Deliverable W-1
Trends and Issues for the Wahiawa-Whitmore Village Area of the

Central Oahu Transportation Study

Prepared for
Oahu Metropolitan Planning Organization

Prepared by
SSFM International, Inc. with
Weslin Consulting Services, Inc. and
Fehr & Peers

July 2019

Document Control

Deliverable Name	Date	Activity Completed
Deliverable W-1: Trends and Issues for the Wahiawa/Whitmore Village Area of the Central Oahu Transportation Study	6/20/19	1st Draft
Deliverable W-1: Trends and Issues for the Wahiawa/Whitmore Village Area of the Central Oahu Transportation Study	7/5/19	Version 2 with OahuMPO's edits

This report was funded in part through grants from the Federal Highway Administration and Federal Transit Administration, U.S. Department of Transportation. The views and opinions of the agency expressed herein do not necessarily state or reflect those of the U.S. Department of Transportation.

TABLE OF CONTENTS

Overview of Central Oahu Transportation Study v
1.0 Study Area 1
1.1 Summary of Wahiawa and Whitmore Trends and Issues 1
2.0 Review of Existing Population, Land Use, and Travel Characteristics 5
2.1 Population and Demographics 5
2.1.1 Population 5
2.1.2 Households 9
2.1.3 Household Economic Status 10
2.1.4 Population Migration 13
2.1.5 Disabled 14
2.1.6 Poverty 16
2.1.7 Minority 18
2.1.8 Environmental Justice 18
2.2 Land Use and Housing 22
2.2.1 Housing Units 22
2.2.2 Jobs 22
2.3 Travel Characteristics 22
2.3.1 Workers and Their Commuting Travel Behavior 22
2.3.2 Crash Trends 26
3.0 Transportation and Traffic Characteristics 31
3.1 Existing Conditions 31
3.1.1 Areas of Congestion 32
3.1.2 Base Year Travel Patterns 36
3.1.3 Vehicle and Person Miles of Travel 38
3.2 Future Conditions 39
3.2.1 Areas of Congestion 39
3.2.2 Areas of Congestion 40
3.2.3 Future Year Travel Patterns 41
3.2.4 Future Miles of Travel 44
3.3 Existing Transit Conditions 45
3.3.1 TheBus 45
3.3.2 TheHandi-Van 48
3.4 Bicycle Infrastructure 48

LIST OF TABLES

Table 1. Trends and Issues Wahiawa and Whitmore Village 1
Table 2. 2015 Poverty Thresholds by Family Size and Related Children Under 18 Years 16
Table 3. Environmental Justice Population by Block Group 20
Table 4. Percent of Workers Commuting by Non-Personal Vehicles Means 24
Table 5. Wahiawa-Whitmore Village Land Use - Base Year (2012) 31
Table 6. Wahiawa-Whitmore Village Miles of Travel - Base Year (2012) 39
Table 7. Wahiawa-Whitmore Village Land Use - Future Year (2040) 40
Table 8. Wahiawa-Whitmore Village's Trip Length - Future Year (2040) 44
Table 9. TheBus Routes Serving Wahiawa-Whitmore Village 46
Table 10. TheBus Weekday Schedule Adherence 46
Table 11. TheBus Saturday Schedule Adherence 47
Table 12. TheBus Sunday Schedule Adherence 47
Table 13. TheBus Routes Serving Wahiawa-Whitmore Village Ridership 47
Table 14. Transit Facilities in Wahiawa 47

LIST OF FIGURES

Figure 1. Wahiawa-Whitmore Village Expanded Study Area 3
Figure 2. Population by Time Period 5
Figure 3. Percent of Population 65 Years of Age and Over by Time Period 6
Figure 4. Population 65 Years of Age and Older by Census Block 7
Figure 5. Population Aged 21 to 34 by Census Block 8
Figure 6. Median Age of Population 9
Figure 7. Households 9
Figure 8. Percent of Renter-Occupied Households by Time Period 10
Figure 9. Mean Household Income 10
Figure 10. Unemployment Rate 11
Figure 11. Vehicles Available to Workers by Geographic Area 12
Figure 12. Residence One Year Ago by Geographic Area and Time Period 13
Figure 13. Native Born Residents 14
Figure 14. Disabled Population 14
Figure 15. Disabled Population by Census Tract 15
Figure 16. Income Below the Poverty Line by Census Block Group 17
Figure 17. Income 50 Percent Below the Poverty Line 18
Figure 18. Minority Population by Census Block Group 19
Figure 19. Environmental Justice Areas 21
Figure 20. Wahiawa Percent of Workers Commuting by Major Mode of Travel 23
Figure 21. Whitmore Village Percent of Workers Commuting by Major Mode of Travel 23
Figure 22. Mean Travel Time in Minutes to Work by Major Mode for Wahiawa Workers 25
Figure 23. Commute Start Time 25
Figure 24. Wahiawa-Whitmore Village Auto Crash Data (location and number of crashes) 26
Figure 25. Wahiawa-Whitmore Village Motorcycle/Moped Crash Data (location and number of crashes) 27
Figure 26. Wahiawa-Whitmore Village Pedestrian Crash Data (location and number of crashes) 28
Figure 27. Wahiawa-Whitmore Village Bicycle Crash Data (location and number of crashes) 29

Figure 28. Wahiawa-Whitmore Village Number of Multi-modal Crashes (2016-2018) 30
Figure 29. Typical Existing Weekday AM Peak Period Congestion 33
Figure 30. Typical Existing Weekday PM Peak Period Congestion 34
Figure 31. OahuMPO Travel Demand Model - Base (2012) AM Peak Period V/C 35
Figure 32. OahuMPO Travel Demand Model - Base (2012) PM Peak Period V/C 36
Figure 33. H-2 Southbound Select Link Distribution - Base Year (2012) AM Peak Period 37
Figure 34. H-2 Northbound Select Link Distribution - Base Year (2012) PM Peak Period 38
Figure 35. OahuMPO Travel Demand Model - Future (2040) AM Peak Period V/C 40
Figure 36. OahuMPO Travel Demand Model - Future (2040) PM Peak V/C 41
Figure 37. H-2 Southbound Select Link Distribution - Future Year (2040) AM Peak Period 42
Figure 38. H-2 Northbound Select Link Distribution - Future Year (2040) PM Peak Period 43
Figure 39. Current Suburban Feeder Route 72 46
Figure 40. Current Routes 51 and 52 46
Figure 41. Current and Proposed Bicycle Network - Oahu Bike Plan 50

This page intentionally left blank.

OVERVIEW OF 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. After community concerns were expressed about the study area, OahuMPO 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-1 is organized as follows:

- Overview of the Project and this Deliverable
- Chapter 1: Summary of Central Oahu Trends and Issues
- Chapter 2: Review of Existing Population, Land Use, and Travel Characteristics
- Chapter 3: Current and Future Transportation and Traffic Characteristics

This page intentionally left blank.

1.0 STUDY AREA

1.1 Summary of Wahiawa and Whitmore Trends and Issues

This chapter provides a summary of the trends and issues in Wahiawa and Whitmore Village. Data used to assess these trends and issues included the following:

- American Community Survey (ACS) (U.S. Census Bureau)
- Crash Data, 2007-2014 (State of Hawaii Department of Health)
- Regional Travel Demand Model (OahuMPO)
- 2015 Traffic Counts (Hawaii Department of Transportation)

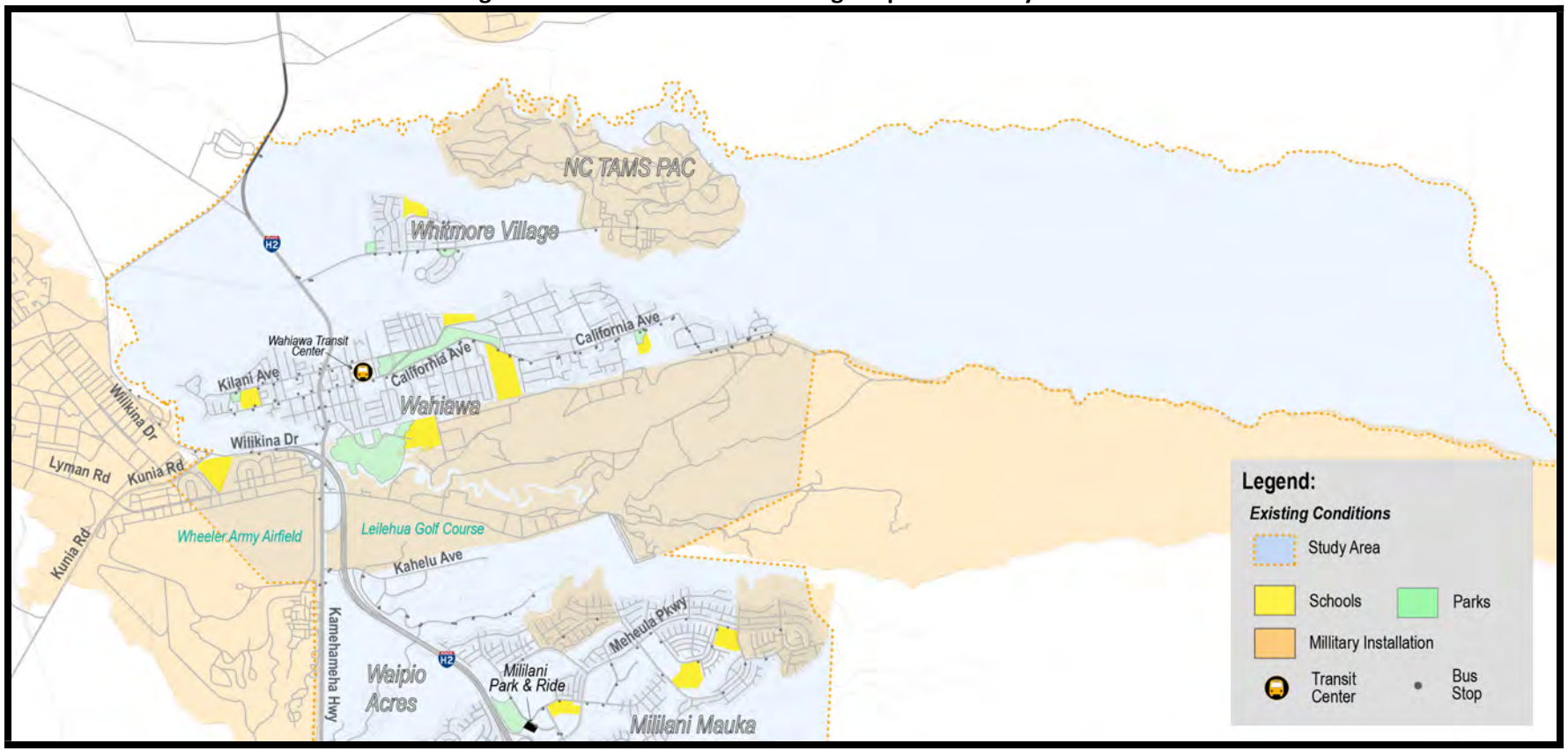
Table 1 summarizes the trends and the impacts of these trends (i.e., issues) on the transportation network in Wahiawa and Whitmore Village.

Table 1. Trends and Issues Wahiawa and Whitmore Village

Category	Trend	Issue
Population (Section 2.1)	The two communities have differences. Wahiawa population is stable increasing slightly at .017 percent since 2013. Whitmore Village population has dropped 14.4 percent. • The percent of the population 65 years of age and older is increasing; both communities have higher percentages of seniors than Oahu overall. • Wahiawa's percent of disabled residents is over 16 percent. Whitmore Village is on par with Oahu overall	Transportation provision will need to adjust to changing demographics and trip types. Peak period express service may scale back and mid-day services may need to increase.
Income (Section 2.1)	Mean household income is rising for both communities; however, it still lags Oahu overall and is about 20 percent lower than the remaining COTS area.	Lower incomes frequently correspond to less transportation choices and more reliance upon public transportation to get to jobs, school, and other trips. Whitmore Village is dependent upon one bus route; the number of trips and time of service may need to be adjusted.
Housing and Jobs (Section 2.2)	The housing supply has dropped about 2 percent although overall can be considered stable. There are, however, no major housing developments scheduled. Notably about 50 percent of the households pay rent. The unemployment rate is higher in these two communities than in Oahu, although it is dropping. Whitmore Village suffers from a higher unemployment rate which may be due to the lack of jobs in the community.	Housing is expected to remain about the same with no new developments scheduled. There are few jobs in Wahiawa and Whitmore Village; therefore, most of people must commute to work. Many available jobs may be during hours outside traditional commuting times and therefore more difficult for those dependent on public transportation to get to/from work.
Travel Characteristics (Section 2.3)	Driving alone is increasing slowly in Whitmore Village and dropping slowly in Wahiawa. Significant differences: • Carpooling for Wahiawa workers has remained about the same; carpooling in	The Transportation Demand Management program, identified in the full COTS list of projects, may provide some assistance for Whitmore Village commuters including guaranteed ride home and ride-matching.

Category	Trend	Issue
	Whitmore Village dropped from 22.3% to 10.2 percent • Few ride bicycles to travel to work in Wahiawa – none in Whitmore Village. • Bus ridership has increased from 7.1 percent to 13.5 percent for Whitmore Village commuters. In Wahiawa about 9.9 percent ride the bus. • Commute time by bus averages 61 minutes versus 29 minutes for drivers. • 40 percent leave home before 6 AM to get to work.	Additional transit trips and finding ways to reduce travel time is needed.
Safety (Section 2.3)	Most multimodal crashes occur along Kamehameha Highway and California Avenue in Wahiawa with another concentration at the Kamehameha Highway/Whitmore Avenue intersection near Whitmore Village.	Vehicle collisions, and to a lesser extent, pedestrian collisions, appear to be the key modes to address.
Traffic Congestion (Sections 3.1 and 3.2)	One primary location for AM and PM peak period congestion is mauka-bound on Kamehameha Highway just mauka of H-2 entering Wahiawa. In the afternoon, makai-bound congestion occurs on the Karsten Thot bridge and queues extend back past Whitmore Avenue.	Both Wahiawa and Whitmore Village are essentially cul-de-sac communities with limited connectivity to the regional roadway system.

Figure 1. Wahiawa-Whitmore Village Expanded Study Area



This page intentionally left blank.

2.0 REVIEW OF EXISTING POPULATION, LAND USE, AND TRAVEL CHARACTERISTICS

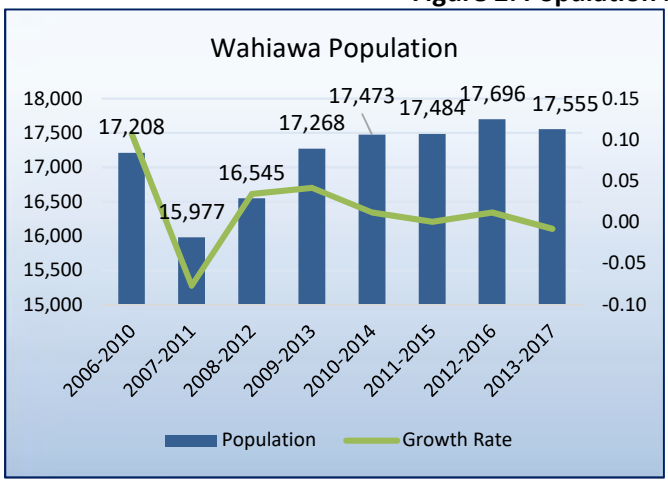
2.1 Population and Demographics

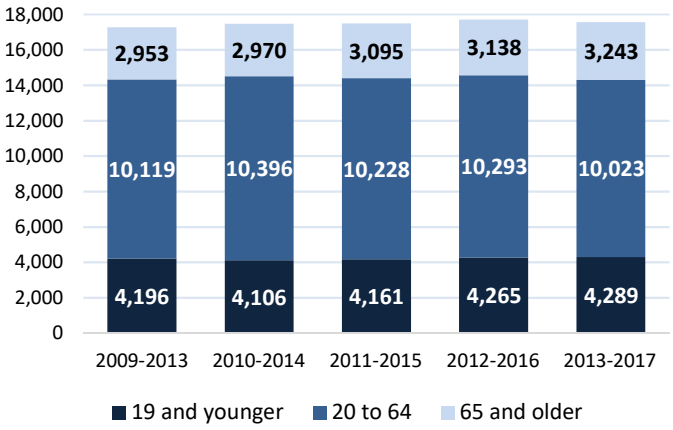
The following review of population and demographics for Wahiawa and Whitmore Village Census Designated Places is from the U.S. Census, American Community Survey. The latest data is for the five-year period 2013-2017. Trends are shown and comparisons to Honolulu County and the remaining COTS area communities are shown where appropriate.

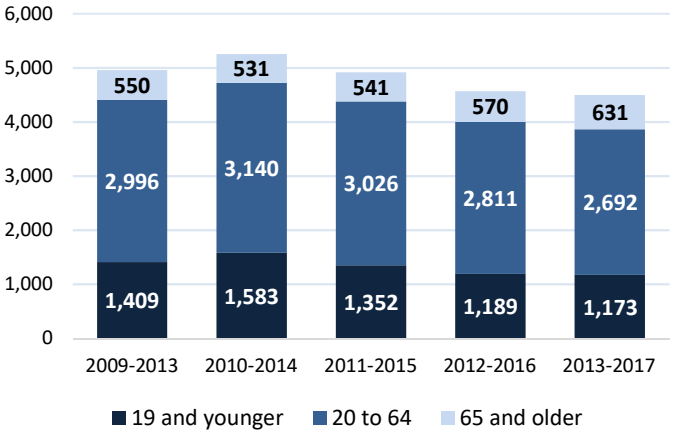
2.1.1 Population

Figure 2 presents the total population and composition by age group for Wahiawa in the top two graphs and Whitmore Village in the bottom two graphs. There are noticeable differences between the two communities. Wahiawa has had a stable population since the 2009-2013 period; with growth at about 0.017 percent overall to the 2013-2017 period. Whitmore Village, however, has shown a decline in population from a high of 5,254 reported in the 2010-2014; resulting in a growth rate of -14.4 percent.

Figure 2. Population by Time Period





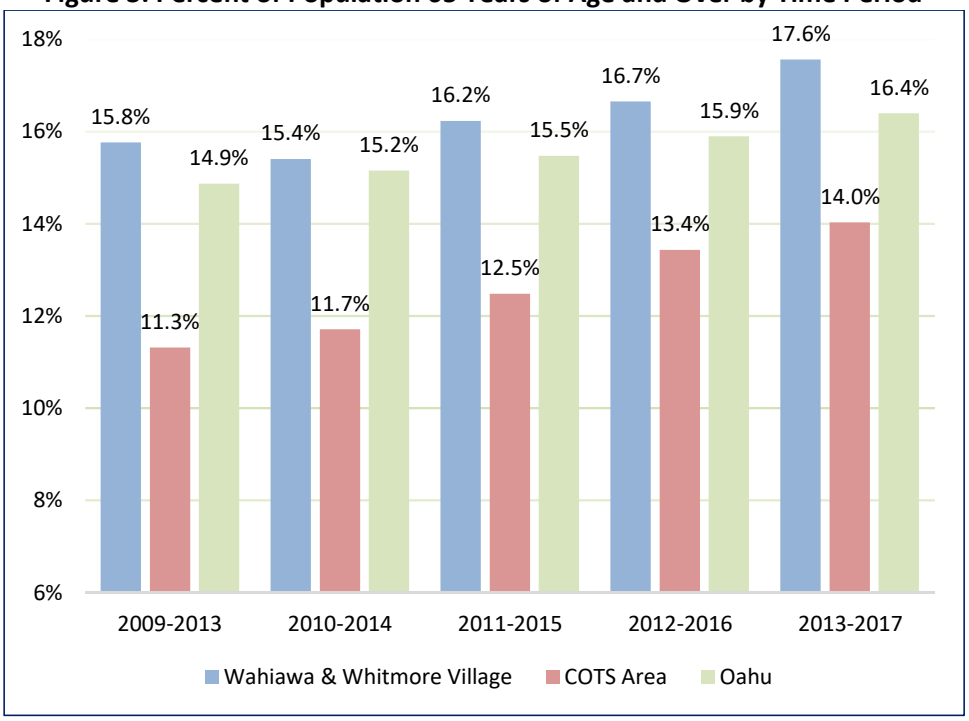


Source: American Community Survey, Five-year Averages, Table S0101

Census Designated Places are defined by the Census as: the statistical counterpart of incorporated places and are delineated to provide data for settled concentrations of population that are identifiable by name but are not legally incorporated under the laws of the state in which they are located. CDPs are delineated cooperatively by state and local officials and the Census Bureau, following Census Bureau guidelines. Graphics in the following sections showing information by community are based on CDP information.

Both communities, however, show a clear trend toward an ever-increasing percent of the population at 65 years of age or older. This growth in aging population is not unique. **Figure 3** shows that this trend is occurring for Oahu as a whole. The combined Wahiawa and Whitmore Village communities has 17.6 percent of the population aged 65 and older in 2013-2017. While the overall percent of those aged 65 and older is lower for the COTS area, the rate of increase from 2009-2013 to 2013-2017 is 23.9 percent. The rate of increase over the same period for Wahiawa and Whitmore Village is 11.4 percent and for Oahu overall is 10.1 percent. The COTS area shown in this graphic does not include Wahiawa and Whitmore Village.

