yes (with path)	N/A	N/A	N/A	N/A	N/A
909	Kamehameha Highway at Whitmore Avenue Intersection Improvements	N/A	N/A	N/A	No	N/A	N/A	Fair	N/A	N/A
910	Roundabout at Kamehameha Highway and California Avenue	N/A	0 min	N/A	No	N/A	6 collisions	Fair	N/A	N/A

ROADWAY AND TRAFFIC OPERATIONS PROJECTS		APPLICABLE PERFORMANCE MEASURES								
Project Number	Project Description	3	4	10	11	12	16	17	18	19
911	Kamehameha Highway between Kilani Avenue and Avocado Street Traffic Signal Timing	N/A	-1 min	N/A	No	N/A	2 collisions	N/A	N/A	N/A
912	California Avenue between Kamehameha Highway and Wahiawa District Park Traffic Signal Timing	N/A	0 min	N/A	No	2	6 collisions	N/A	N/A	N/A
915	Transit Signal Priority on Kamehameha Highway between Kilani Avenue and Avocado Street	N/A	N/A	N/A	Yes	N/A	1 collision	N/A	N/A	N/A

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5.0 CONCLUSIONS

5.1 Transit Projects

All five identified transit projects are recommended for further study. The exception would be Align Express Route 83 on proposed Leilehua High School-Kahelu Road Connection (Project 705) if New roadway at Leilehua High School-Kahelu Road connection between California Avenue and Higgins Road (Project 906) is dropped. Increasing bus service to/from Whitmore Village and Wahiawa Transit Center (Project 71) and increasing bus service to/from Schofield and Wahiawa (Project 702) will provide transit service more suited to the local community needs. The W-1 Report showed that Whitmore Village residents rely upon public transportation to commute to work. Adding trips on a more frequent schedule will allow residents more flexibility in their job choices or travel times. Adding transit trips to Schofield Barracks provides options for those station on base, their families, and those working on the base to reduce SOV travel and congestion during peak times providing relief to the Wilikina Drive and Kamehameha Highway area. Residents during community meetings consistently requested more frequent bus service and longer service hours.

5.2 Bicycle and Pedestrian Projects

All shared-use path projects are recommended. Priority should be given to projects that increase safety and connectivity, can be constructed as part of future development projects, and provide substantive additions to the bikeway network in terms of lane-miles. These shared-use path facilities attract the greatest number of riders and typically provide the highest level of safety of all bike facility types if they are designed to the highest bicycle facility safety standards.

All proposed bike lane projects would enhance the bikeway network within the Wahiawa-Whitmore Village area and could reduce collisions if designed to the highest bicycle facility safety standards. Expanding the network of dedicated bicycle facilities is key to increase the overall numbers of bicyclists and to increase driver awareness of bicyclists on the road. In two cases, the potential bicycle lane projects identified in the list address locations with multiple collisions.

New shared roadway should be the lowest priority of bicycle projects based solely on performance. Shared roadway provide the lowest level of safety enhancement and do not provide a dedicated right-of-way for bicyclists. Other considerations, such as ease of implementation, may elevate one or more of these projects.

5.3 Roadway and Traffic Operations Projects

Based solely on performance measures associated with commuting, the most effective roadway projects in terms of reducing congestion in the Wahiawa/Whitmore Village area are the addition of the New roadway at Leilehua High School-Kahelu Road connection between California Avenue and Higgins Road (Project 906). Kamehameha Highway widening from north of Whitmore Avenue to Kilani Avenue (Project 902) is expected to have mixed results by itself because of its queue reduction benefits but potentially increased volumes through central Wahiawa. When packaged with Kamehameha Highway between Kilani Avenue and Avocado Street Traffic Signal Timing (Project 911), the installation of adaptive signals and optimization of the highway corridor through Wahiawa, Project 902 may minimize increased travel time. In addition, the optimization of signals along California Avenue (Project 912) would complement the California Avenue Complete Streets Project from Kamehameha Highway to Wahiawa District Park (Project 903), which would require re-timing of the signals if the proposed road diet was implemented.

Other projects that have notable local operational, safety, and multimodal benefits include Project 901 (Whitmore Avenue Widening from end of Saipan Drive to east of Ihihi-Nani Ihi) and Project 915 (Transit Signal Priority on Kamehameha Highway between Kilani Avenue and Avocado Street), both of which directly address the project goals of encouraging non-automobile travel in the extended and overall COTS area.

6.0 RESOURCES

The following resources were utilized to rank the potential projects:

- *2040 Regional Travel Demand Model (Base Year and Future Year Models)*, Oahu Metropolitan Planning Organization.
- *City and County of Honolulu, Department of Transportation Services, Public Transit Division, TheBus Routes and Schedules, Public Timetables, 2019.*
- *City and County of Honolulu, Department of Transportation Services, Public Transit Division, TheBus statistics.*
- *Oahu Regional Transportation Plans (2025 and 2040)*, Oahu Metropolitan Planning Organization.
- *Oahu Motor Vehicle Crashes Website*, State of Hawaii Department of Health – Injury Prevention and Control Section, June 2019, (<http://hgstategis.maps.arcgis.com/apps/webappviewer/index.html?id=2ad9abc4cf064a9dabbf46763eddf8b5>)
- *HDOT Highways Program Status Website*, Hawaii Department of Transportation June 2019, (<https://hgstategis.maps.arcgis.com/apps/MapSeries/index.html?appid=39e4d804242740a89d3fd0bc76d8d7de>)
- *Final Alternative Scenarios Summary Report Oahu Regional Transportation Plan 2035 Project Deliverable 9.2.2* (December 2010), Oahu Metropolitan Planning Organization.
- *Honolulu Complete Street Implementation Study Location Report: California Avenue from Kamehameha Highway to Wahiawa District Park (FINAL)*, (June 2015), City & County of Honolulu Department of Transportation Services.
- *Center for Accelerating Innovation*, U.S. Department of Transportation Federal Highways Administration, (<https://www.fhwa.dot.gov/innovation/everydaycounts/edc-1/asct.cfm>).
- *Roundabouts: An Informational Guide*, U.S. Department of Transportation Federal Highways Administration, June 2000.
- *Bike Master Plan, Update, 2019.*

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