Figure 3. Percent of Population 65 Years of Age and Over by Time Period



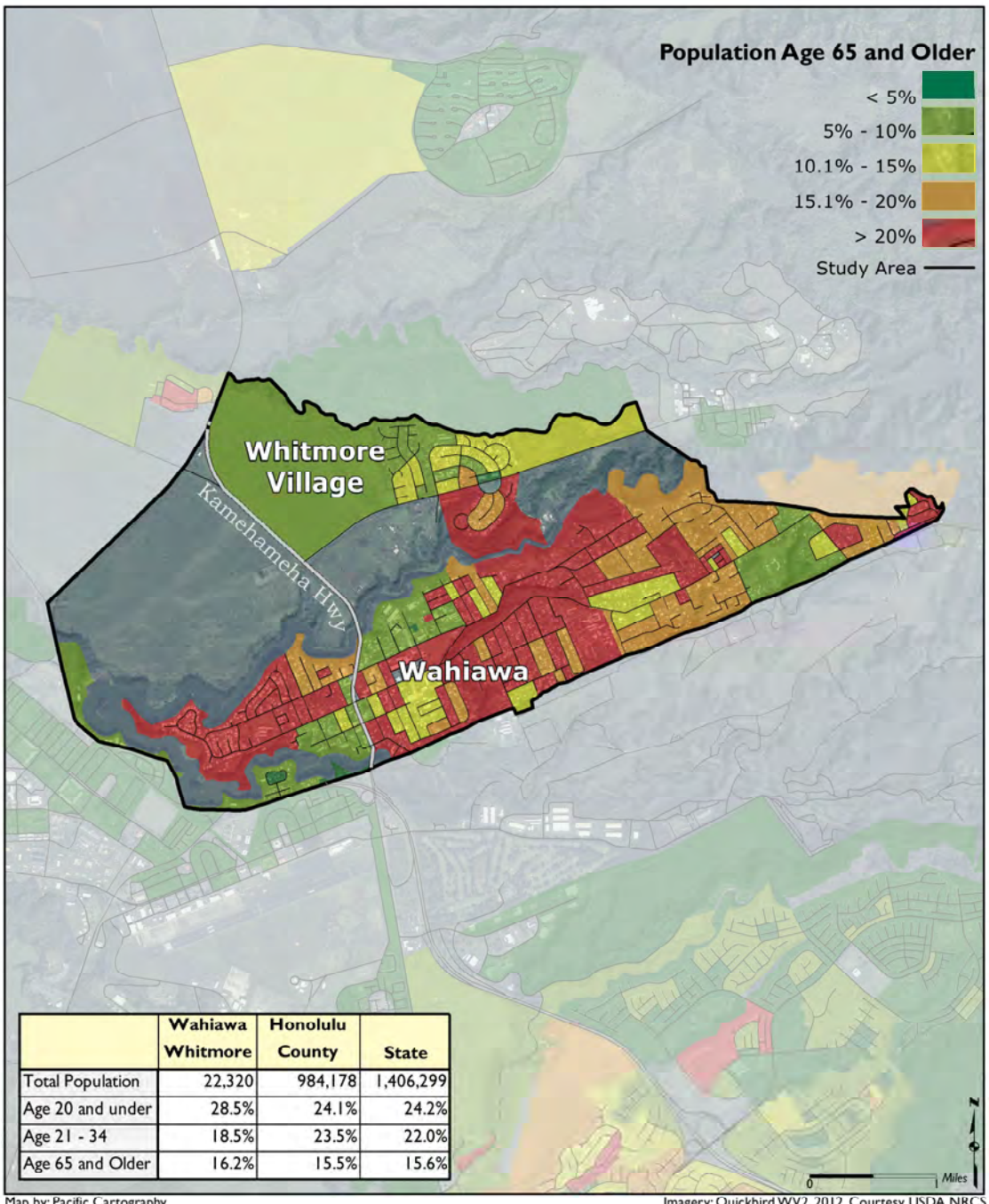
Source: American Community Survey, five-year averages, Tables S0101

Figure 4 presents the distribution of population aged 65 and older in Wahiawa and Whitmore Village based on the 2010 Census data. As shown Wahiawa has numerous Census blocks with population aged 65 and older at over 20 percent of the population (shown in red). Whitmore Village does show Census blocks with the elderly population over 20 percent on Circle Makai, Circle Mauka and North Circle Mauka.

The distribution of persons aged 21 to 34 is presented in **Figure 5**. This shows where younger families are settling. Every census block in Whitmore Village has over 15 percent of the population in this age group. Wahiawa Heights has more younger persons than the neighborhood on the Ewa side of Kamehameha Highway. This corresponds to the higher percentage of elderly residents living in that area.

The review of demographics is important to transportation planning. Many older residents have different transportation needs than younger families, such as more internal trips and less commute trips. These concentrations of resident demographics are noted during the project development process.

Figure 4. Population 65 Years of Age and Older by Census Block

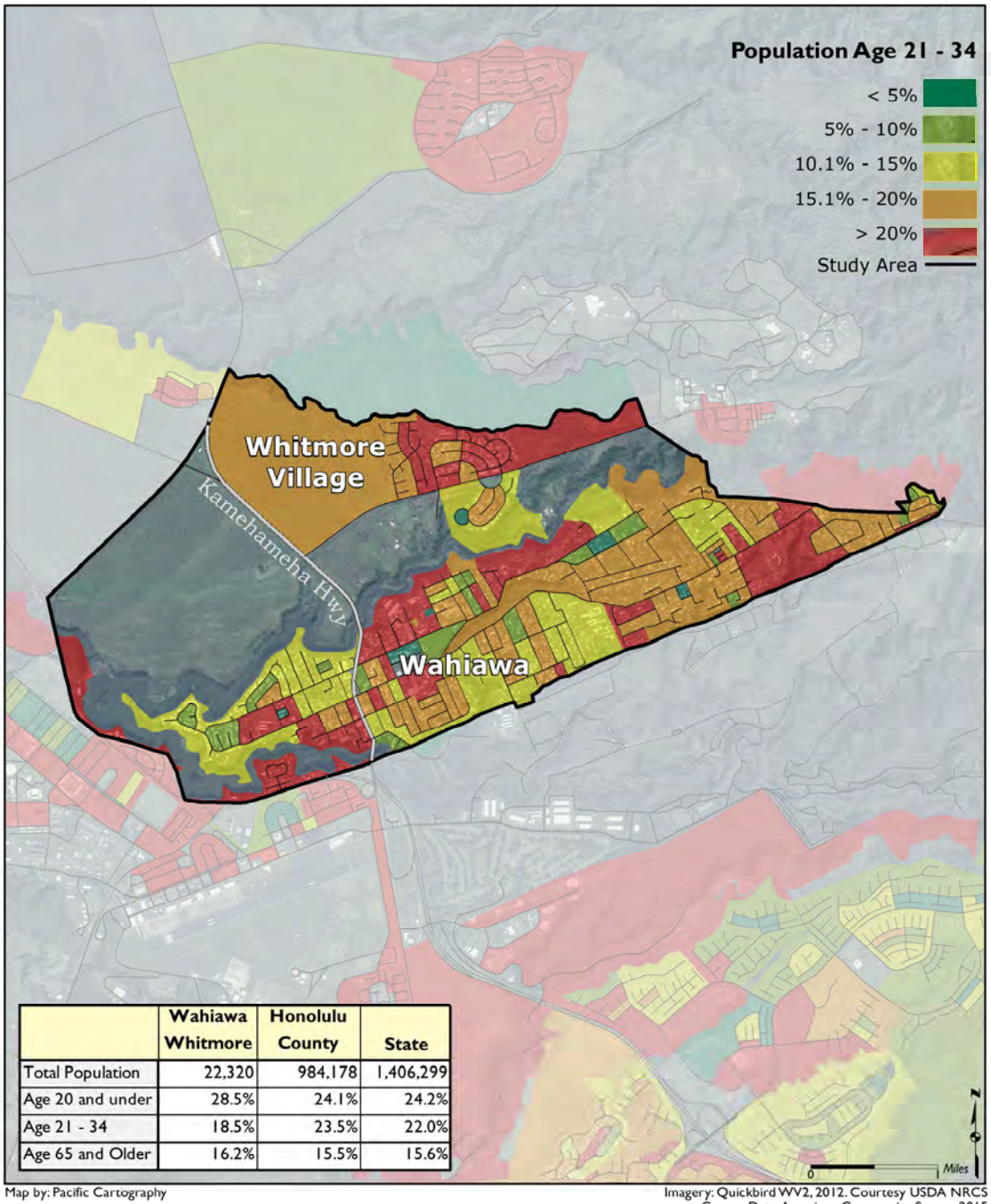


	Wahiawa Whitmore	Honolulu County	State
Total Population	22,320	984,178	1,406,299
Age 20 and under	28.5%	24.1%	24.2%
Age 21 - 34	18.5%	23.5%	22.0%
Age 65 and Older	16.2%	15.5%	15.6%

Map by: Pacific Cartography

Imagery: Quickbird WV2, 2012. Courtesy USDA NRCS
Census Data: American Community Survey, 2015
Roads: City & County Honolulu, 2014

Figure 5. Population Aged 21 to 34 by Census Block



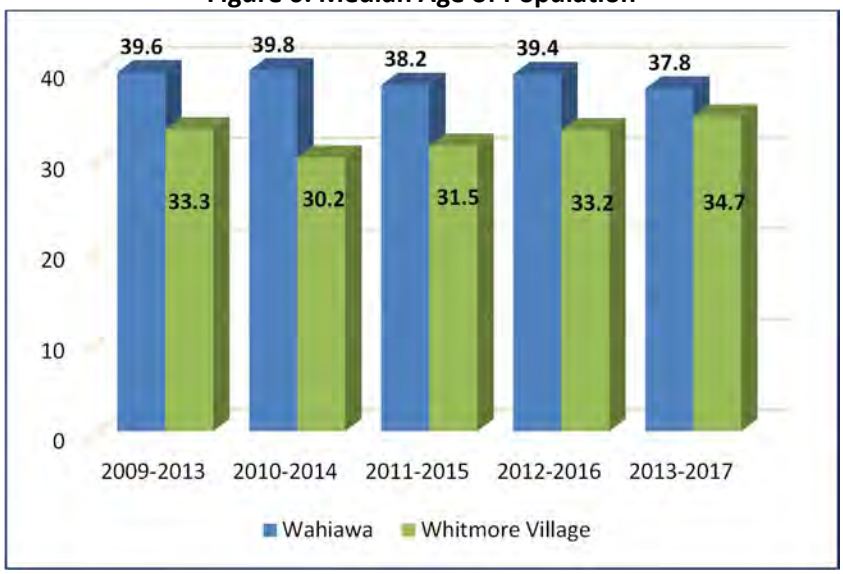
	Wahiawa Whitmore	Honolulu County	State
Total Population	22,320	984,178	1,406,299
Age 20 and under	28.5%	24.1%	24.2%
Age 21 - 34	18.5%	23.5%	22.0%
Age 65 and Older	16.2%	15.5%	15.6%

Map by: Pacific Cartography

Imagery: Quickbird WV2, 2012. Courtesy USDA NRCS
Census Data: American Community Survey, 2015
Roads: City & County Honolulu, 2014

The median age for the two communities is shown in **Figure 6**. The median age is rising slowly in Whitmore Village, but appears stable in Wahiawa.

Figure 6. Median Age of Population

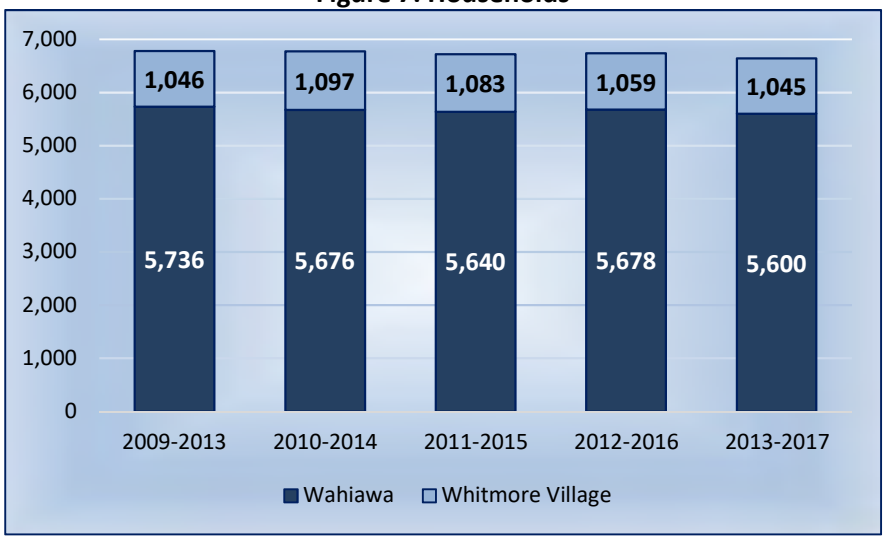


Source: American Community Survey, five-year averages, Tables S0101

2.1.2 Households

As shown in **Figure 7**, the peak number of households occurred in the five-year period ending in 2013 where 6,782 households were reported in the combined Wahiawa and Whitmore Village CDPs. Between this peak and the period ending 2017, the number of households dropped by 137, a loss of two percent. By contrast, Oahu overall had a household increase of 0.5 percent (Oahu households increased from 309,803 in the period ending in 2013 to 311,451 households in the period ending in 2017). There are no major developments planned for these two communities, therefore a substantial increase in households is unlikely in the near future.

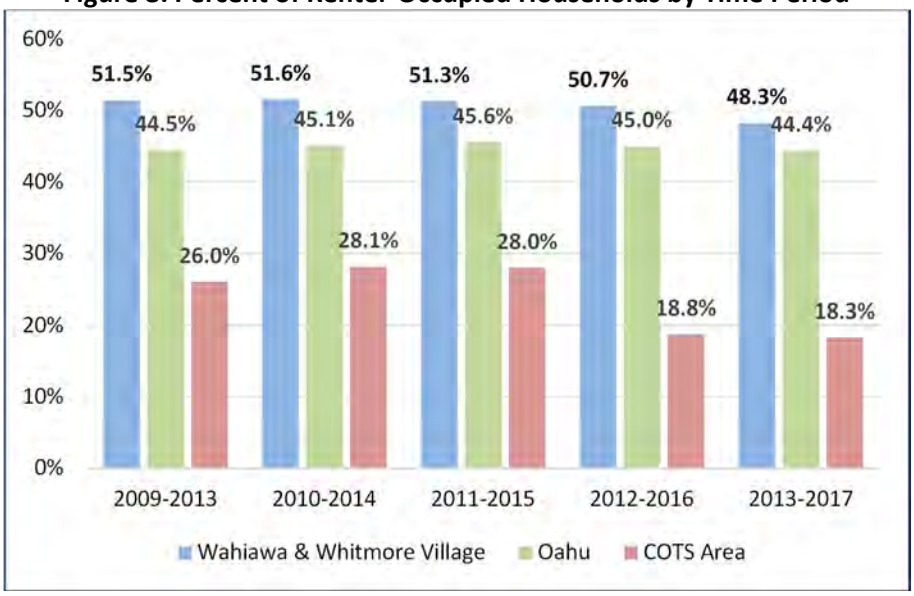
Figure 7. Households



Source: American Community Survey, five-year averages, Tables S1101

Figure 8 shows that those living in Wahiawa and Whitmore Village have a higher tendency to be renters than those living elsewhere on Oahu. The last reporting period in 2017 saw the percent of renters drop to below fifty percent for the first time since 2010. Oahu overall, hovers around 45 percent renters while the COTS area (without Wahiawa and Whitmore Village) has dropped to 18.3 percent of the households occupied by renters.

Figure 8. Percent of Renter-Occupied Households by Time Period

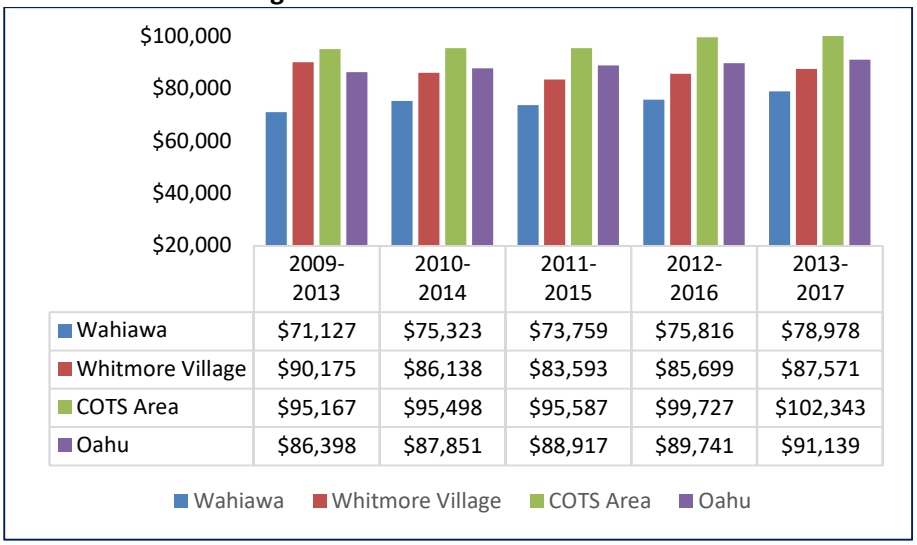


Source: American Community Survey, five-year averages, Tables S1101

2.1.3 Household Economic Status

Household income is increasing for all geographic areas shown in **Figure 9**, with some at a smaller rate than other areas. Of note, is that the periods ending in 2014 and 2015 show that incomes were either flat or had decreased slightly over that period. Household incomes had started rising in the 2012-2016 period.

Figure 9. Mean Household Income

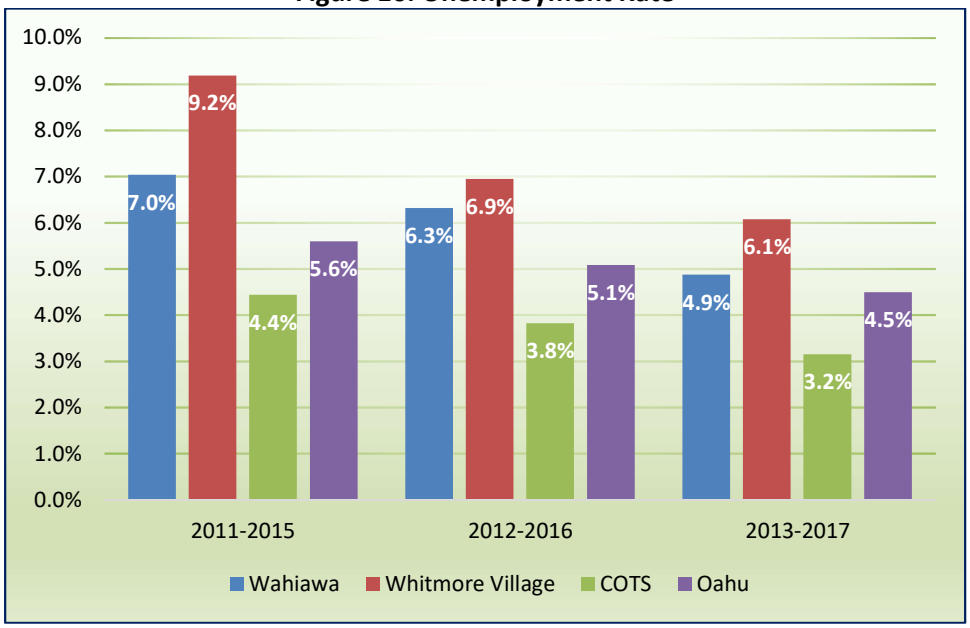


	2009-2013	2010-2014	2011-2015	2012-2016	2013-2017
Wahiawa	$71,127	$75,323	$73,759	$75,816	$78,978
Whitmore Village	$90,175	$86,138	$83,593	$85,699	$87,571
COTS Area	$95,167	$95,498	$95,587	$99,727	$102,343
Oahu	$86,398	$87,851	$88,917	$89,741	$91,139

Source: American Community Survey, five-year averages, Tables S1901

The differences between neighborhoods is considerable on many of the socio-economic factors. This is particularly noticeable when comparing the unemployment rate. The Census defines employment as those aged 16 and over in the labor market. Conversely with the rising household income shown in the previous graphic, the unemployment rate for all geographic areas shown in **Figure 10** is dropping. The unemployment rate for the COTS area communities (without Wahiawa and Whitmore Village) has been consistently lower than Oahu overall and for Wahiawa and Whitmore Village. As shown, in the period ending in 2015, Whitmore Village had an unemployment rate of more than twice that of the COTS area communities. Whitmore Village still lags considerably behind Oahu overall in the latest period ending in 2017.

Figure 10. Unemployment Rate



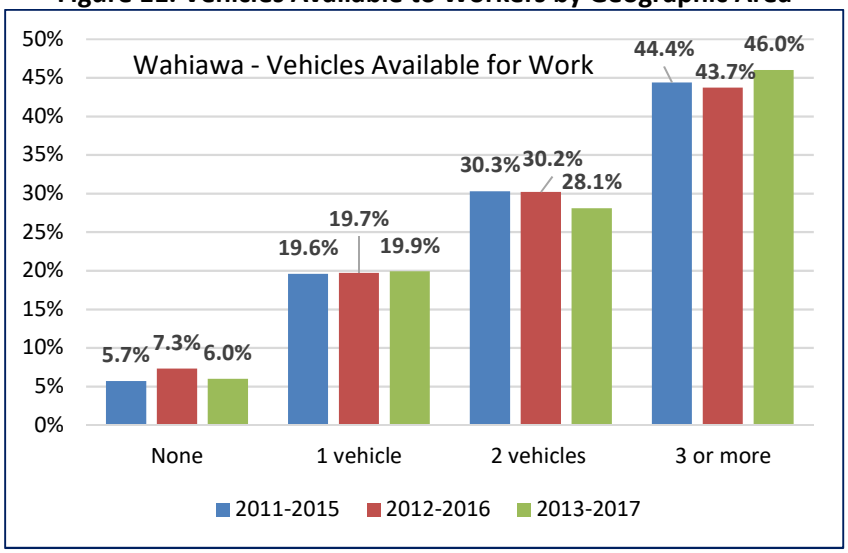
Source: American Community Survey, five-year averages, Tables S1701

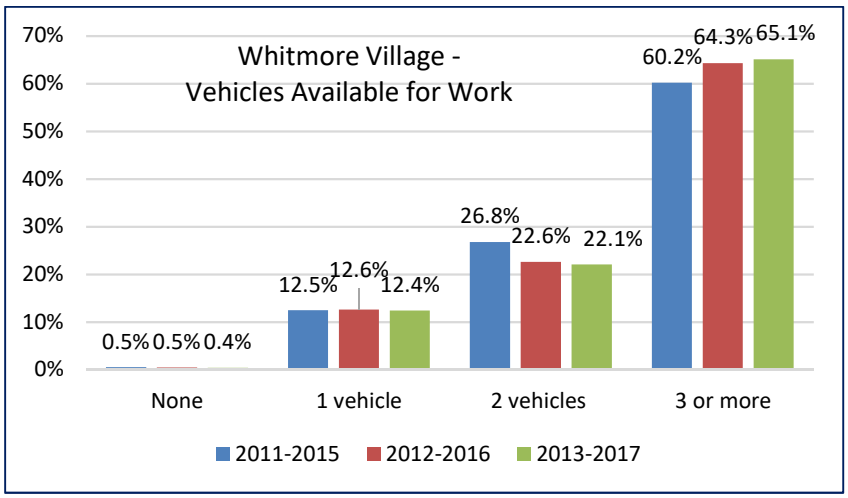
Wahiawa and Whitmore Village diverge from Oahu overall statistics relating to the number of vehicles available for people to get to work. **Figure 11** shows the number of vehicles available for workers for Wahiawa (top graphic), Whitmore Village (second graphic), and Oahu overall (third graphic). As shown, Wahiawa workers over the three time periods have consistent percentages of no vehicle (about 6 percent), one vehicle (19 percent), two vehicles (30 percent), or three or more vehicles (45 percent) available.

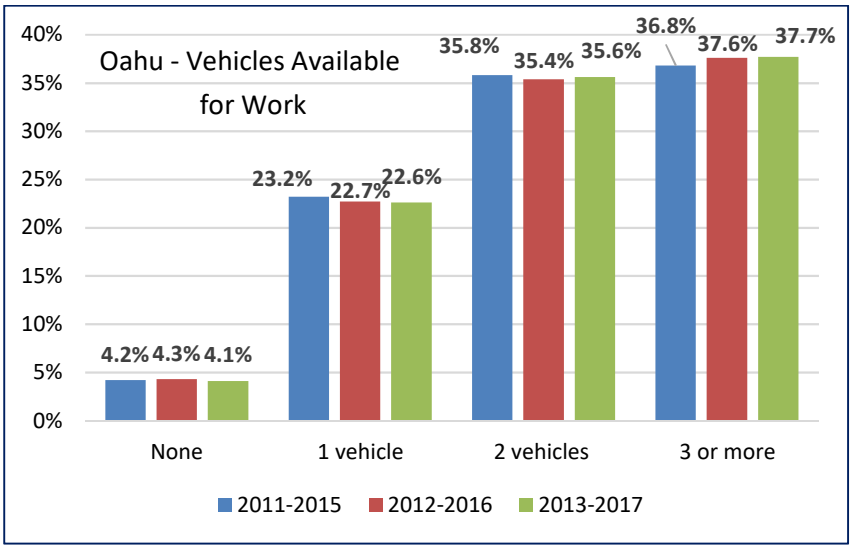
Whitmore Village shows consistent numbers of less than one percent of the employed having no vehicles available, about 12 percent having one vehicle available, about 23 percent with two vehicles available, and over 60 percent with three or more available vehicles. Oahu overall has similar percentages of workers with access to two or three or more vehicles at about 36 percent.

Further research into the statistics sheds light on why Whitmore Village is an outlier in both vehicles and household incomes. One finding is that about 29 percent of Oahu households have four or more members, while about 44 percent of Whitmore Village households have four or more members.

Figure 11. Vehicles Available to Workers by Geographic Area







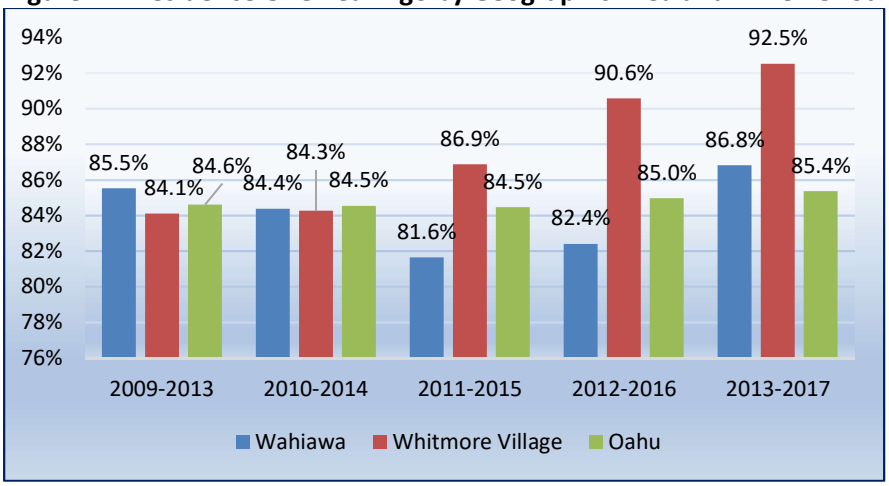
Source: American Community Survey, five-year averages, Tables S0802

2.1.4 Population Migration

The two time periods ending in 2013 and 2014 show that residents in Wahiawa, Whitmore Village, and Oahu overall resided in the same house as they did in the previous year at almost the same rate of 84 percent, shown in **Figure 12**. The next three time periods show that Oahu overall stayed about the same, with 85 percent of residents living in the same house.

The period ending 2015 saw a decrease for Wahiawa residents suggesting housing changes. By 2017 stability had returned as evidenced by 86.8 percent of Wahiawa residents living in their same place. Whitmore Village residents living in their same place has grown to 92.5 percent by the time period ending 2017. These statistics reveal that both communities are stable in terms of population migration. As noted, Oahu islandwide has been stable with little variance between the time periods.

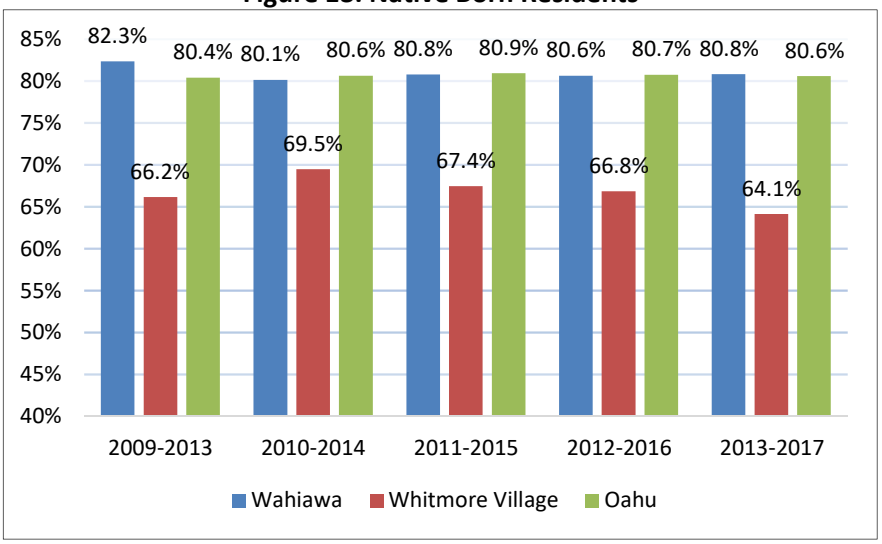
Figure 12. Residence One Year Ago by Geographic Area and Time Period



Source: American Community Survey, five-year averages, Tables B07003.
(Scale adjusted to highlight data and trends.)

Figure 13 shows that just over 80 percent of Wahiawa and Oahu overall residents were native born. Under 70 percent of those living in Whitmore Village identified as native born. About 20 percent of those living on Oahu are foreign-born, this increases to over 30 percent for Whitmore Village residents. Almost 55 percent (54.8 percent) of Whitmore Village residents indicated English is the language spoken at home. Almost 44 percent (43.8 percent) of the residents indicated the language spoken at home was from the Asian/Pacific Islander language group. Of these, half speak English less than "very well."

Figure 13. Native Born Residents

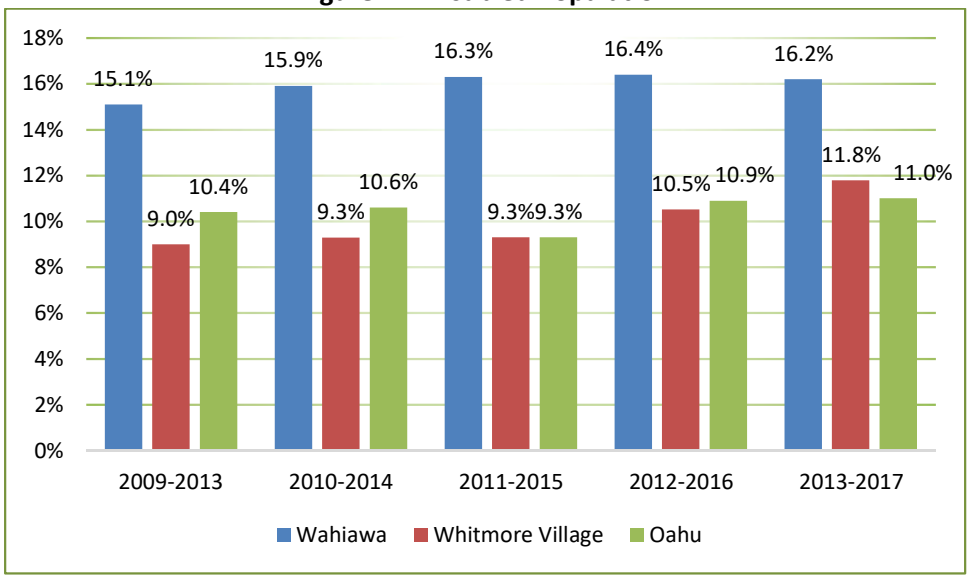


Source: American Community Survey, five-year averages, Tables B05002.
(Scale adjusted to highlight data and trends.)

2.1.5 Disabled

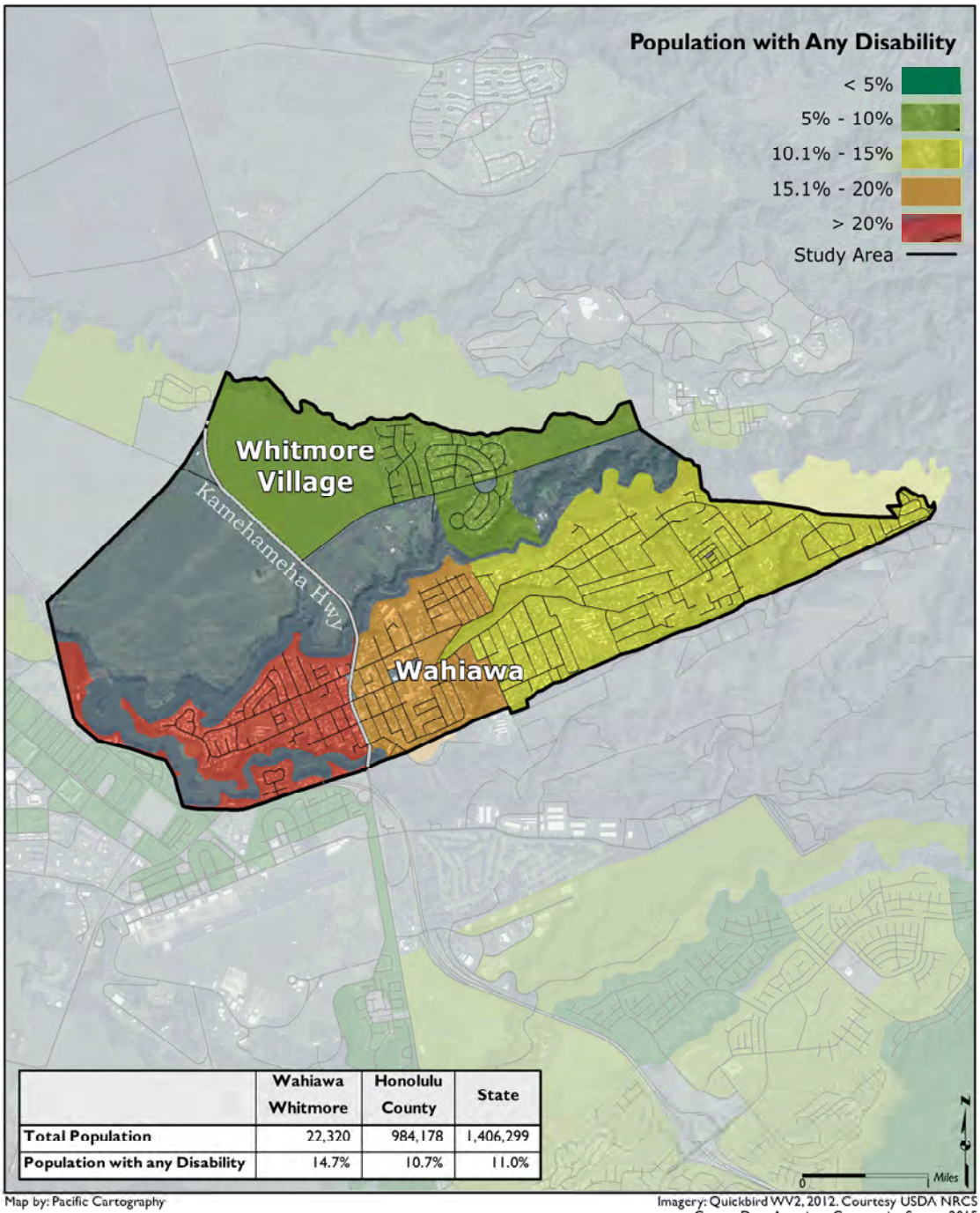
Figure 14 provides resident disability status as a percent of the entire population. The increasing percent of disabled residents over the five time periods suggest an emerging trend corresponding to the increasing percent of elderly. Disability is shown by census tract in **Figure 15**. The census tracts with the highest number of people with a disability are located west of Kamehameha Highway in Wahiawa. Census data is available in different geographic units depending on the data. Age is presented in the smallest geographic unit the census block, residents with a disability is shown in the larger geographic unit; census tracts, therefore the mapping shown in Figure 15 is for the entire census tract and does not show smaller areas of concentration of disabled residents.

Figure 14. Disabled Population



Source: American Community Survey, five-year averages, Tables S1810

Figure 15. Disabled Population by Census Tract



	Wahiawa Whitmore	Honolulu County	State
Total Population	22,320	984,178	1,406,299
Population with any Disability	14.7%	10.7%	11.0%

Map by: Pacific Cartography

Imagery: Quickbird WV2, 2012. Courtesy USDA NRCS
Census Data: American Community Survey, 2015

2.1.6 Poverty

The US Census uses income thresholds to determine poverty. These thresholds are based on Directive 14, from the Office of Management and Budget (OMB) and are developed based on family composition as shown in **Table 2**.

Table 2. 2015 Poverty Thresholds by Family Size and Related Children Under 18 Years

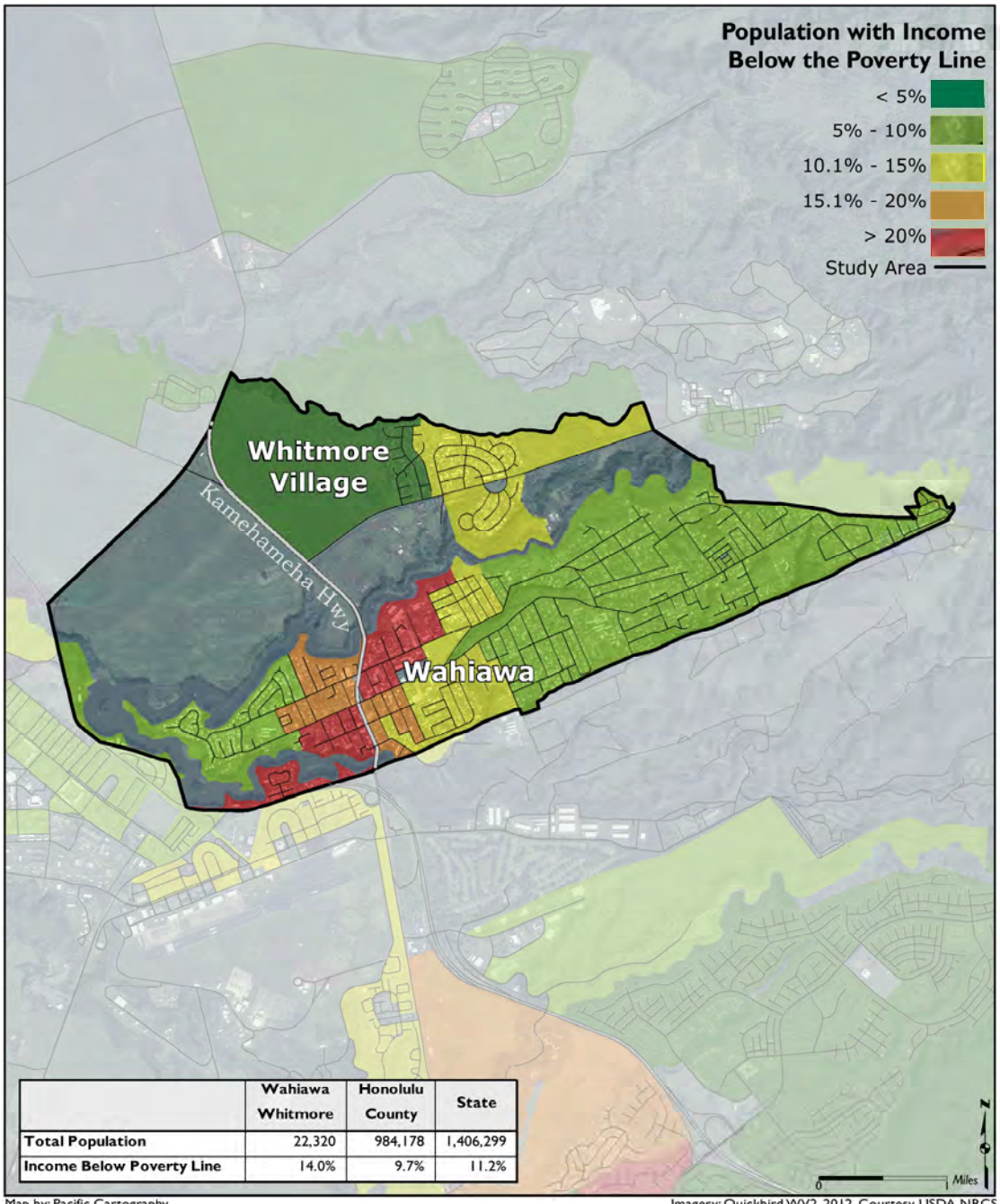
SIZE OF FAMILY UNIT	RELATED CHILDREN UNDER 18 YEARS OF AGE								
	None	One	Two	Three	Four	Five	Six	Seven	Eight or more
One person (unrelated individual)									
Under 65 years	$13,069								
65 and over	$12,043								
Two people									
Householder under 65	$16,815	$17,308							
Householder 65 and over	$15,178	$17,242							
Three people	$19,642	$20,212	$20,231						
Four people	$25,900	$26,324	$25,465	$25,554					
Five people	$31,234	$31,689	$30,718	$29,967	$29,509				
Six people	$35,925	$36,068	$35,324	$34,612	$33,553	$32,925			
Seven people	$41,336	$41,594	$40,705	$40,085	$38,929	$37,581	$36,102		
Eight people	$46,231	$46,640	$45,800	$45,064	$44,021	$42,696	$41,317	$40,967	
Nine or more people	$55,613	$55,883	$55,140	$54,516	$53,491	$52,082	$50,807	$50,491	$48,546

Source: US Census https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-thresholds.html; 2018

People and families are classified as being in poverty if their income is less than their poverty threshold. If their income is less than half their poverty threshold, they are considered below 50 percent of poverty; less than the threshold itself, they are in poverty (below 100% of poverty); less than 1.25 times the threshold, below 125% of poverty, and so on (U.S. Census, 2016).

Figure 16 shows that the highest concentrations of people living with income below the poverty line are in areas adjacent to Kamehameha Highway. Oahu has had a consistent 4.7 percent of the population living 50 percent below the poverty level as shown in **Figure 17**. This dropped to 4.4 percent in the latest period. Whitmore Village had a very low percent of people living below the poverty level, but this has steadily climbed from 1.8 percent to 4.5 percent. Wahiawa has 7.2 percent of the population living 50 percent below the poverty line, down from a high of 7.6 percent recorded in the period ending in 2015.

Figure 16. Income Below the Poverty Line by Census Block Group

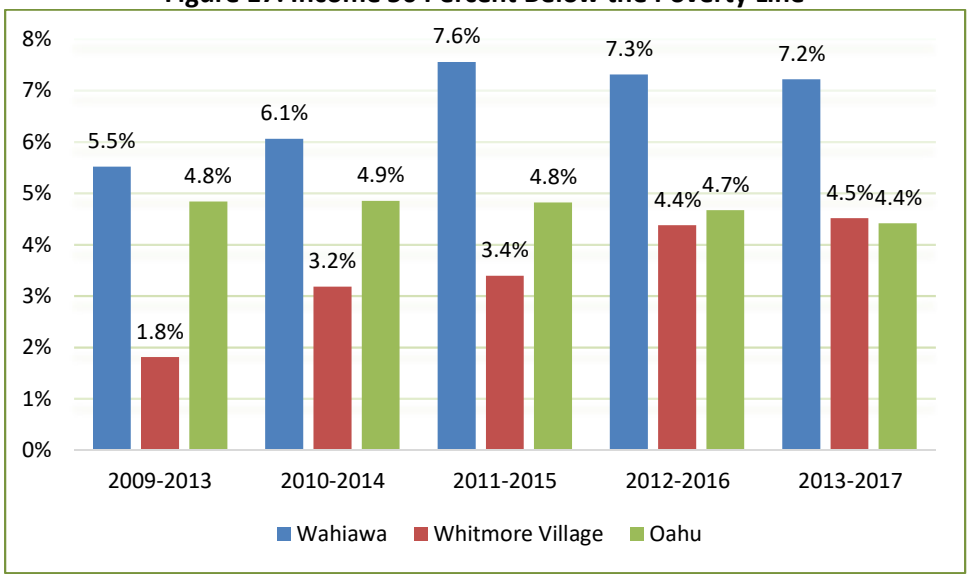


	Wahiawa Whitmore	Honolulu County	State
Total Population	22,320	984,178	1,406,299
Income Below Poverty Line	14.0%	9.7%	11.2%

Map by: Pacific Cartography

Imagery: Quickbird WV2, 2012. Courtesy USDA NRCS
Census Data: American Community Survey, 2015
Roads: City & County Honolulu, 2014

Figure 17. Income 50 Percent Below the Poverty Line



Source: American Community Survey, five-year averages, Tables S1701

2.1.7 Minority

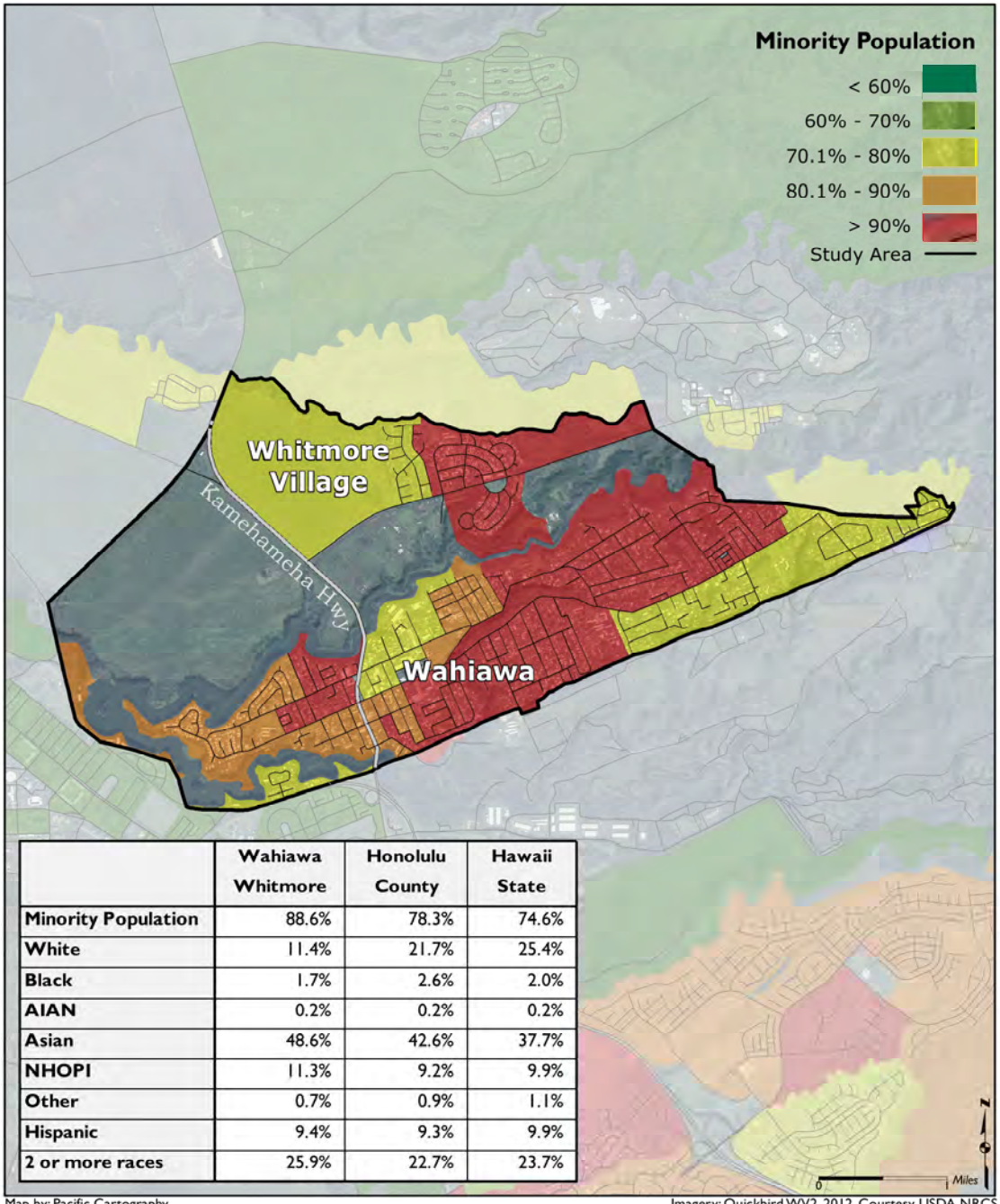
The minority population for Wahiawa and Whitmore Village is shown in **Figure 18**. Both Wahiawa and Whitmore Village are mostly comprised of minority populations. Both communities have over 60 percent minority population with most block groups having over 80 percent minority population.

2.1.8 Environmental Justice

Executive Order 12898, issued February 11, 1994, requires Federal agencies to achieve environmental justice by identifying and addressing disproportionately high and adverse human health or environmental effects, including the interrelated social and economic effects of their programs, policies, and activities on minority populations and low-income populations in the United States. Local governments identify environmental justice (EJ) population definitions to assess the distribution and equity of transportation projects. The Federal Highway Administration (FHWA) identifies EJ populations as:

- **Low-Income.** A person whose median household income is at or below the Department of Health and Human Services poverty guidelines.
- **Minority.** A person who is:
  1. Black: a person having origins in any of the black racial groups of Africa;
  2. Hispanic or Latino: a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race;
  3. Asian American: a person having origins in any of the original peoples of the Far East, Southeast Asia or the Indian subcontinent;
  4. American Indian and Alaskan Native: a person having origins in any of the original people of North America, South America (including Central America), and who maintain cultural identification through tribal affiliation or community recognition; or
  5. Native Hawaiian and Other Pacific Islander: a person having origins in any of the original peoples of Hawaii, Guam, Samoa or other Pacific Islands.

Figure 18. Minority Population by Census Block Group



	Wahiawa Whitmore	Honolulu County	Hawaii State
Minority Population	88.6%	78.3%	74.6%
White	11.4%	21.7%	25.4%
Black	1.7%	2.6%	2.0%
AIAN	0.2%	0.2%	0.2%
Asian	48.6%	42.6%	37.7%
NHOPI	11.3%	9.2%	9.9%
Other	0.7%	0.9%	1.1%
Hispanic	9.4%	9.3%	9.9%
2 or more races	25.9%	22.7%	23.7%

Map by: Pacific Cartography

Imagery: Quickbird WV2, 2012. Courtesy USDA NRCS
Census Data: American Community Survey, 2015
Roads: City & County Honolulu, 2014

The U.S. Department of Transportation (DOT) Federal Highway Administration (FHWA) states the U.S. DOT is committed to following the principles of EJ, which include:

- To avoid, minimize, or mitigate disproportionately high and adverse human health or environmental effects, including social and economic effects, on minority populations and low-income populations.
- To ensure the full and fair participation by all potentially affected communities in the transportation decision-making process.
- To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority populations and low-income populations.

These goals of EJ should be considered throughout transportation planning and project development, and through all public outreach and participation efforts conducted by the U.S. DOT and their grantees.[1] *The Oahu Metropolitan Planning Organization Title VI/Environmental Justice Analysis Update Report* notes that the County of Honolulu is racially diverse with a 19.2 percent of the population identified as non-Hispanic white as compared to the U.S. average of 63.7 percent.[2] Estimates from the ACS 2011-2015 five-year estimates show that the "white alone" category for Honolulu County is 21.7 percent of the population compared to 73.6 percent for the U.S. Due to the diverse nature of Hawaii's population, the City and County of Honolulu Department of Planning and Permitting (DPP) based EJ identification on "disproportionate settlement patterns of racial minority populations."[3]

As a federally funded agency, OahuMPO is required to consider Title VI and Environmental Justice populations in the planning process. Using the methodology described in the 2004 OahuMPO report, the EJ population was computed by block group. This is described in **Table 3** for the Wahiawa and Whitmore Village extension and Oahu.

Table 3. Environmental Justice Population by Block Group

POPULATION CATEGORY	EXTENSION AREA	OAHU
Total individuals	23,212	952,704
EJ designated for race – # of block groups	3	105
EJ designated for race - population	6,342	240,599
EJ designated for income - # of block groups	3	60
EJ designated for income - population	6,364	113,515
EJ designated for both race and income – block groups	2	30
EJ designated for both race and income - population	3,061	64,793
Total EJ block groups	4	135
Total EJ population	9,645	289,321
EJ population as a percent of total population	41.6%	30.4%

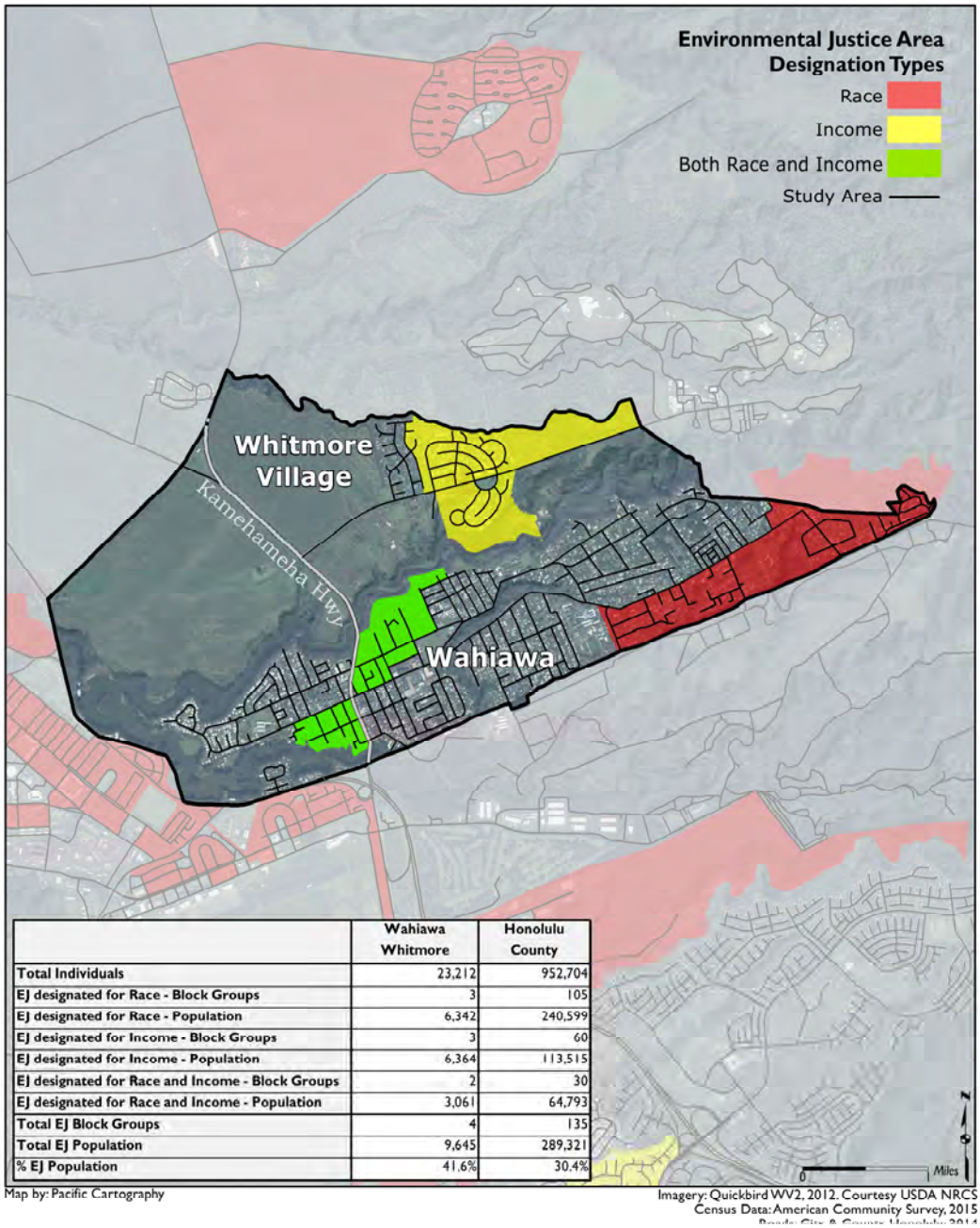
[1] U.S. Department of Transportation Federal Highway Administration Environmental Justice at Department of Transportation https://www.fhwa.dot.gov/environment/environmental_justice/ej_at_dot/

[2] *The Oahu Metropolitan Planning Organization Title VI/Environmental Justice Analysis Update Report*, September 15, 2016.

[3] Refer to the *OMPO 2004 Environmental Justice in the OMPO Planning Process: Defining Environmental Justice Populations*, 2004 for methodology.

Four block groups in the Wahiawa and Whitmore Village area were designated as EJ; three for race and one for income. These three block groups represent 9,645 individuals or 41.6 percent of the Wahiawa and Whitmore Village population. As shown in the table, Oahu islandwide has 30.4 percent of the population designated as EJ. The four designed EJ block groups are shown in **Figure 19**. As discussed previously, EJ designation was based not directly on minority populations, but on disproportionate settlement patterns of minority populations. The block group identified as EJ in the southeastern portion of Wahiawa is due to higher settlement patterns of Hispanic persons and "two or more races" than the County averages.

Figure 19. Environmental Justice Areas



	Wahiawa Whitmore	Honolulu County
Total Individuals	23,212	952,704
EJ designated for Race - Block Groups	3	105
EJ designated for Race - Population	6,342	240,599
EJ designated for Income - Block Groups	3	60
EJ designated for Income - Population	6,364	113,515
EJ designated for Race and Income - Block Groups	2	30
EJ designated for Race and Income - Population	3,061	64,793
Total EJ Block Groups	4	135
Total EJ Population	9,645	289,321
% EJ Population	41.6%	30.4%

Map by: Pacific Cartography

Imagery: Quickbird WV2, 2012. Courtesy USDA NRCS
Census Data: American Community Survey, 2015

2.2 Land Use and Housing

2.2.1 Housing Units

Per the United States Census in 2010 there were 6,192 housing units in Wahiawa and 990 housing units in Whitmore Village. Estimates for the period ending 2017 show that units have decreased 2.1 percent to 6,063 units. Of those units, 66.5 percent or 4,031 were classified as single units and 2,032 or 33.5 percent were classified as multiple units.

Whitmore Village units have increased 10.3 percent to 1,092 between 2010 and 2017. The composition of housing units in Whitmore Village is 83.6 percent single units (913) and 16.4 percent multiple units or a total of 179.

2.2.2 Jobs

The 2012 Economic Census of the United States identified 349 employers in Wahiawa and 9 in Whitmore Village. Actual number of employees is uncertain as the data was categorized using ranges such as 0 to 19 employees, but there are few major non-military employers in the area. This is reflected by the 79.1 percent of Wahiawa workers and the 93.6 percent of Whitmore Village workers that work outside of the area they live.

2.3 Travel Characteristics

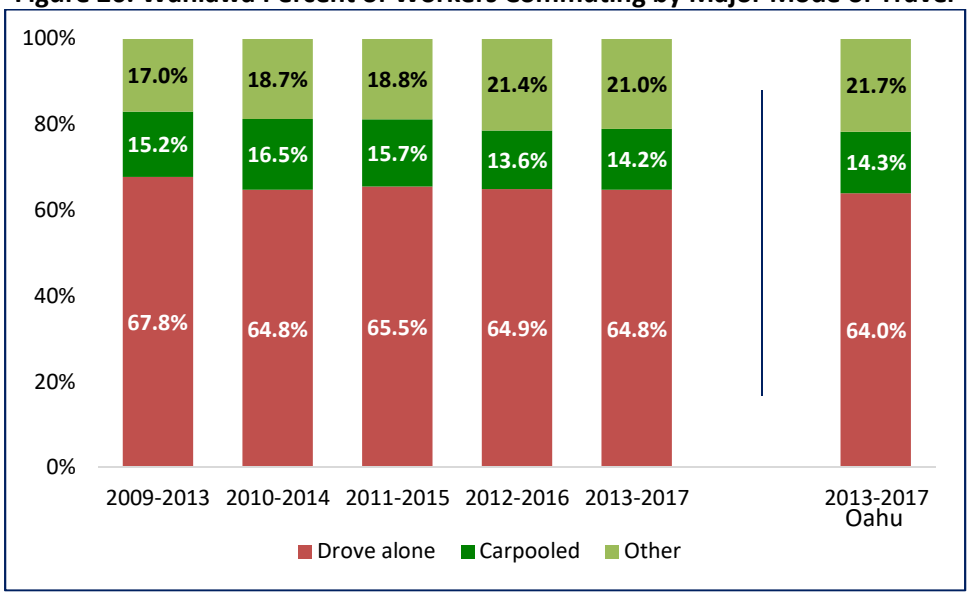
2.3.1 Workers and Their Commuting Travel Behavior

This section includes a series of figures which present the ACS statistics on workers aged 16 years and older and their commuting behavior. The peak number of workers 16 years of age and older for the combined Wahiawa and Whitmore Village area was reached in the five-year period ending in 2014 when there were a reported 10,554 workers. However, the range for all five time periods has remained relatively constant from a low of 10,110 workers in the period ending 2013 to 10,454 works in 2017. This has been accomplished with a seven percent increase in Wahiawa workers over this time frame offset by an 8.2 percent decrease of Whitmore Village workers.

Figure 20 shows that the percent of Wahiawa area commuters who drove alone has remained relatively constant over the five periods illustrated in the graphic. The figure shows that Wahiawa commuters have the same percent of major mode choice as Oahu overall.

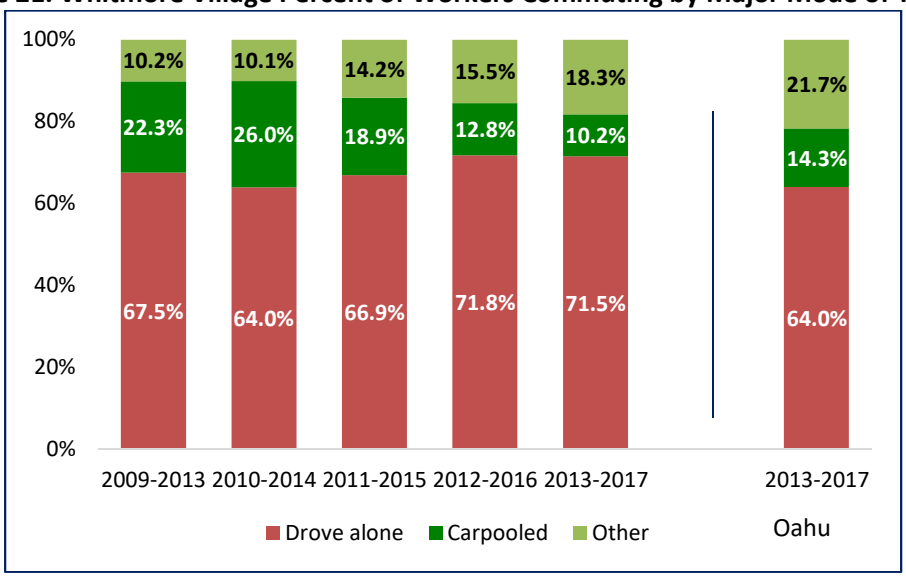
Figure 21 shows that Whitmore Village commuters rely more upon driving alone than their neighbors in Wahiawa and Oahu overall. This figure also shows that carpooling has remained stable in Wahiawa but has decreased sharply in Whitmore Village. Perhaps Whitmore Village residents would benefit from the Transportation Demand Management techniques and coordinator discussed in the full COTS report.

Figure 20. Wahiawa Percent of Workers Commuting by Major Mode of Travel



Source: American Community Survey, five-year averages, Tables S0801

Figure 21. Whitmore Village Percent of Workers Commuting by Major Mode of Travel



Source: American Community Survey, five-year averages, Tables S0801

To some degree this shift has been toward a use of alternative transportation modes as shown in **Table 4**. This table includes five non-personal vehicle commute modes: bicycle, taxi/motorcycle, walk, work at home, and public transportation. A noticeable trend is the steady increase in the use of public transportation. The table presents the use of these modes by time period showing Wahiawa commuters first and Whitmore Village commuters second. It is notable that during all five time periods, Whitmore Village commuters do not bicycle to their places of work.

Table 4. Percent of Workers Commuting by Non-Personal Vehicles Means

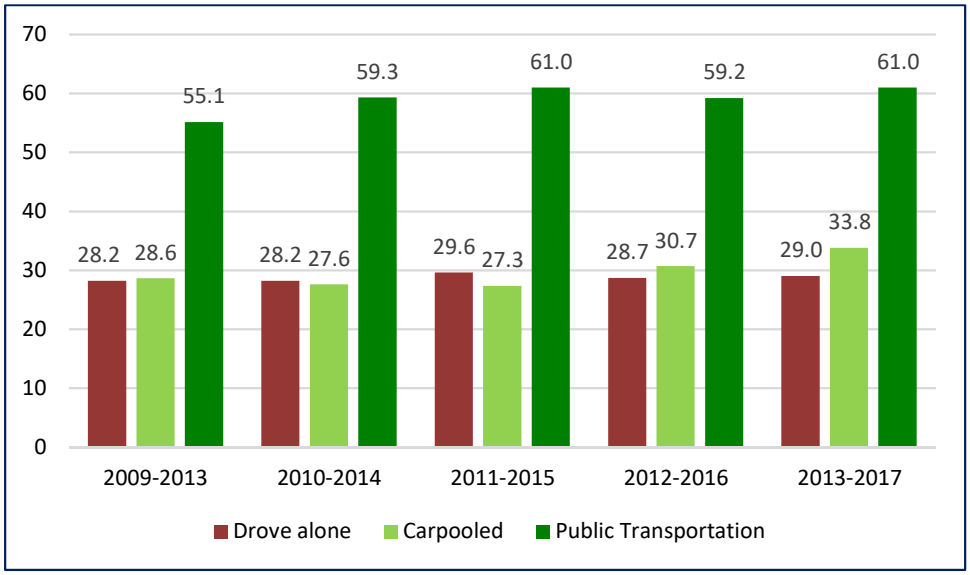
	2009 to 2013		2010 to 2014		2011 to 2015		2012 to 2016		2013 to 2017	
Mode	Wahiawa	Whitmore Village	Wahiawa	Whitmore Village	Wahiawa	Whitmore Village	Wahiawa	Whitmore Village	Wahiawa	Whitmore Village
Public Transportation	7.8%	7.1%	8.1%	7.3%	7.7%	9.0%	10.0%	11.6%	9.9%	13.5%
Walked	5.8%	1.1%	6.4%	0.5%	6.5%	1.5%	5.5%	1.6%	5.8%	1.6%
Bicycle	0.5%	0.0%	0.5%	0.0%	0.6%	0.0%	0.5%	0.0%	0.3%	0.0%
Taxi, Other	1.1%	0.9%	2.2%	0.5%	2.2%	0.5%	2.6%	0.6%	2.5%	0.4%
Worked at Home	1.8%	1.2%	1.4%	1.7%	1.8%	3.1%	2.8%	3.0%	2.6%	2.7%

Source: American Community Survey, five-year averages, Tables S0801

Table 4 shows a large increase in public transportation use by Whitmore Village commuters, almost doubling from 7.1 percent in the period ending in 2013 to 13.5 percent in the period ending in 2017. This is despite the mean travel time to work by public transportation at twice the drive alone time as shown in **Figure 22**. In the period ending 2017, public transportation took on average 61 minutes for Wahiawa commuters to reach their places of work.

While the drive alone travel time to work has remained relatively constant throughout the five time periods shown, the travel time to work by public transportation has risen from a mean of 55.1 minutes in the period ending in 2013 to 61 minutes in the period ending in 2017. Carpool commute times are fairly similar to drive alone. Sample sizes for Whitmore Village commuters were not sufficient to estimate travel times in three out of the five time periods. Therefore, travel times are not shown for Whitmore Village given the low sample sizes.

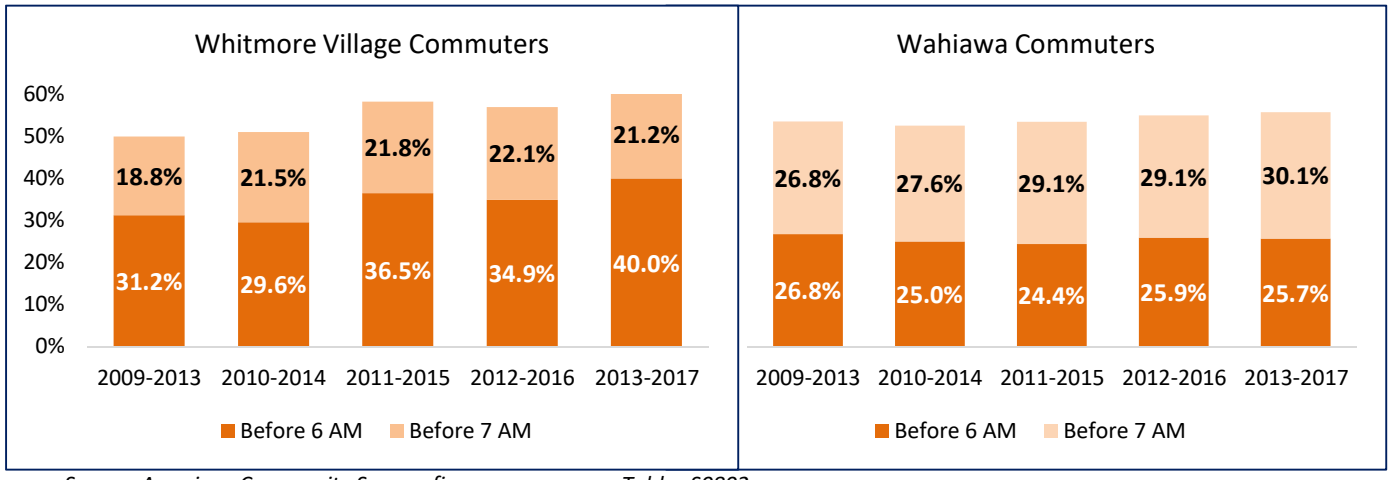
Figure 22. Mean Travel Time in Minutes to Work by Major Mode for Wahiawa Workers



Source: American Community Survey, five-year averages, Tables S0802

The commute start times for Whitmore Village and Wahiawa commuters is shown in **Figure 23**. The percent of commuters in Whitmore Village starting their commute before 6 AM continues to increase from 31.2 percent in the period ending in 2013 to 40 percent in the period ending in 2017. Wahiawa commuters start times has remained relatively flat over the five time periods as shown in the figure.

Figure 23. Commute Start Time



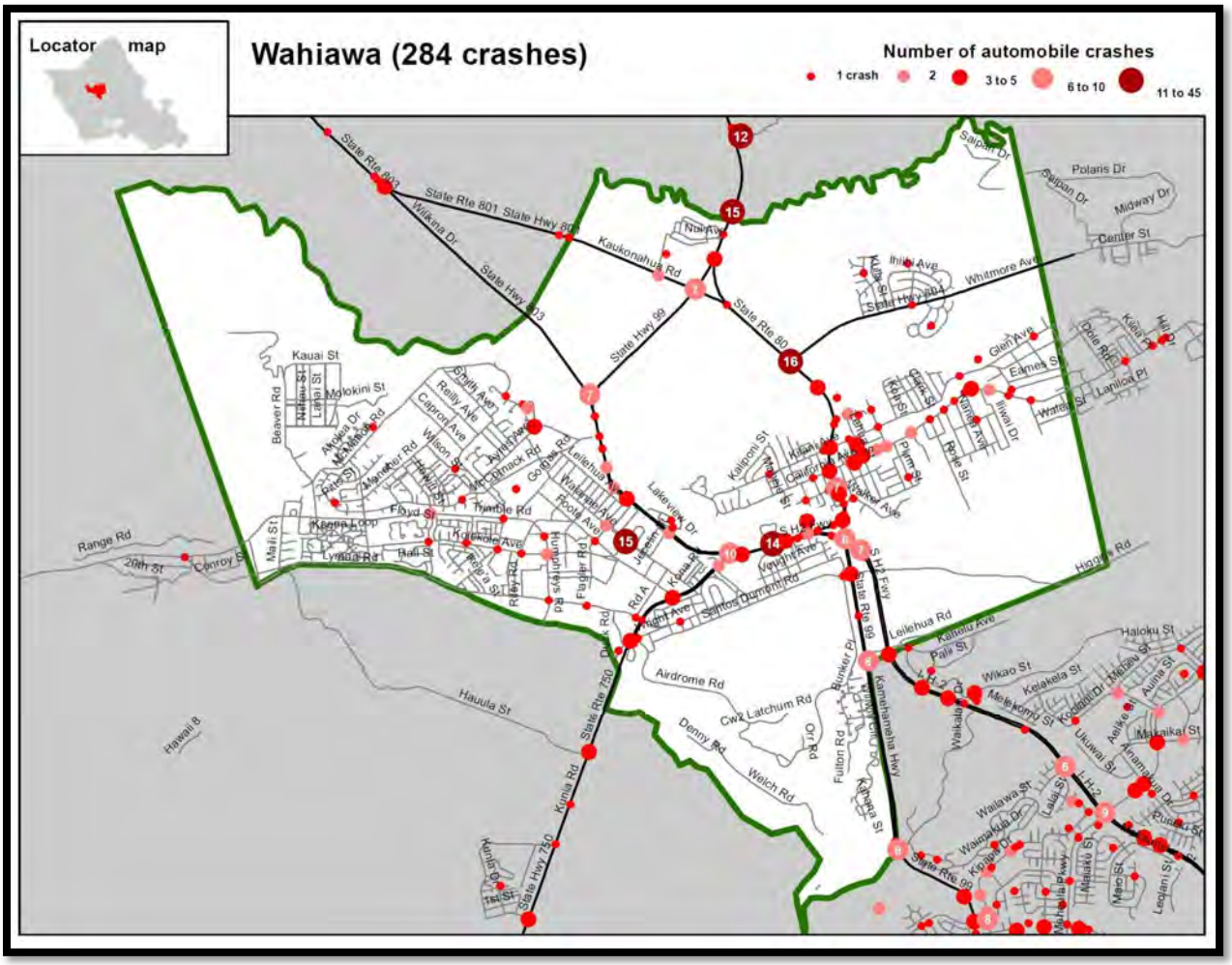
Source: American Community Survey, five-year averages, Tables S0802

2.3.2 Crash Trends

The State of Hawaii Department of Health provides crash data for pedestrian, bicycle, motorcycle/moped, and car/truck crashes. This data is provided by year from 2007 to 2011 (consistent with the original more focused COTS area). Individual maps plot the location of the crashes for each mode by year. Crash locations are identified with a circle on the maps. The size of the circle indicates the number of crashes occurring at a location. The actual number of crashes is available at each location. Crash details such as fault or severity are not published.

Figure 24 shows how the crash data is presented. This figure sums the total number of automobile crashes in the Wahiawa-Whitmore Village Neighborhood Board area for the period 2007 to 2011. Importantly, this summing of data quickly shows where crashes are more frequent such as the intersection of Kamehameha Highway and Whitmore Avenue and all along California Avenue.

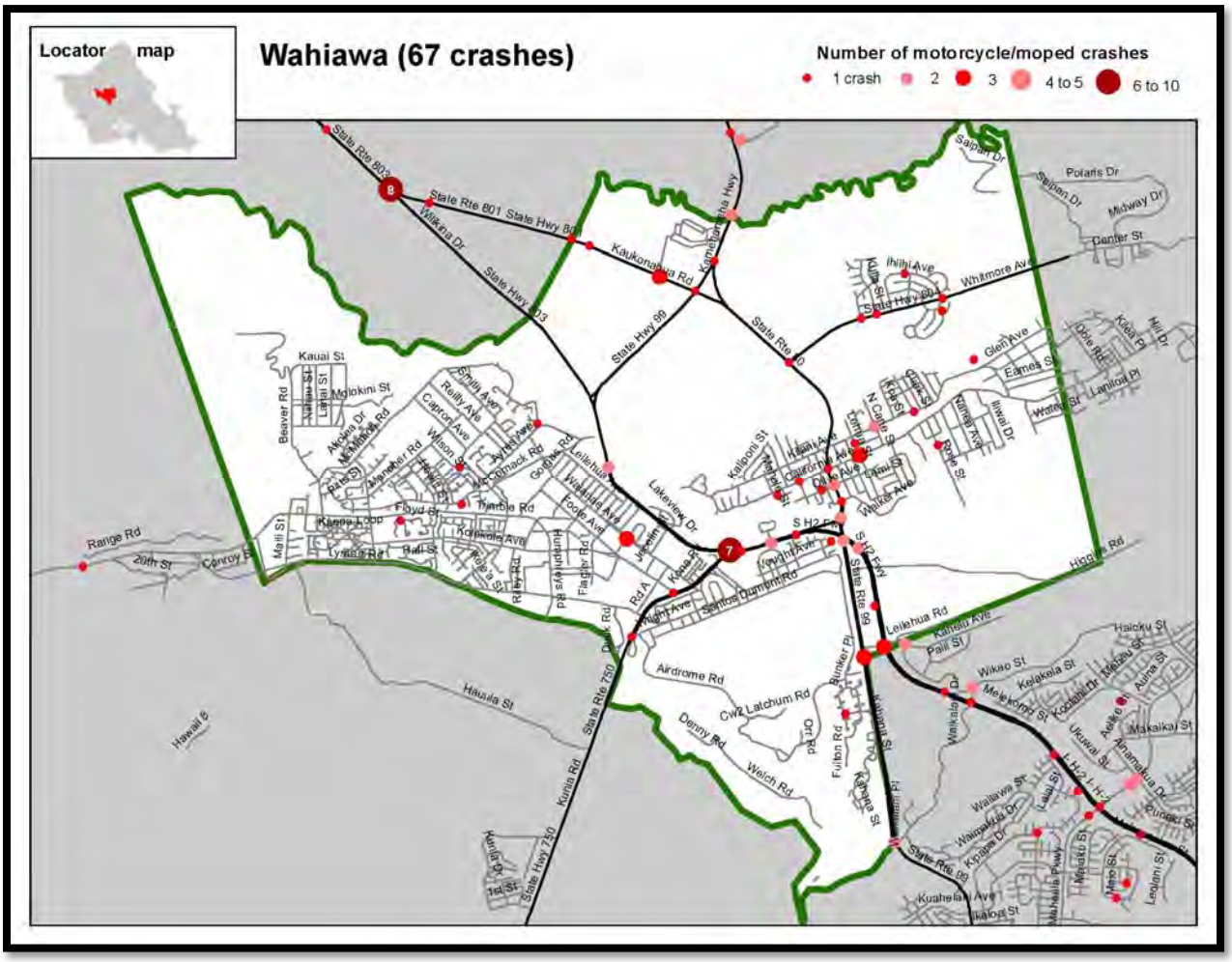
Figure 24. Wahiawa-Whitmore Village Auto Crash Data (location and number of crashes)



Source: Mapbook of EMS-attended motor vehicle crashes on Oahu, by Neighborhood Board, 2007-2011

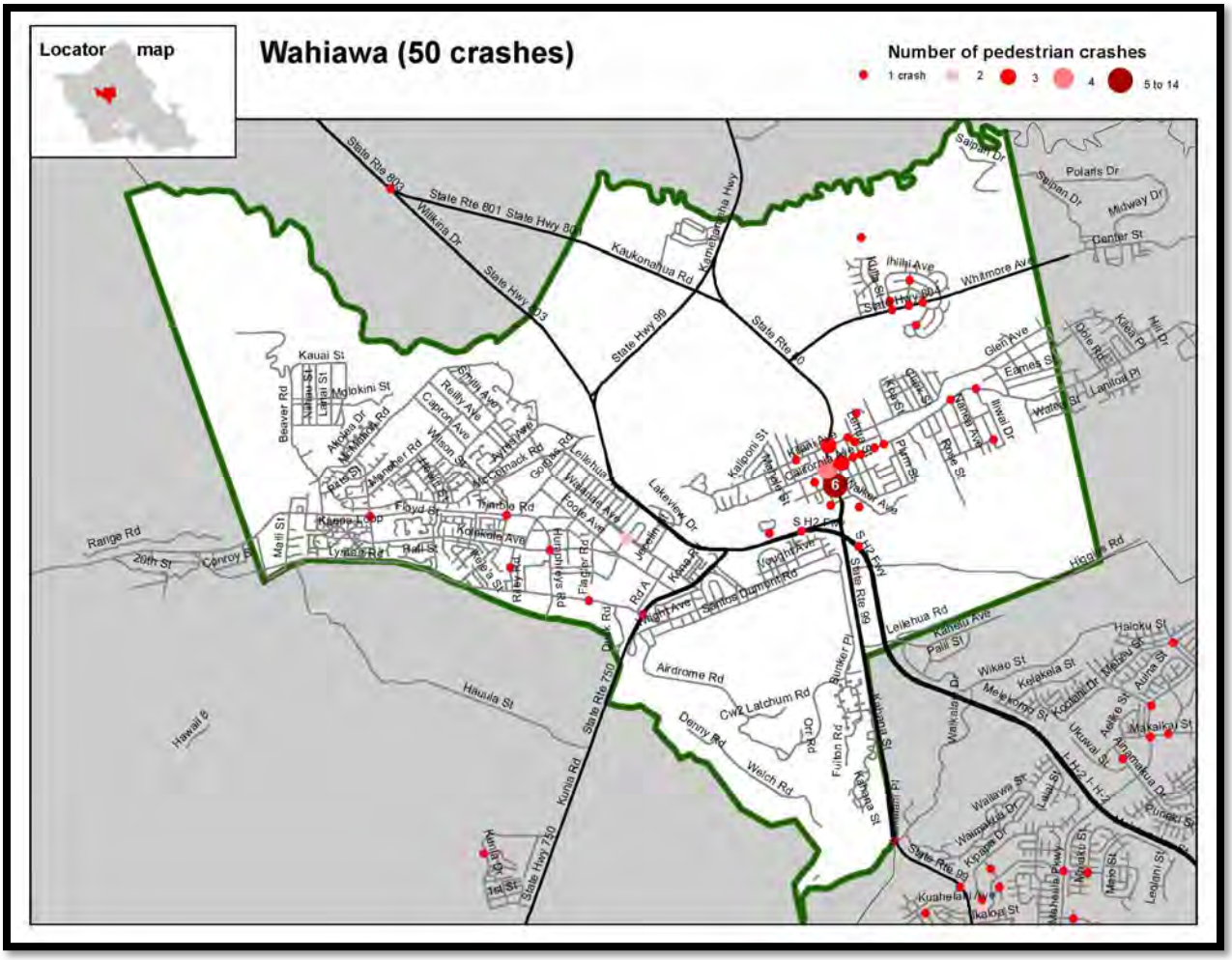
Figure 25 shows the location of motorcycle and moped crashes in Wahiawa-Whitmore Village. This neighborhood board area had the highest number of motorcycle and moped crashes in the COTS area. This higher number of motorcycle and moped crashes may be due to the close proximity of Schofield Barracks and Wheeler Army Field bases. Wahiawa-Whitmore Village experienced 67 motorcycle/moped crashes.

Figure 25. Wahiawa-Whitmore Village Motorcycle/Moped Crash Data (location and number of crashes)


Locator map
Wahiawa (67 crashes)
Number of motorcycle/moped crashes
1 crash
2
3
4 to 5
6 to 10
8
7
State Rte 801
State Hwy 80
Kaukonahua Rd
State Hwy 99
State Rte 7
Whitmore Ave
Kaiwi Ave
Kaiwi St
Kaiwi Dr
Glen Ave
Eames St
Kilea Pl
Dole Rd
Lanilani Pl
Kuhio St
Kamehameha Hwy
Saipan Dr
Polaris Dr
Midway Dr
Center St
Kauai St
Molokini St
Beaver Rd
Range Rd
20th St
Conroy Pl
Floyd St
Thimble Rd
Kamp Loop
Kopikoa Ave
Lyman Rd
Ball St
Leilehua Rd
Lakeview Dr
Santos Dumont Rd
S H2 Frwy
State Rte 99
Kamehameha Hwy
Higgins Rd
Airdrome Rd
Cwz Latchum Rd
Denny Rd
Welch Rd
Hauula St
State Rte 750
Kunia Rd
State Hwy 750
Hawaii 6
Wikao St
Kelakela St
Meleknoni St
Makaikai St
Aiea Heights Dr
Aulua St
Ukuwai St
Wailawa St
Kipapa Dr
Kuahelani Ave
Ikaloa St
Mililani Pkwy
Meio St
Legioni St
Haleku St
Kaiwi St
Kuhio St
Kamehameha Hwy
Kaiwi St
Kuhio St
Kamehameha Hwy
Kaiwi St
Kuhio St
Kamehameha Hwy

The Wahiawa-Whitmore Village Neighborhood Board area experienced 50 pedestrian crashes as shown in **Figure 26**. Most of the pedestrian crashes experienced in Wahiawa-Whitmore Village are concentrated along Kamehameha Highway and California Avenue.

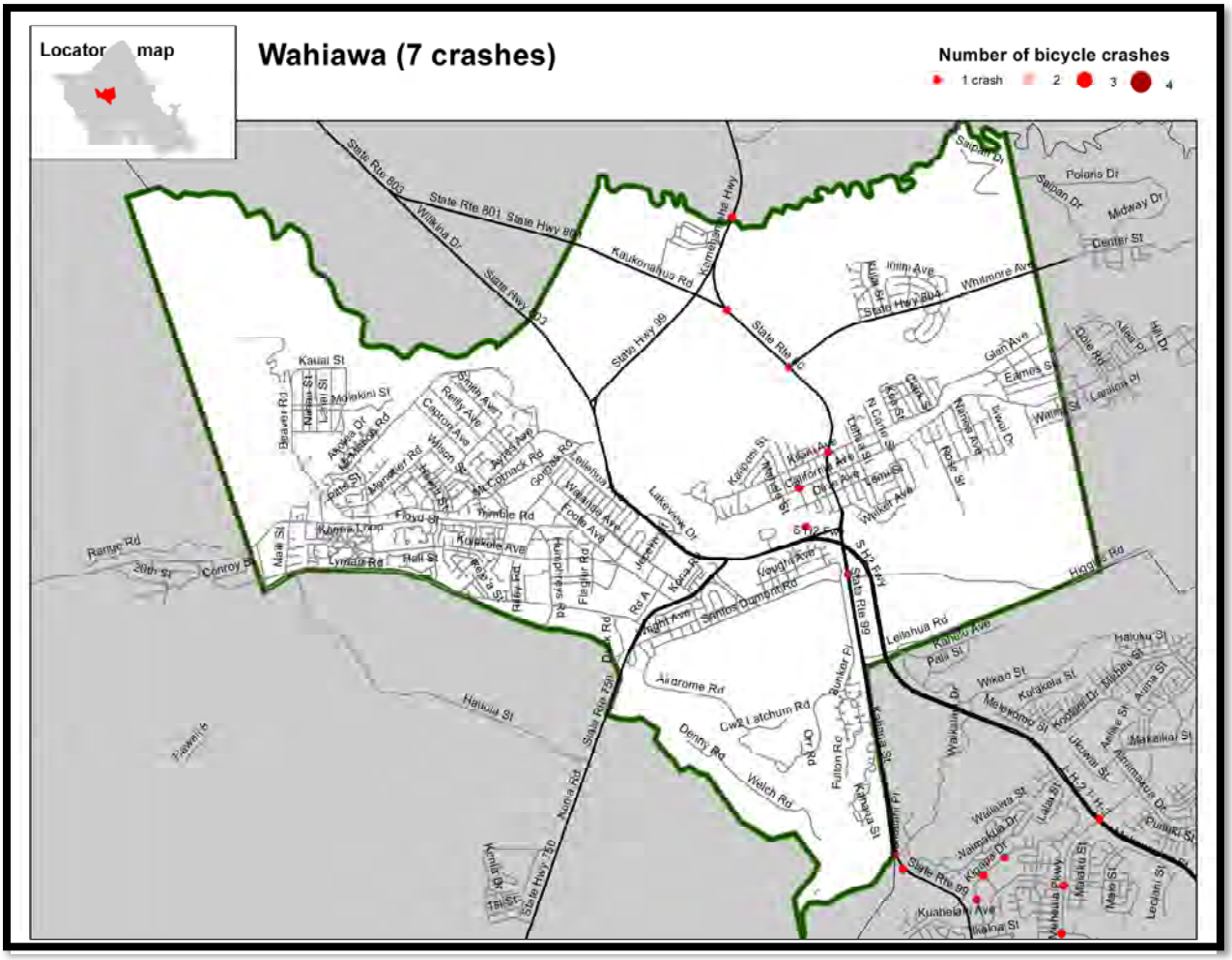
Figure 26. Wahiawa-Whitmore Village Pedestrian Crash Data (location and number of crashes)


Locator map
Wahiawa (50 crashes)
Number of pedestrian crashes
1 crash
2
3
4
5 to 14
State Rte 801
State Hwy 803
Kaukonahua Rd
State Hwy 99
State Rte 99
Kamehameha Hwy
Whitmore Ave
Kaiaulu St
Kaiaulu Ave
Kaiaulu Pl
Kaiaulu Way
Kaiaulu Pkwy
Kaiaulu Dr

Bicycle crashes requiring Emergency Medical attention were not common in the Wahiawa-Whitmore Village Neighborhood Board area. Seven crashes were identified as shown in **Figure 27**. As bicycling as a mode of transport has increased islandwide, it is expected that the Wahiawa-Whitmore Village area may expect more conflict between modes.

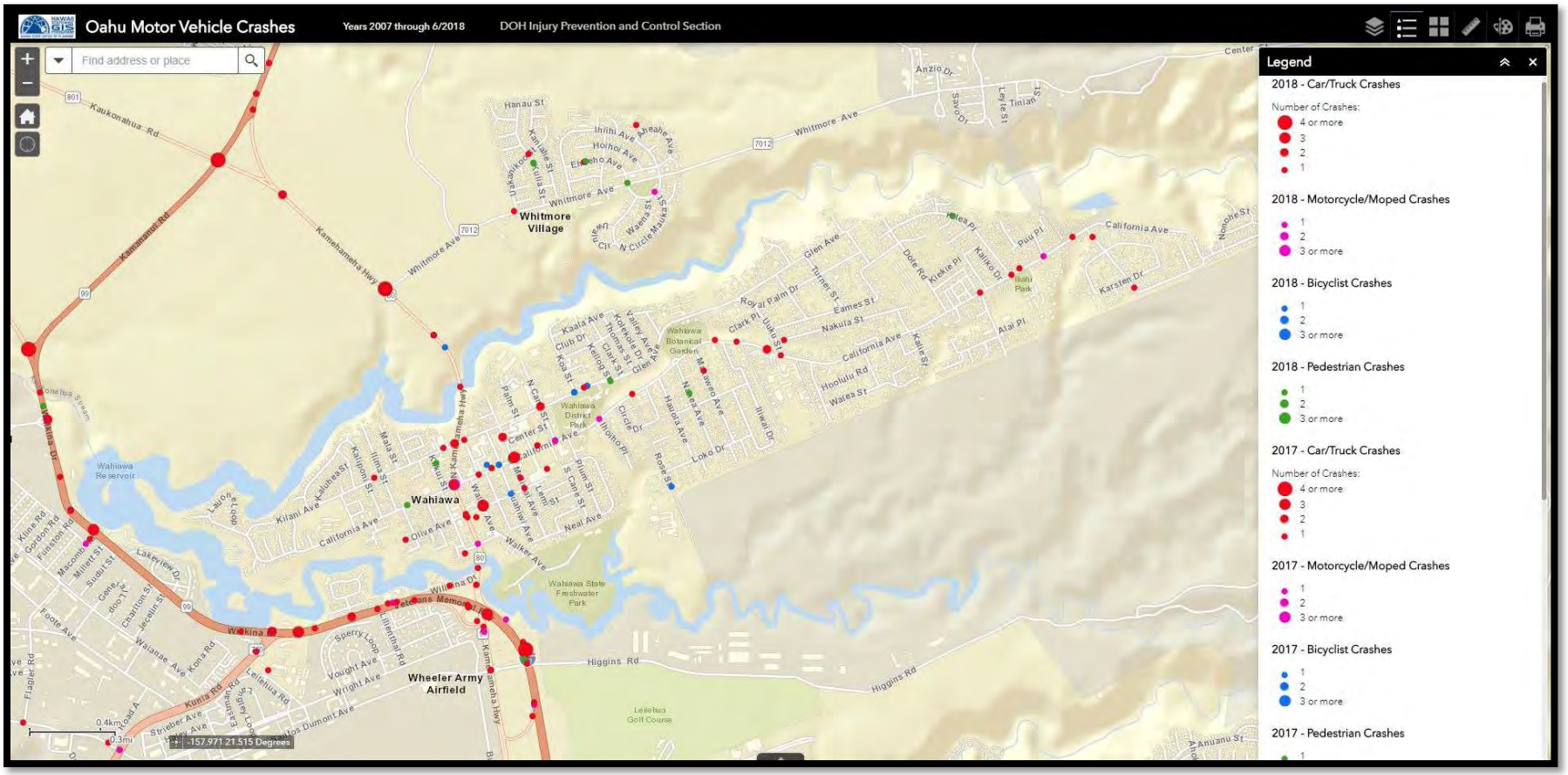
More recent DOH data is available by mode by year and was obtained for the most recent three-year period (from 2016 through 2018) for the expanded study area. The location and mode involved is illustrated in **Figure 28** where red depicts auto only crashes, blue represents bicycle-involved crashes, green shows pedestrian-involved crashes, and pink illustrates motorcycle/moped crashes. This data shows a similar trend to the previous data (2007 to 2011) in terms of the general location of collisions. The Kamehameha Highway and California Avenue corridors have the greatest proportion and number of multi-modal crashes.

Figure 27. Wahiawa-Whitmore Village Bicycle Crash Data (location and number of crashes)



Source: Mapbook of EMS-attended motor vehicle crashes on Oahu, by Neighborhood Board, 2007-2011

Figure 28. Wahiawa-Whitmore Village Number of Multi-modal Crashes (2016-2018)



Source: State of Hawaii Department of Health, Oahu Motor Vehicle Crashes (2016-2018)

3.0 TRANSPORTATION AND TRAFFIC CHARACTERISTICS

OahuMPO conduct long-range transportation planning studies for the island of Oahu in consultation with the City and County of Honolulu (e.g., the Department of Planning and Permitting and Department of Transportation Services), the State of Hawaii Department of Transportation, and the Honolulu Authority for Rapid Transportation. OahuMPO uses a wide variety of data and tools to assist with the planning process to identify mobility improvements based on projected land uses and supporting transportation infrastructure.

A key tool is the travel demand forecasting model (TDFM). It uses a series of data inputs and survey information to forecast travel demand over the life of the regional transportation plan (currently forecast to 2040). The model inputs include land use, demographic, and socio-economic data, as well as street, transit (bus and rail), and walk networks. It forecasts travel demand for all modes, but the walk and bicycle modes have not been validated at the traffic analysis zone (TAZ) level. The latest model includes the initial operating segment of the Honolulu Rail Transit Project between the East Kapolei Station and Ala Moana Shopping Center, as well as modified bus routes that will help to serve existing and future transit demand. The model is validated to a 2012 base year and includes forecasts of daily, peak period, and off-peak period demand in 2040 between various origin-destination (O-D) pairs across the island.

Traffic forecasts from the model account for congestion on some facilities that diverts traffic to other roadways, especially during peak commute periods. The current forecasting methodology also incorporates multi-stop travel or "tours" that more accurately represent actual trip-making made by Oahu residents. For example, a trip from home to school (to drop off a child student) to work, or a trip from work to a store (to pick up groceries) to home, is included in the model estimation process. This is an advancement over previous versions of the model that simply forecast trips between single O-D pairs without interim stops. Information included in the model for existing (2012 base year) conditions and future (2040) conditions is presented below.

Maps in this chapter of the report may look different because some of the data and maps come directly from Google. Other data comes from the TDFM and associated figures show desire lines, not scaled information.

3.1 Existing Conditions

Table 5 shows the total population and employment in the expanded study area for the applicable Wahiawa and Whitmore Village TAZs from the Base Year (2012) OahuMPO travel demand model. The total population in these TAZs is 15,604 and the total employment is 3,940.

Table 5. Wahiawa-Whitmore Village Land Use - Base Year (2012)

OahuMPO Travel Demand Model	Base Year (2012)
Population	15,604
Employment	3,940

Source: OahuMPO Regional Travel Demand Model.

The roadway and transit network in the model is based on existing roadway classifications and transit routes.

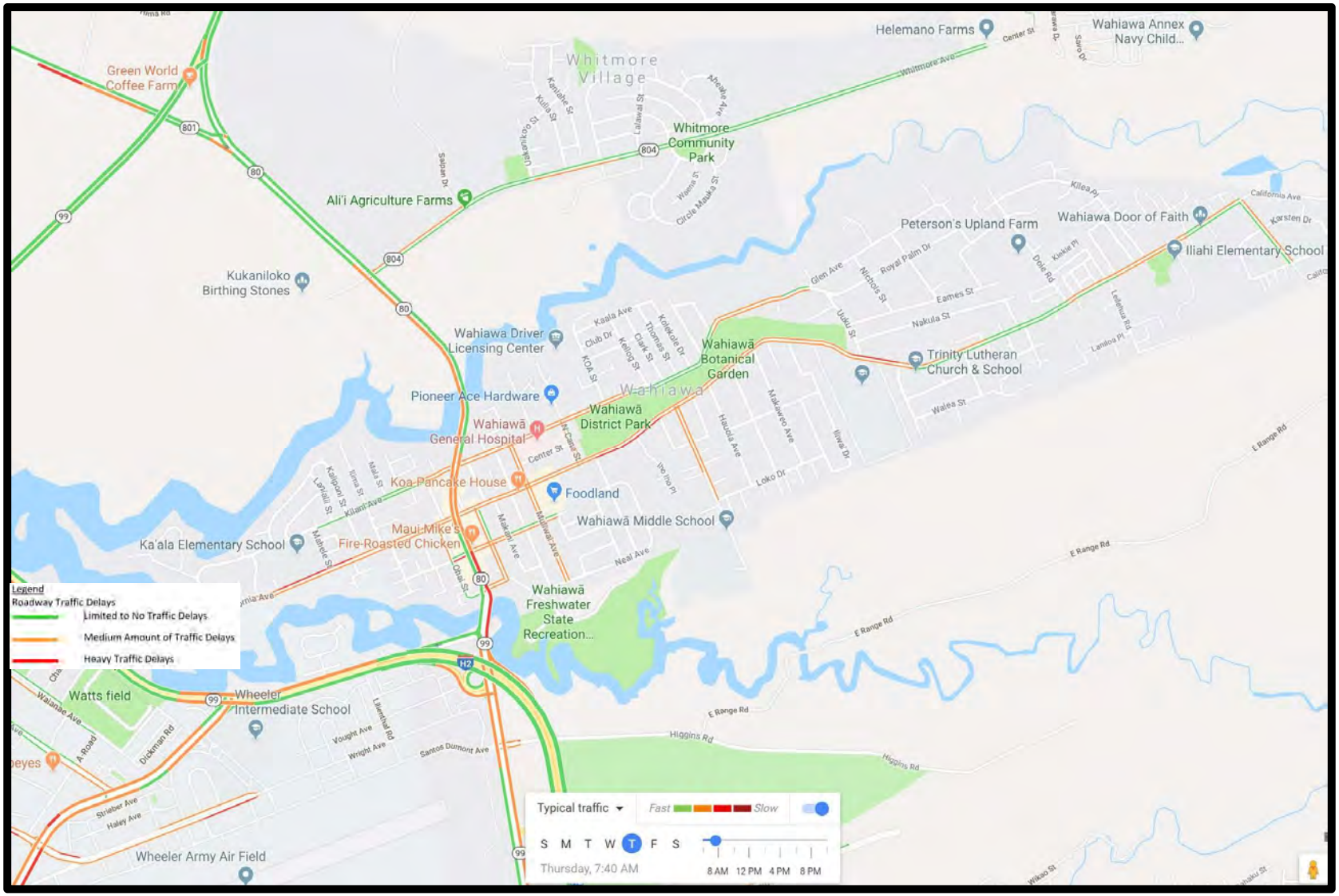
3.1.1 Areas of Congestion

Figure 29 and **Figure 30** show the Existing (2019) typical weekday traffic congestion in the Central Oahu study area during the AM and PM peak periods, respectively. These figures, obtained from Google Maps using their aggregated traffic data, delineate streets as green, orange, and red to identify the following traffic conditions: Green – no traffic delays; Orange – medium amount of traffic; and Red – traffic delays. Specific time periods were selected based on the greatest amount of congestion (i.e., the longest red segments).

During the AM peak period, the primary congestion occurs on mauka-bound Kamehameha Highway as traffic enters Wahiawa mauka of the H-2 northbound off-ramp. Traffic on the local streets experiences less delay except in the immediate vicinity of schools during peak drop-off times.

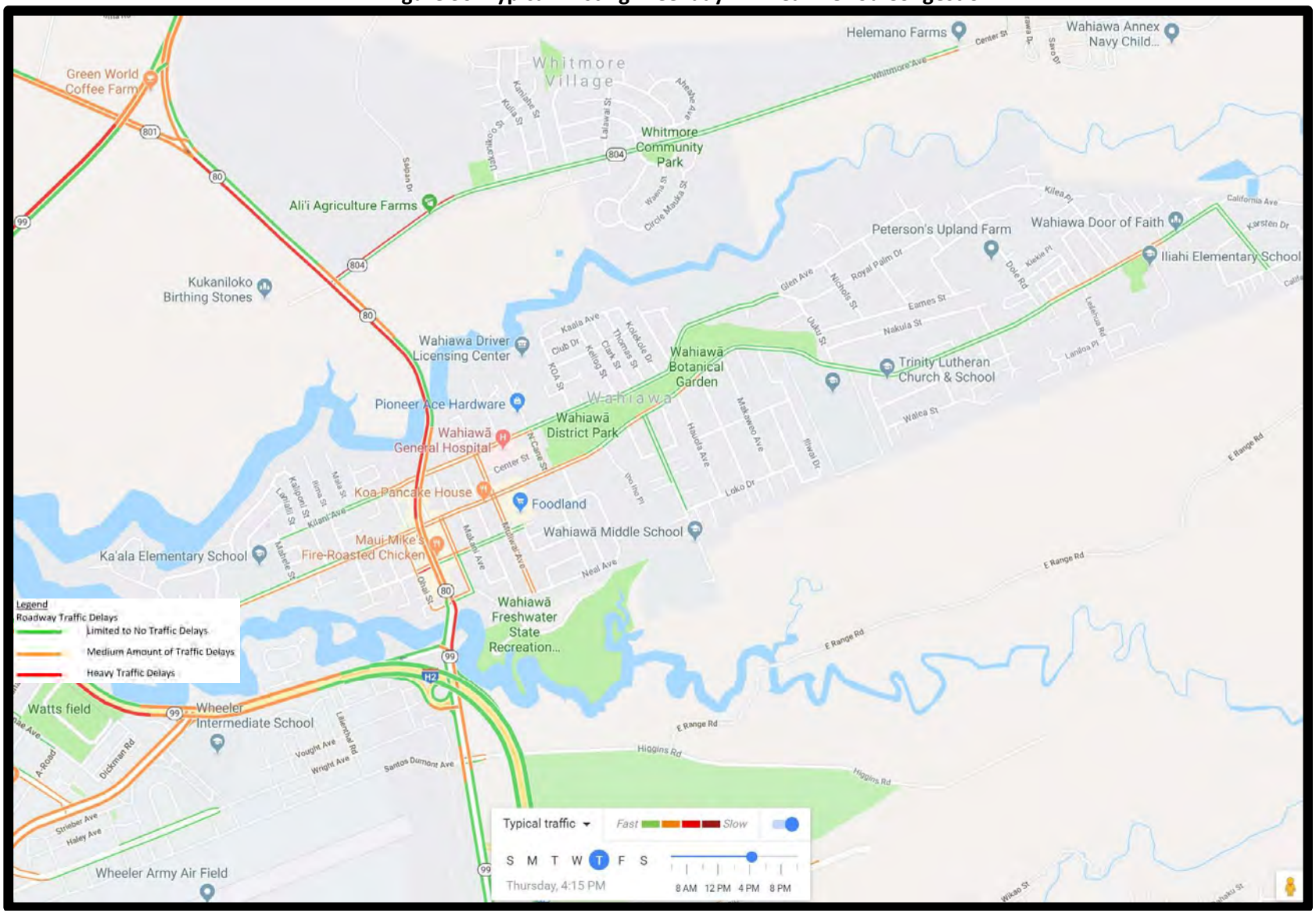
Traffic congestion during the PM peak period is more severe compared to the AM peak period in terms of the length and number of roadway segments affected. Traffic is congested at the same location on Kamehameha Highway entering Wahiawa from H-2, but additional congestion occurs on makai-bound Kamehameha Highway over the Karsten Thot bridge. In addition, delays are experienced by traffic turning left from Whitmore Avenue onto the highway.

Figure 29. Typical Existing Weekday AM Peak Period Congestion



Source: Google Maps, 2019

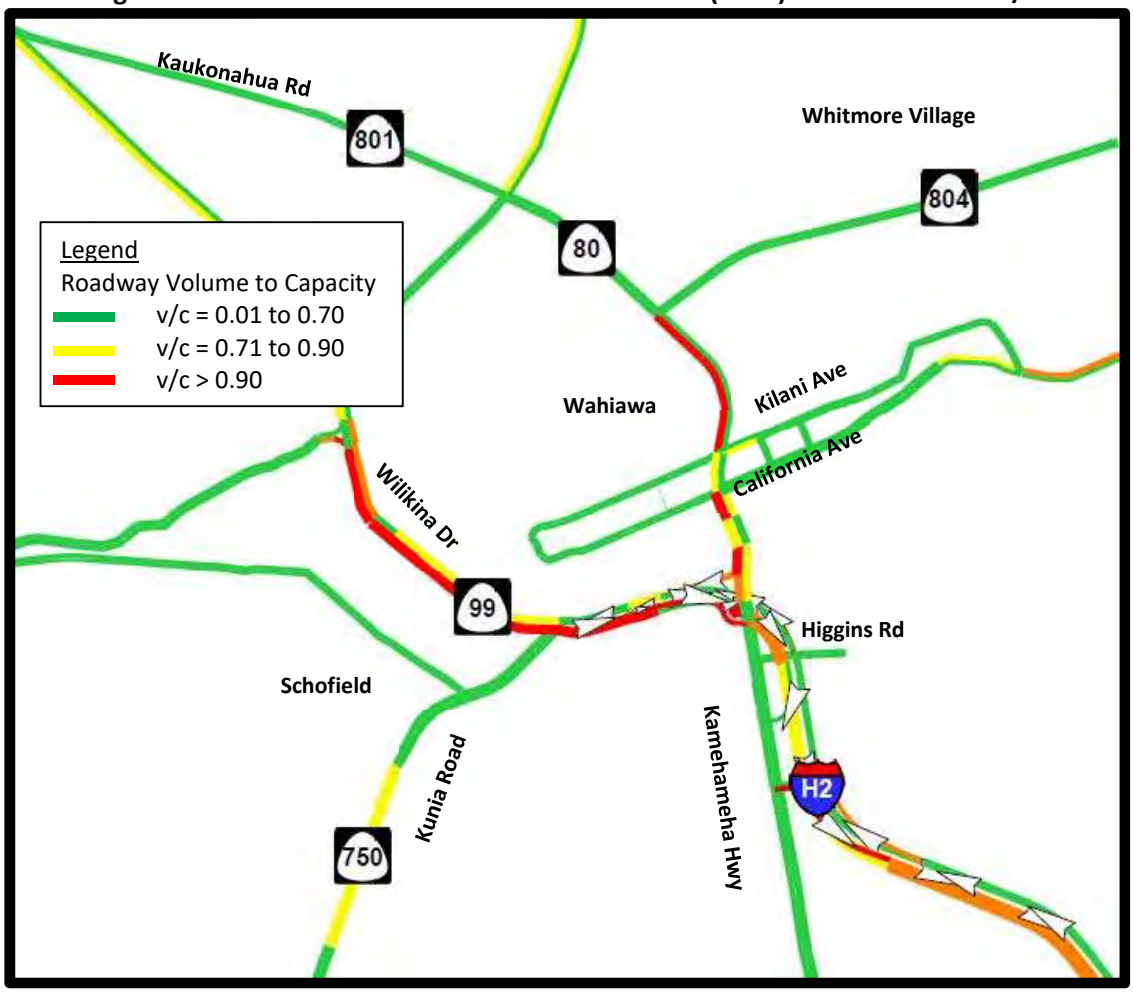
Figure 30. Typical Existing Weekday PM Peak Period Congestion



Source: Google Maps, 2019

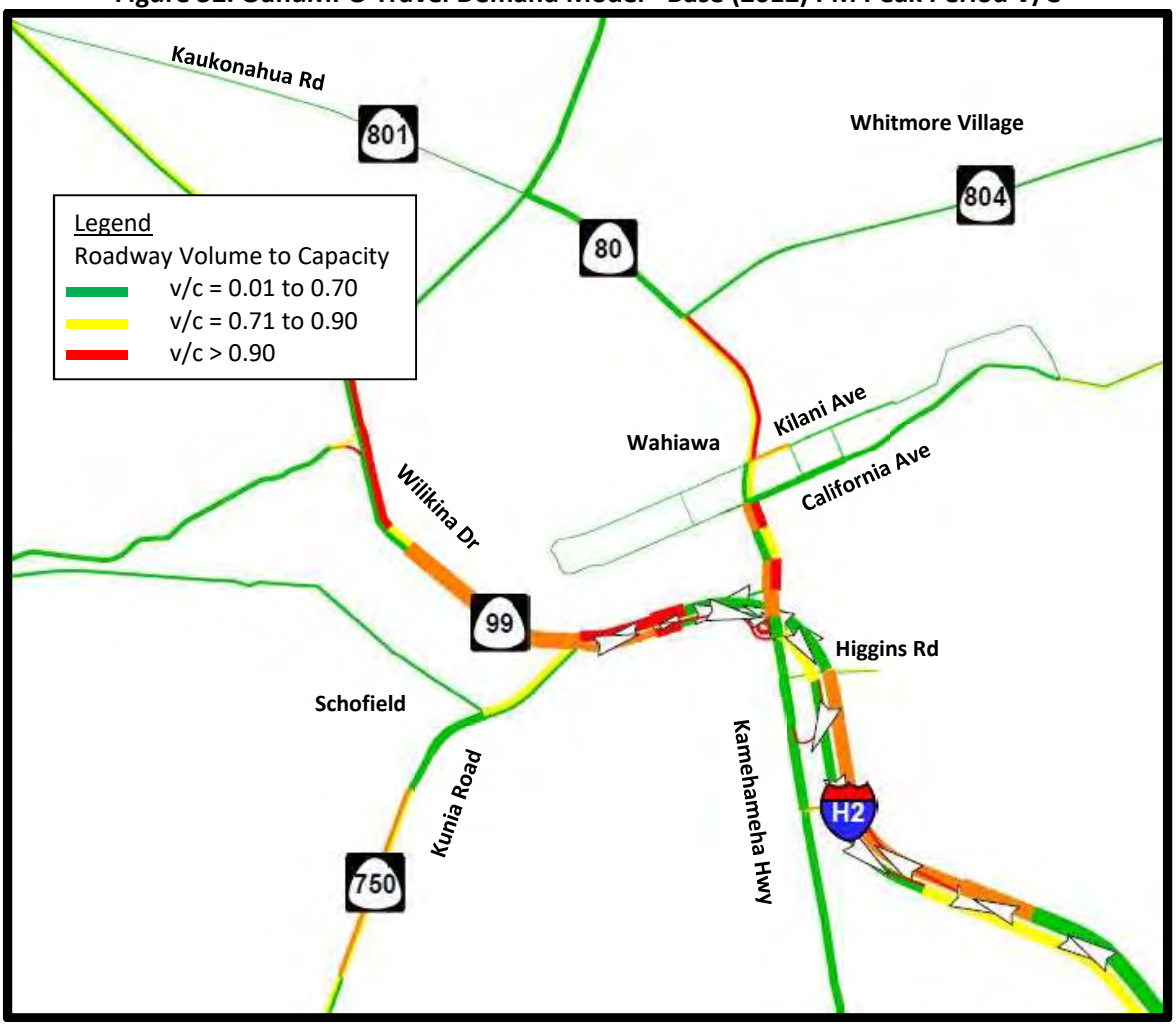
Figure 31 and **Figure 32** show the OahuMPO's Base Year (2012) model volume-to-capacity (V/C) ratios on the expanded study area roadways for AM and PM peak period conditions. The model shows generally the same trends and locations of congestion but does illustrate more congestion during the AM peak period. Given the scope of the model as a regional planning tool, some discrepancies between the Google traffic data (which uses actual travel times) and the OahuMPO model is to be expected. Overall, the general consistency helps to validate use of the model for evaluating future traffic conditions and testing improvement alternatives.

Figure 31. OahuMPO Travel Demand Model - Base (2012) AM Peak Period V/C



Source: OahuMPO Travel Demand Forecasting Model

Figure 32. OahuMPO Travel Demand Model - Base (2012) PM Peak Period V/C



Source: OahuMPO Travel Demand Forecasting Model

3.1.2 Base Year Travel Patterns

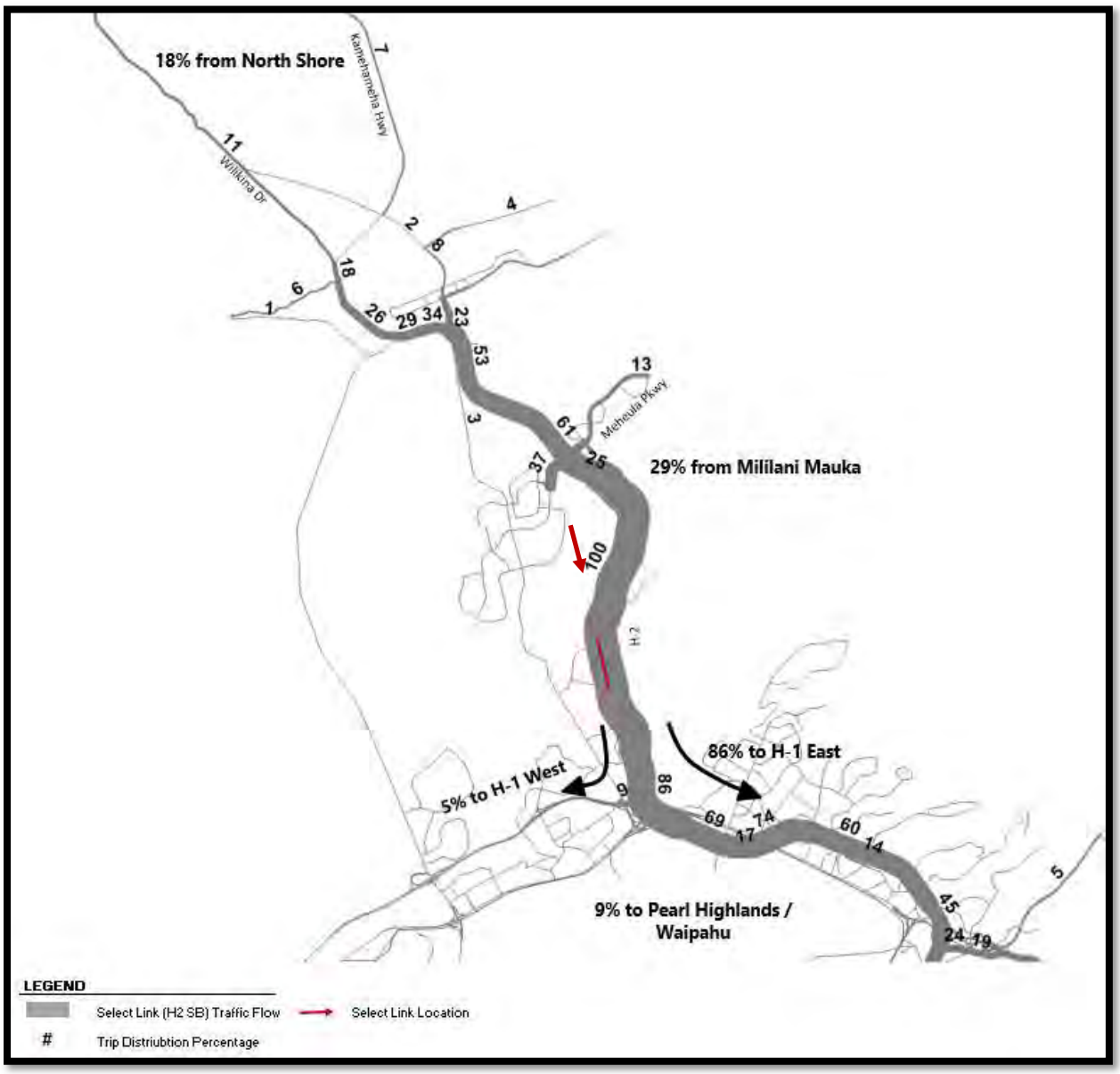
To illustrate the source and destination of through traffic on H-2 in the study area, a select link analysis was performed on the segment of H-2 southbound and northbound at the Ka Uka Boulevard interchange makai of the H-1 interchange for the AM and PM peak periods, respectively. The select link analysis identifies the specific origins and destinations of trips traveling through this segment and shows the contribution of traffic along the selected corridor. **Figure 33** and **Figure 34** show the Base Year select link analysis for the AM and PM peak periods.

In the AM peak period, approximately 18% of the traffic on southbound H-2 at Ka Uka originates north of Schofield/Wahiawa (i.e., comes from the North Shore) according to the model. About 29% originates in Mililani Mauka and 21% originates in Wahiawa and Whitmore Village. The rest comes from the Schofield area and Mililani and enters H-2 at Kamehameha Highway and Meheula Parkway, respectively.

This traffic is destined for the following locations: 86% to H-1 East towards the Primary Urban Center, 9% to Pearl Highlands/Waipahu, and the remaining 5% to H-1 West (towards Kapolei).

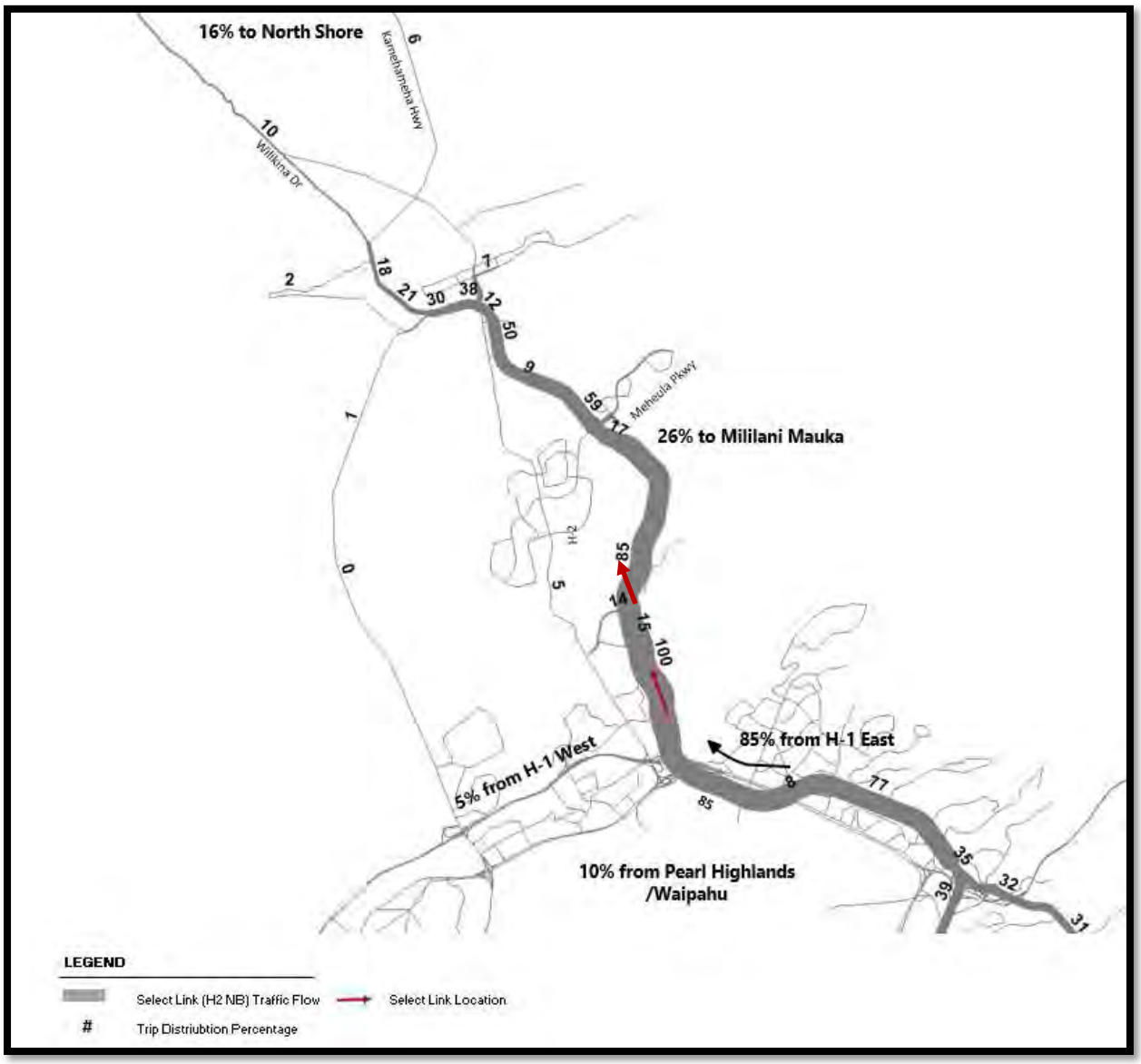
In the PM peak period, the majority (86%) of northbound traffic on H-2 at Ka Uka originates from H-1 East, with the remainder originating from the following locations: 9% from Pearl Highlands/Waipahu (with most from the Pearl Highlands area), and 5% from H-1 West. The destinations on the segment of H-2 northbound in the PM peak hour include: 26% to Mililani Mauka, 24% to Wahiawa, 22% to the Schofield area, and 16% to the North Shore.

Figure 33. H-2 Southbound Select Link Distribution - Base Year (2012) AM Peak Period



Source: OahuMPO Travel Demand Forecasting Model

Figure 34. H-2 Northbound Select Link Distribution - Base Year (2012) PM Peak Period



Source: OahuMPO Travel Demand Forecasting Model

3.1.3 Vehicle and Person Miles of Travel

The model was also used to calculate the amount of trip-making to and from the COTS study area within which the expanded study area is located. Two metrics were examined to quantify trip-making including person miles traveled (PMT) and vehicle miles traveled (VMT). To illustrate these values, consider a bus with 30 passengers that travels 10 miles. The VMT for the bus is 10 (1 vehicle x 10 miles), while the PMT value is 300 (30 persons x 10 miles). Similarly, a passenger car with one driver traveling 5 miles would have the same VMT of 5 (1 vehicle x 5 miles) as PMT (1 persons x 5 miles).

Table 6 shows the PMT and VMT for the study area under Base Year (2012) AM and PM peak period conditions. The table specifies the three types of Wahiawa-Whitmore Village trips: internal to internal (I-I), internal to external (I-X), and external to internal (X-I). According to the model, the majority of Wahiawa-Whitmore Village trips (PMT and VMT) are I-X in the AM peak period and X-I in the PM peak period. This is reasonable, since the majority of people living in Wahiawa-Whitmore Village travel outside of the study for work; thus, they leave Wahiawa-Whitmore Village in the morning and return in the evening. Approximately only 7% of the total trips stay internal in Wahiawa-Whitmore Village. Trips that travel entirely through or around the study area (referred to as external to external or X-X trips) are not included in this summary but do contribute towards congestion because they use the area roadways and transit facilities.

Table 6. Wahiawa-Whitmore Village Miles of Travel - Base Year (2012)

Trip Type[1]		Base Year (2012)	
		AM Peak Period	PM Peak Period
PMT	I-I	45,254 (7.4%)	51,798 (6.4%)
	I-X	372,708 (61.4%)	286,349 (35.5%)
	X-I	189,526 (31.2%)	468,902 (58.1%)
VMT	I-I	28,390 (6.3%)	34,542 (5.6%)
	I-X	288,478 (63.5%)	215,489 (34.8%)
	X-I	137,024 (30.2%)	369,036 (59.6%)

Source: OahuMPO Regional Travel Demand Model.

[1] PMT = Person Miles Traveled, VMT = Vehicle Miles Traveled

I-I = Both origin and destination are in Wahiawa and Whitmore Village, I-X = Origin is in Wahiawa-Whitmore Village, and destination is outside of Wahiawa-Whitmore Village, X-I = Origin is outside Wahiawa-Whitmore Village, and the destination in in Wahiawa-Whitmore Village

3.2 Future Conditions

3.2.1 Areas of Congestion

The Future Year model includes land use for planned future developments and transportation projects. Additional housing and employment is planned in the Central Oahu area in several substantial developments. One of the major projects in the Central Oahu study area is Koa Ridge Makai. This project includes development of 3,500 new housing units plus 91 acres of commercial, medical/healthcare, and church/recreational center uses in the Mililani area immediately west of H-2 between Ka Uka Boulevard and the existing Plantation Road overcrossing.

The Future Year model only includes 2,100 units in the Koa Ridge Makai TAZ; however, it should be noted that the model also includes land use for other projects in Central Oahu that have not received their final entitlements (Waiawa Castle & Cooke) or have yet to be planned in more detail (Waiawa Ridge). The remaining 1,400 units of Koa Ridge Makai are included in the TAZ located east of the freeway, and the additional 6,500 units in the future developments are also located in this area. Inclusion of all of these projects provides a conservative estimate of traffic for purposes of analyzing traffic needs for the COTS.

Table 7 summarizes the OahuMPO Base Year (2012) and Future Year (2040) model population and employment totals for the expanded study area only. According to the model, an increase of 0.8% in total population is projected between 2012 and 2040, while the total employment is projected to increase by 7.9% over the same period. The Future Year model includes generally the same roadway network in the extended study area as the Base Year model, but also includes the future Honolulu Rail Transit Project (as well as the associated changes to bus service anticipated with the new rail line) at the south end of the overall COTS area.

Table 7. Wahiawa-Whitmore Village Land Use - Future Year (2040)

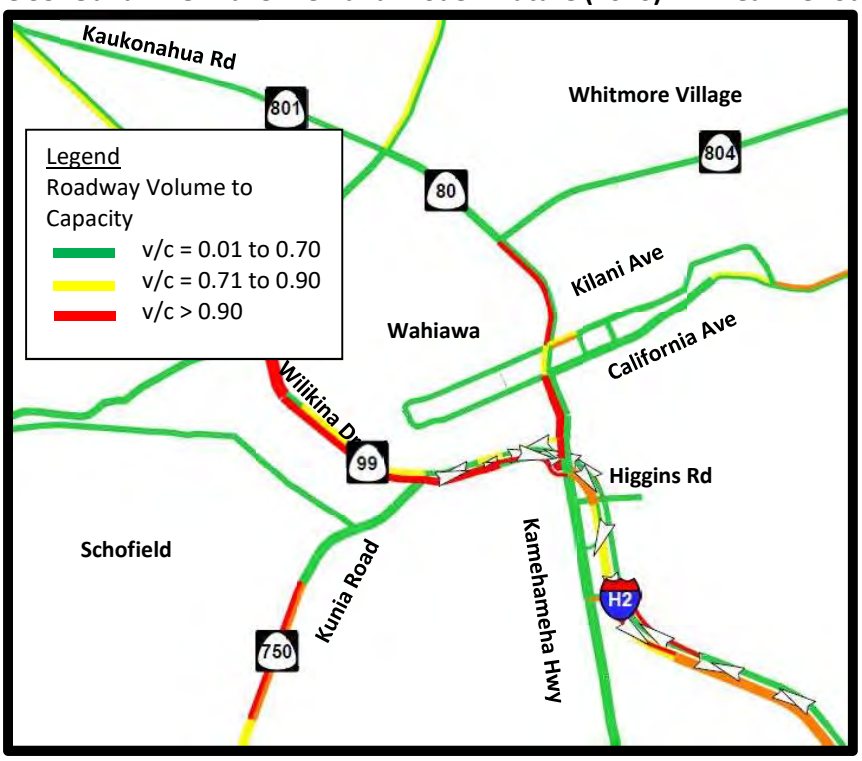
OahuMPO Travel Demand Model	Base Year (2012)	Future Year (2040)	Net Difference	
			Absolute Number	Percent Difference
Population (Persons)	15,604	15,724	120	0.8%
Employment (Jobs)	3,940	4,251	311	7.9%

Source: OahuMPO Regional Travel Demand Model.

3.2.2 Areas of Congestion

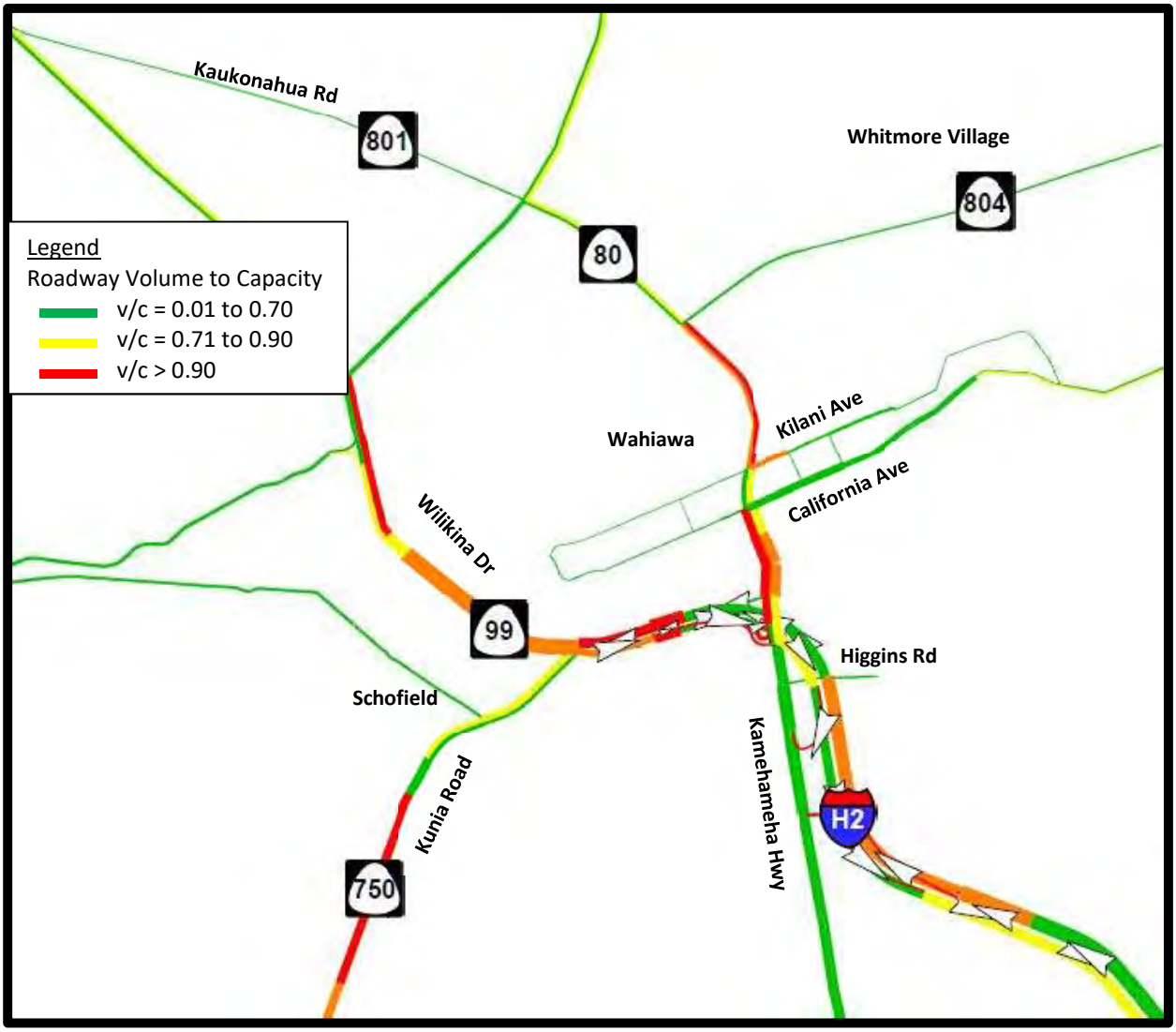
Figure 35 and Figure 36 display the Future Year V/C ratios on the Wahiawa-Whitmore Village for AM and PM peak period conditions. Similar to the Base Year model, segments on H-2 are projected to operate over capacity in the AM and PM peak periods, as well as the H-2 and H-1 interchange. Additionally, the model is also showing that the V/C ratios will increase on Kunia Road and Kamehameha Highway compared to the Base Year model.

Figure 35. OahuMPO Travel Demand Model - Future (2040) AM Peak Period V/C



Source: OahuMPO Travel Demand Forecasting Model

Figure 36. OahuMPO Travel Demand Model - Future (2040) PM Peak V/C



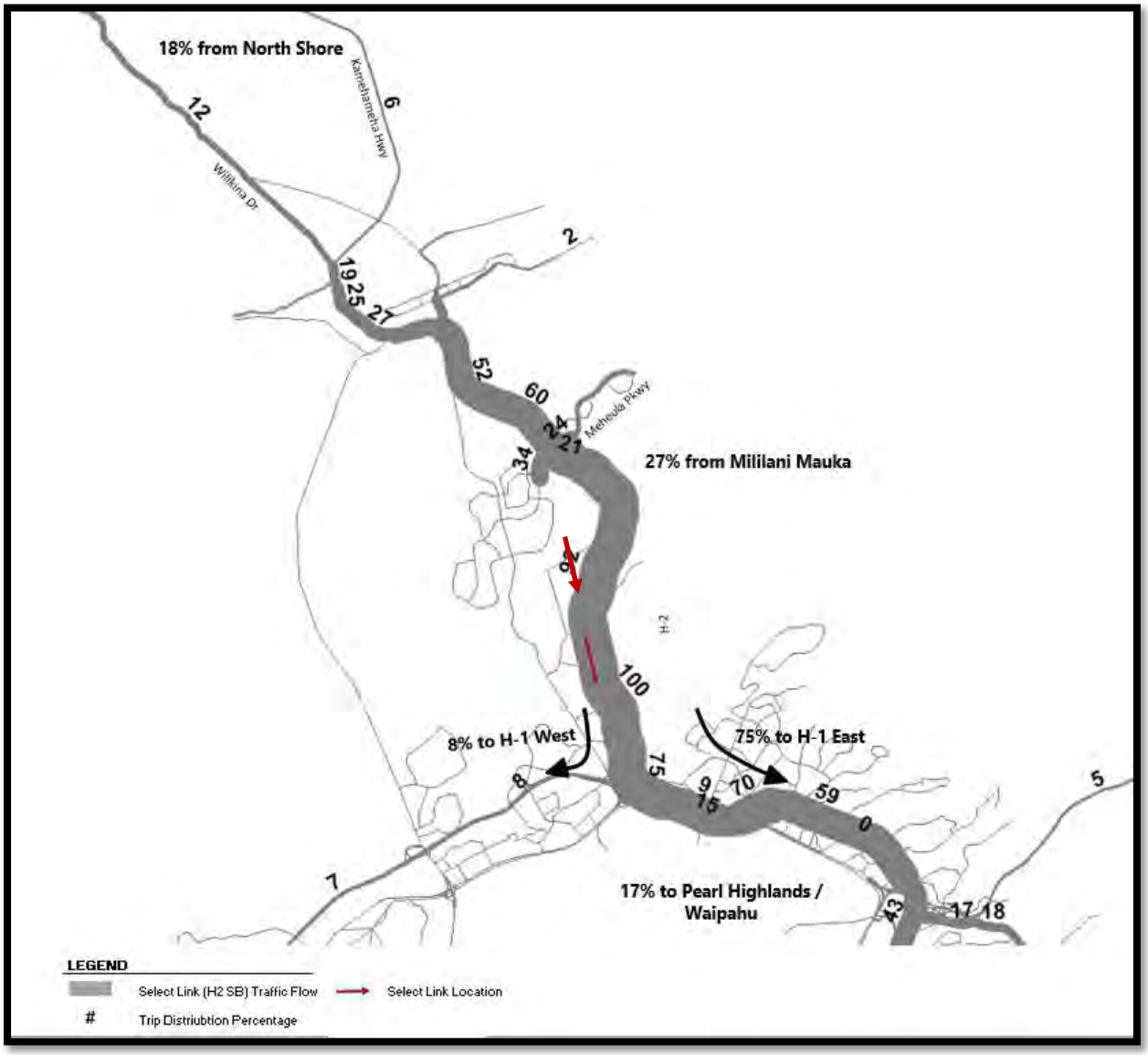
Source: OahuMPO Travel Demand Forecasting Model

3.2.3 Future Year Travel Patterns

Figure 37 and Figure 38 show the Future Year select link analysis for the segment of H-2 southbound and northbound between Ka Uka Boulevard and H-1 interchange for the AM and PM peak periods, respectively. In the Future Year AM peak period, the origin of trips is generally the same as Base Year, except for some additional traffic that will originate from the Koa Ridge/Castle & Cooke Waiawa project. With increased development in Kapolei, more of the traffic on H-2 southbound will be destined for H-1 West (increasing from 5% to 8%), and a much larger proportion will be destined for the Pearl Highlands/Waipahu area (primarily due to the transit station). This reduces the amount of H-2 southbound traffic that will eventually get to H-1 East (reduced from 86% to 79%).

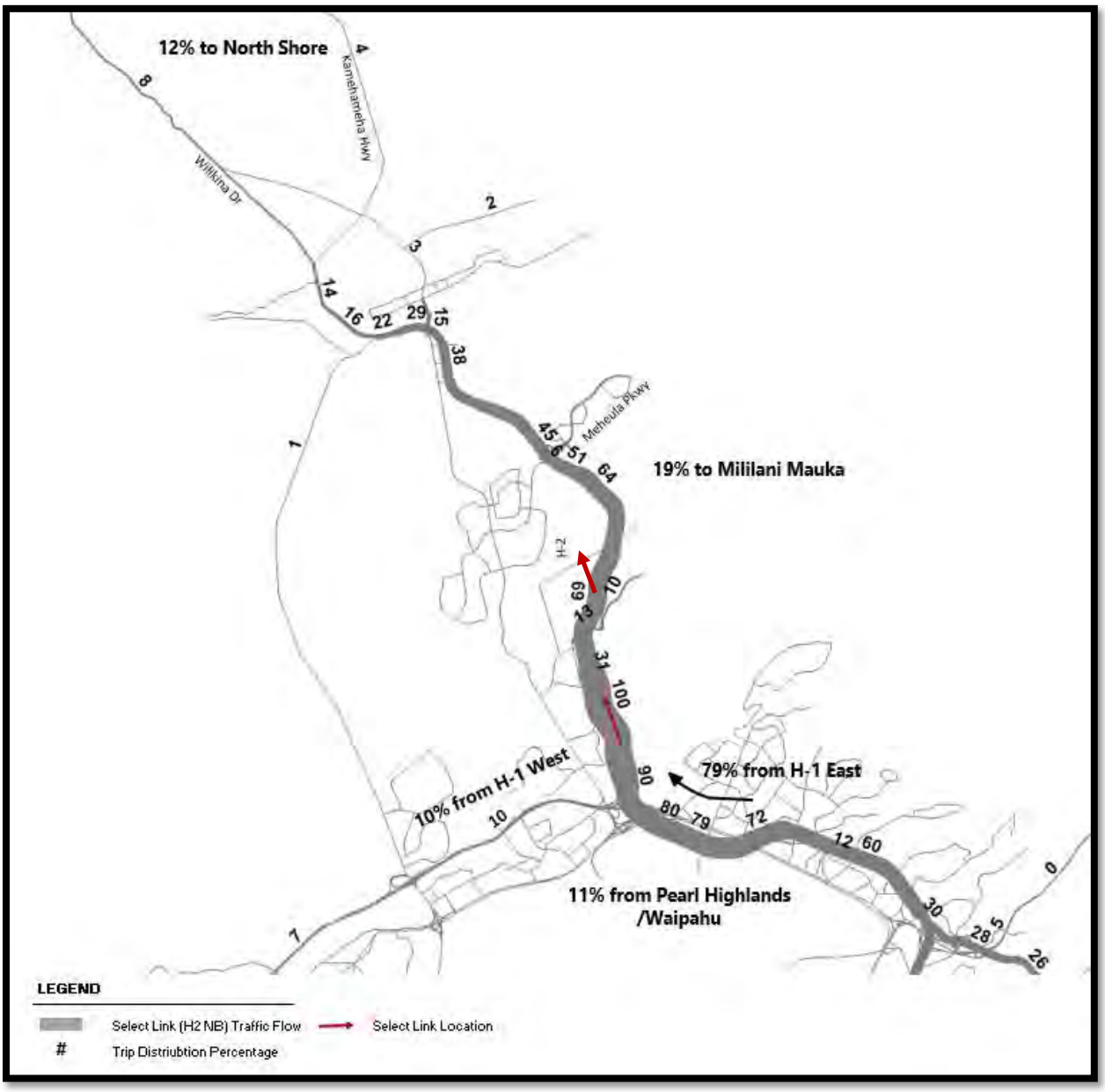
In the Future Year PM peak period, the traffic originating from H-1 East reduces (86% to 79%) due to the future transit station in Pearl Highlands and the increased development in Kapolei. As such, of the traffic traveling northbound on H-2, 10% originates from Kapolei and 11% from the Pearl Highlands, Waipahu Area. Due to the future development in Koa Ridge/ Castle Cooke, more traffic on H-2 northbound is destined for the Koa Ridge/Waipio area, which reduces the amount of traffic destined to the following mauka communities: Wahiawa/Schofield (43% to 33%), Mililani Mauka (26% to 19%), and the North Shore (16% to 12%).

Figure 37. H-2 Southbound Select Link Distribution - Future Year (2040) AM Peak Period



Source: OahuMPO Travel Demand Forecasting Model

Figure 38. H-2 Northbound Select Link Distribution - Future Year (2040) PM Peak Period



Source: OahuMPO Travel Demand Forecasting Model

3.2.4 Future Miles of Travel

Table 8 summarizes and compares the Future Year PMT and VMT for the AM and PM peak periods to the Base Year trip lengths for the Wahiawa-Whitmore Village study area. The distribution of trip types and overall directionality in 2040 is comparable to Existing Conditions where the majority of trips in the AM are I-X and X-I in the PM; however, the I-X trips increase substantially in the PM peak hour (44% for PMT and 38% for VMT). Similarly, the number of X-I trips increases substantially in the AM peak hour (32% for PMT and VMT). Interestingly, this growth is opposite of Wahiawa-Whitmore Village's work commuting periods (I-X for AM and X-I for PM), which implies that the improved balance of land uses is increasing trips in the non-peak direction.

Table 8. Wahiawa-Whitmore Village's Trip Length - Future Year (2040)

Trip Type[1]		Base Year (2012)		Future Year (2040)		Net Difference			
						Absolute Number		Percent Difference	
		AM	PM	AM	PM	AM	PM	AM	PM
PMT	I-I	45,254	51,798	50,447	57,824	5,193	6,026	11%	12%
	I-X	372,708	286,349	445,256	411,255	72,548	124,907	19%	44%
	X-I	189,526	468,902	251,121	578,323	61,595	109,422	32%	23%
VMT	I-I	28,390	34,542	31,419	37,899	3,029	3,357	11%	10%
	I-X	288,478	215,489	325,094	297,874	36,616	82,386	13%	38%
	X-I	137,024	369,036	180,208	431,024	43,184	61,987	32%	17%

Source: Fehr & Peers, 2016.

[1] PMT = Person Miles Traveled, VMT = Vehicle Miles Traveled

I-I = Internal to Internal, I-X = Internal to External, X-I = External to Internal

3.3 Existing Transit Conditions

3.3.1 TheBus

Oahu Transportation Services, Inc. (OTS), a non-profit corporation to manage, operate, and maintain the City bus system (TheBus) and the City paratransit service (TheHandi-Van). TheHandi-Van provides origin to destination transportation services to mobility impaired Americans with Disabilities Act of 1990 (ADA) qualified individuals. DTS, through OTS, contracts with various taxicab companies to provide supplemental paratransit services. Day to day management and operations of TheBus and TheHandi-Van is handled by OTS. The DTS Public Transit Division (PTD) is responsible for the overall monitoring and administration of the performance of TheBus and TheHandi-Van operations.

TheBus currently operates 104 routes. The 104 routes serve about 3,800 bus stops. Passenger amenities include approximately 980 passenger shelters and 2,400 benches. Bus routes fall within eight service classifications. Of these classifications bus routes serving Wahiawa and Whitmore Village fall within three of the classifications. Their function is described below.

- Suburban Trunk – Suburban trunk routes provide all day service from outlying communities to the urban center. These routes also provide connections between the suburban communities connecting with community circulators at transit centers. Routes stop at all local bus stops and operate all day, every day. Suburban trunk routes typically provide 30-minute service. Routes 51 and 52 are the bus routes in this category.
- Suburban Feeder – These routes provide service in lower demand areas providing connections to major attractions such as shopping areas, hospitals or schools. These routes typically provide 60-minute service and some routes offer intermittent or peak-period-only service such as those operating in Pearl City/Aiea. Route 72 serving Whitmore Village, Wahiawa, and Schofield Barracks is the route in this category.
- Express – Peak expresses serve predominantly home-to-work trips by connecting specific neighborhoods to employment centers. These trips are provided in the peak period, peak direction only with minimal scheduled departures. A subset of the Peak Express classification is the service designed for Pearl Harbor and Hickam Air Force Base destinations. These routes are designated with a “PH” preceding the route number. These routes serve all the local bus stops in the neighborhoods and work destination areas (including downtown Honolulu and Pearl Harbor). Express routes serving Wahiawa are Routes 83, 88A, 99, and PH3.

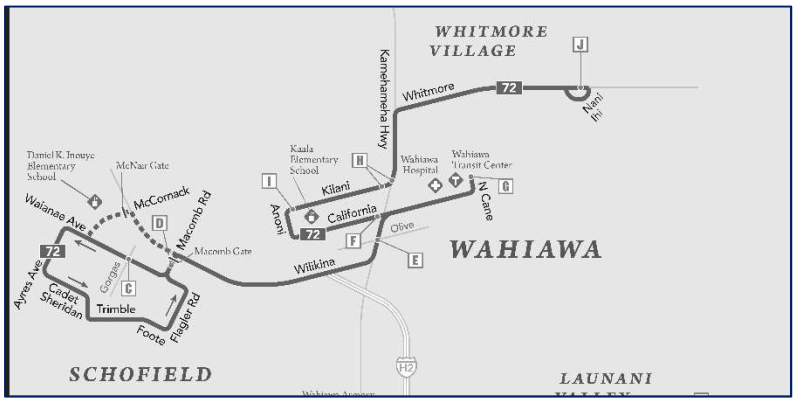
Table 9 identifies *TheBus* routes serving Wahiawa and Whitmore Village. These routes include one suburban feeder (**Figure 41**), two suburban trunks (**Figure 42**), and four express routes.

Table 9. TheBus Routes Serving Wahiawa-Whitmore Village

THEBUS ROUTES		
Number	Description	Classification
51	Wahiawa-Honolulu	Suburban Trunk
52	Haleiwa-Honolulu	Suburban Trunk
72	Whitmore Village-Wahiawa-Schofield	Suburban Feeder
83	Wahiawa-Honolulu	Express
88A	North Shore Express	Express
99	Wahiawa-Mililani-Waipahu-Kapolei	Express
PH3	Wahiawa Heights-Pearl Harbor	Express

Source: DTS/OTS Public Timetables, 2019

Figure 39. Current Suburban Feeder Route 72



Source for Figures 39 and 40: DTS/OTS Public Timetables and Route Maps, 2019

Figure 40. Current Routes 51 and 52

Table 10, **Table 11**, and **Table 12** present on-time performance for bus routes serving Wahiawa and Whitmore Village. This information is presented by service day (weekday, Saturday, Sunday) and separated for service within the COTS area, outside of the COTS area, and overall route. The express routes highlighted in Table 10 in blue shading operate with "Zoom" scheduling. Zoom operations allow routes to operate early at specific timepoints. For example, during the morning trips into Honolulu, routes must stay on schedule in the neighborhood. However, once the bus is off the freeway and serving downtown bus stops the bus can leave stops early since passengers are disembarking. The reserve occurs during the afternoon trips.

Table 10. TheBus Weekday Schedule Adherence

	Within COTS Area			Outside of COTS Area			Overall		
Route	*Early*	*On Time*	*Late*	*Early*	*On Time*	*Late*	*Early*	*On Time*	*Late*
51	14%	57%	29%	13%	58%	29%	14%	58%	29%
52	27%	56%	17%	28%	58%	14%	28%	57%	15%
72	16%	66%	18%				16%	66%	18%
83	17%	58%	26%	49%	41%	10%	35%	48%	17%
88A	20%	58%	15%	26%	59%	15%	26%	59%	15%
99	13%	67%	21%	12%	70%	18%	13%	68%	20%
PH3	26%	67%	7%	14%	52%	34%	21%	60%	19%

Table 11. TheBus Saturday Schedule Adherence

Route	Within COTS Area			Outside of COTS Area			Overall		
	Early	*On Time*	*Late*	*Early*	*On Time*	*Late*	*Early*	*On Time*	*Late*
51	13%	62%	24%	10%	66%	24%	12%	64%	24%
52	17%	57%	26%	18%	58%	24%	18%	57%	25%
72	15%	63%	22%				15%	63%	22%

Table 12. TheBus Sunday Schedule Adherence

Route	Within COTS Area			Outside of COTS Area			Overall		
	Early	*On Time*	*Late*	*Early*	*On Time*	*Late*	*Early*	*On Time*	*Late*
51	18%	58%	25%	13%	62%	25%	15%	60%	25%
52	16%	59%	25%	20%	59%	21%	18%	59%	23%
72	19%	76%	5%				19%	76%	5%

Source: All three tables provided by the City and County of Honolulu Department of Transportation Services

TheBus averages 70,000,000 annual unlinked passenger trips. Over the past six years this has varied from 66,285,449 passenger trips in 2014 to 76,296,597 passenger trips as reported to the National Transit Database (NTD). **Table 13** provides ridership details of the bus routes serving Wahiawa and Whitmore Village. Of the five routes listed only Route 72 provides service only within the two communities and Schofield Barracks, highlighted. Ridership is shown for each bus route within the COTS area, total route ridership, and the percent of the route ridership occurring within the COTS area. The number of bus trips (roundtrip) is provided along with the number of riders per trip. **Table 14** describes the Wahiawa Transit Center and the National Guard Facility Parking and Ride Lot.

Table 13. TheBus Routes Serving Wahiawa-Whitmore Village Ridership

ROUTE	BUS TRIPS (roundtrip)	RIDERSHIP			
		COTS Area	Total	COTS % of Total	Riders per Trip
51	37.5	2,670	5,309	50.3%	142
52	30	1,405	3,947	35.6%	132
72	12	608	--	100.0%	51
83	7	235	474	49.6%	68
88A	2	45	279	16.1%	140
99	2	22	88	25.0%	44
PH3	1	25	39	64.1%	39

Source: City and County of Honolulu Department of Transportation Services.

Table 14. Transit Facilities in Wahiawa

Transit Facility Location	Facility Type	Features	Bus Routes
Wahiawa Transit Center between Center Street and California Avenue	Transit Center	6 bus positions Parking structure attached	51, 52, 72, 83, 99, PH3
Wahiawa-Hawaii National Guard Facility across from Wheeler Army Airfield (shared use with Hawaii National Guard)	Park & Ride Lot (off-base facility open to the general public)	50 parking spaces	51, 52, 83, 84, 84A, 98, 98A, 503, PH3

Source: City and County of Honolulu Department of Transportation Services.

3.3.2 TheHandi-Van

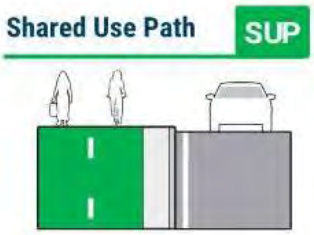
ADA Paratransit services are provided to passengers within ¾ mile of a fixed route operation. These services are offered during the times the fixed route is in operation. Some areas such as those ¾ mile from the Route 2 and Route 40 alignments have 24-hour service while the remaining, including Wahiawa and Wahiawa Heights, are generally between the hours of 4:00 AM to 1:00 AM depending upon fixed route hours in the geographic area. Whitmore Village ADA Paratransit service provides shorter service hours to match the fixed route service hours of 5:10 AM and approximately 7:00 PM. As the project area residents continue to age with a higher incidence of disabilities, demand for TheHandi-Van service will continue to grow.

3.4 Bicycle Infrastructure

Bicycling as a mode of travel is increasing in interest for residents of Oahu. The City has put a priority on bicycle infrastructure with a number of programs including Complete Streets, Vision Zero, Transit-Oriented Development and BikeShare Hawaii. Currently, bicycling as a mode of travel to work is a very small percentage of the overall Wahiawa and Whitmore Village area travel. However, with additional infrastructure this may start increasing as has been shown in other parts of the island. This could be part of a mixed mode commute that includes biking to the bus or rail transit.

The current and proposed bicycle network is presented in **Figure 41**. Existing facilities are shown as solid lines by facility types. The Oahu Bike Plan Update (2019) identifies six types of facilities: Shared Use Path (SOP), Protected Bike Lane (PBL), Buffered Bike Lane (BBL), Bike Lane (BL), Shoulder Bikeway (SB), and Shared Roadway (SR). Of these six, four are proposed for Wahiawa-Whitmore Village. Definitions are shown on next page.

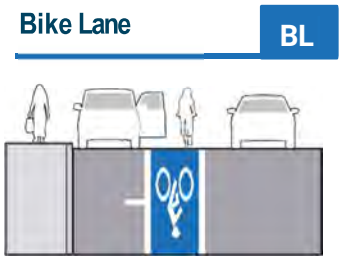
BICYCLE FACILITY TYPES



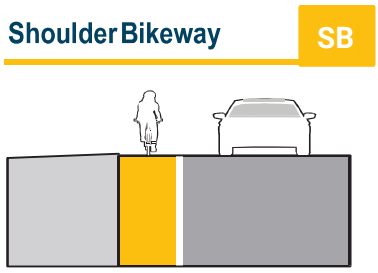
A shared use path is a two-way facility that is physically separated from motor vehicle traffic and used by bicyclists pedestrians, and other non-motorized users. Shared use paths are often located in an independent alignment, such as a greenbelt or abandoned railroad right-of-way, and are used for recreation, leisure, and commuting

Protected Bike Lanes (also known as separated bike lanes or cycletracks) are an exclusive bikeway facility that combines the user experience of a shared use path with the on-street infrastructure of a conventional bike lane. They are physically separated from motor vehicle traffic and distinct from the sidewalk.

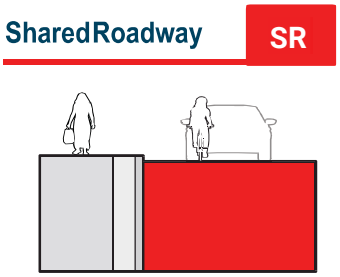
Buffered bike lanes are created by painting a flush buffer zone between a bike lane and the adjacent travel lane. While buffers are typically used between bike lanes and motor vehicle travel lanes to increase bicyclists' comfort, they can also be provided between bike lanes and parking lanes to discourage bicyclists from riding too close to parked vehicles.



Bike lanes provide an exclusive space for bicyclists in the roadway through the use of lines and symbols. Bike lanes are for one-way travel and are normally provided in both directions on two-way streets and on one side of a one-way street. When roadway width is limited and the road is sloped, a bike lane may be provided in only the uphill direction. This is referred to as a ***climbing lane.***



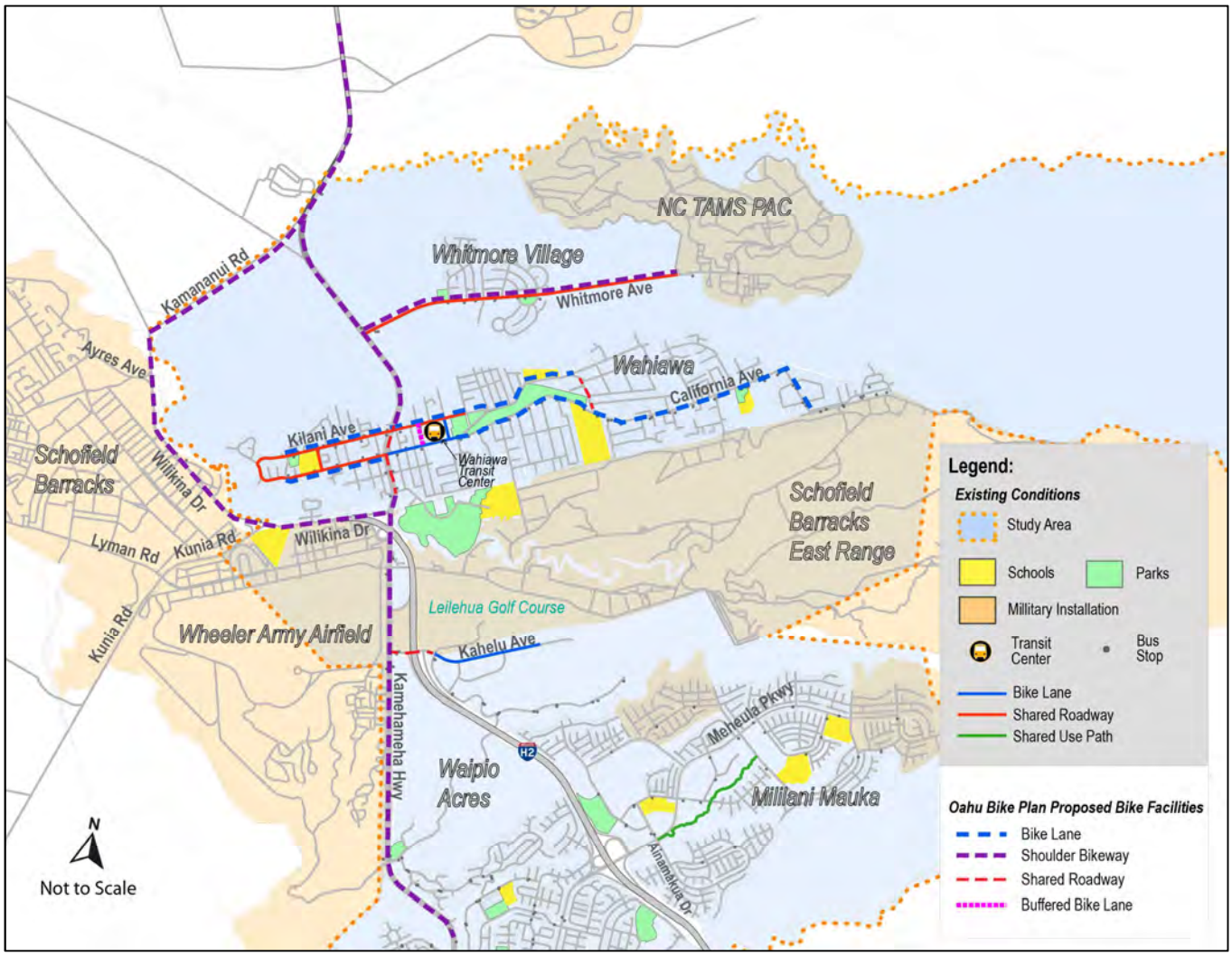
Shoulder bikeways are typically reserved for rural road cross-sections. Paved shoulders provide a range of benefits: they reduce motor vehicle crashes; reduce long-term roadway maintenance; ease short-term maintenance, such as debris clearing; and provide space for bicyclists and pedestrians.



Shared roadways are bikeways where bicyclists and motor vehicles are expected to share the same travel lane. They are denoted by pavement marking (sharrows) and /or signage.
They are typically used in locations with low traffic speeds and volumes or as a temporary solution on constrained higher-traffic streets.

Source: Draft 2019 Oahu Bike Plan Update, A Bicycle Master Plan

Figure 41. Current and Proposed Bicycle Network - Oahu Bike Plan



Source: Draft 2019 Oahu Bike Plan Update, A Bicycle Master Plan