UNIVERSITY OF HAWAI'I AT MĀNOA

CAMPUS CENTER RENOVATION AND EXPANSION

Draft Environmental Assessment

November 2008

PREPARED FOR:

kya design group

PREPARED BY:

PBR HAWAII & ASSOCIATES, INC.

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LIST OF ACRONYMS

The following is a list of terms, abbreviations, and acronyms used in this document.

A	
ACOE	US Army Corps of Engineers
ADA	Americans with Disability Act
ALISH	Agricultural Lands of Importance to the State of Hawaiʻi
AM	Morning
ATA	Austin, Tsutsumi & Associates, Inc.
B	
BMPs	Best Management Practices
BOR	Board of Regents, University of Hawaiʻi at Mānoa
BWS	City and County of Honolulu, Board of Water Supply
bgs	below ground surface
C	
CATV	Cable television
CFC	Chlorofluorocarbons
CIA	Cultural Impact Assessment
CIP	Capital Improvement Project
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
D	
DAGS	State of Hawaiʻi, Department of Accounting and General Services
dba	Doing business as
DLNR	State of Hawaiʻi, Department of Land & Natural Resources
DOD	State of Hawaiʻi, Department of Defense
DOH	State of Hawaiʻi, Department of Health
DP	Development Plan
DPP	City and County of Honolulu, Department of Planning & Permitting
DTS	City and County of Honolulu, Department of Transportation Services
E	
EA	Environmental Assessment
EB	Eastbound
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ETS	Environmental Tobacco Smoke
F	
F	Fahrenheit
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map

FM	Domestic/fire service (water meter)
FONSI	Finding of No Significant Impact
FPMO	UH Facilities Planning and Management Office
FSC	Forest Stewardship Council
FWCA	Fish and Wildlife Coordination Act
G	
GPD	Gallons per day
GPM	Gallons per minute
H	
H-POWER	Honolulu Program of Waste Energy Recovery
HAR	Hawaiʻi Administrative Rules
HCM	Highway Capacity Manual
HECO	Hawaiian Electric Company
HFD	Honolulu Fire Department
HHCTCP	Honolulu High-Capacity Transit Corridor project
HPD	Honolulu Police Department
HOV	High Occupancy Vehicle
HRS	Hawaiʻi Revised Statutes
HVAC	Heating, ventilation and air conditioning
I	
IBC	International Building Code
K	
kVA	Kilovolt Amperes
KW	Kilowatt
KWhr	Kilowatt hour
KYADG	KYA Design Group
L	
LEED	Leadership in Energy and Environmental Design
LEED NC	LEED New Construction
LOS	Level-of-service is a quantitative and qualitative assessment of traffic operations
LRDP	Long Range Development Plan
LSB	Land Study Bureau
LT	Left turn
LUC	State of Hawaiʻi, Land Use Commission
LUO	Land Use Ordinance
M	
MIA	Makiki Stony Clay Loam soil
MPH	Miles per hour
MSL	Mean sea level
MUTCD	Manual on Uniform Traffic Control Devices
MVA	Megavolt Amperes
N	
NEPA	National Environmental Policy Act
NFPA 10	National Fire Protection Association Standard for Portable Fire Extinguishers

NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NWS	National Weather Service
O	
OCCL	Department of Land and Natural Resources, Office of Conservation and Coastal Lands
OHA	Office of Hawaiian Affairs
OSHA	Occupational Safety and Health Administration
OTWC	Oceanic Time Warner Cable
P	
PM	Afternoon
PRU	Plan Review Use approval
psi	Pounds per square inch
PUC	Primary Urban Center
R	
R-5	Residential Zoning District (City and County of Honolulu)
ROH	Revised Ordinances of Honolulu
RT	Right-turn
S	
SF	Square feet
SHPD	State Historic Preservation Division
SMA	Special Management Area
SMP	Special Management Area Use Permit
SOI	Secretary of the Interior
T	
TH	Through (traffic)
TIAR	Traffic Impact Analysis Report
TMK	Tax Map Key
U	
UH	University of Hawaiʻi
UHM	University of Hawaiʻi at Mānoa
UHSM	University Health Services Mānoa
UIC	Underground Injection Control Line
USC	United States Code
USGS	U.S. Geological Survey
V	
VOC	Volatile organic compound
W	
WB	Westbound
WMP	Water Management Plan

1.0 INTRODUCTION

This Draft Environmental Assessment (EA) is prepared in accordance with Chapter 343, Hawaiʻi Revised Statutes (HRS) for the proposed renovation and expansion of the Campus Center, renovation of Hemenway Hall, relocation or removal of two portable buildings and the removal of two buildings in the Engineering Quadrangle at the University of Hawaiʻi at Mānoa, hereinafter referred to as "Campus Center Renovation and Expansion."

1.1 PROJECT SUMMARY

Project Name: Campus Center Renovation and Expansion

Location: Honolulu, Oʻahu

Tax Map Key (TMK): (1) 2-8-23-03 (por.)

Applicant: University of Hawaiʻi at Mānoa

Landowner: State of Hawaiʻi - University of Hawaiʻi System (per Executive Order (EO) 1807 to the Board of Regents (BOR) of the University of Hawaiʻi)

	Campus Center	**Engineering Quadrangle**	**Portable Buildings**	**Hemenway Hall Auditorium**
Existing Use	Student programming and activities offices, food service, establishments, retail services, Campus bookstore	University Publications	Facilities for PEACESAT & Miller Annex	Classroom/meeting facilities
Proposed Action	Renovation and Addition	Removal and Preservation in place	Removal or Relocation	Renovation
Project Area	Approximately 206,100 square feet (SF)	2 buildings, approximately 5924 SF will be removed **2 buildings, approximately 6383 Swill be preserved in place**	Approximately 3,528 SF	Approximately 3,517 SF

Land Use Designations:	**State Land Use:**	Urban
	City and County of Honolulu Primary Urban Center Development Plan:	Institutional
	City and County of Honolulu Zoning:	Residential (R-5)
Special Management Area:	The project is not in the Special Management Area (SMA)	
Permits/Approvals Requested:	Approval of Project Construction Plans Building and Grading Permits Plan Review Use (PRU) permit State Historic Preservation review National Pollutant Discharge Elimination System (NPDES)	
Approving Agency:	University of Hawaiʻi at Mānoa	
Anticipated Determination:	Finding of No Significant Impact (FONSI)	

1.2 LOCATION

The proposed site for the Campus Center Renovation and Expansion is located within the University of Hawaiʻi at Mānoa Central Campus, in urban Honolulu on the Island of Oʻahu, State of Hawaiʻi (Figure 1). The Campus Center Renovation and Expansion is located south of Campus Road and is surrounded by Gartley Hall, Miller Hall, the Art Building, Building 37, Kuykendall Hall, Bachmann Annex, Sinclair Library, and Varsity Circle.

1.3 LAND OWNERSHIP

The State of Hawaiʻi - University of Hawaiʻi System (per Executive Order (EO) 1807 to the Board of Regents of the University of Hawaiʻi) holds title to the land under the location (Figure 2) of the proposed action. Utilizing the Tax Map Key system, the land under the project site is identified as TMK (1) 2-8-23:03 (por.)

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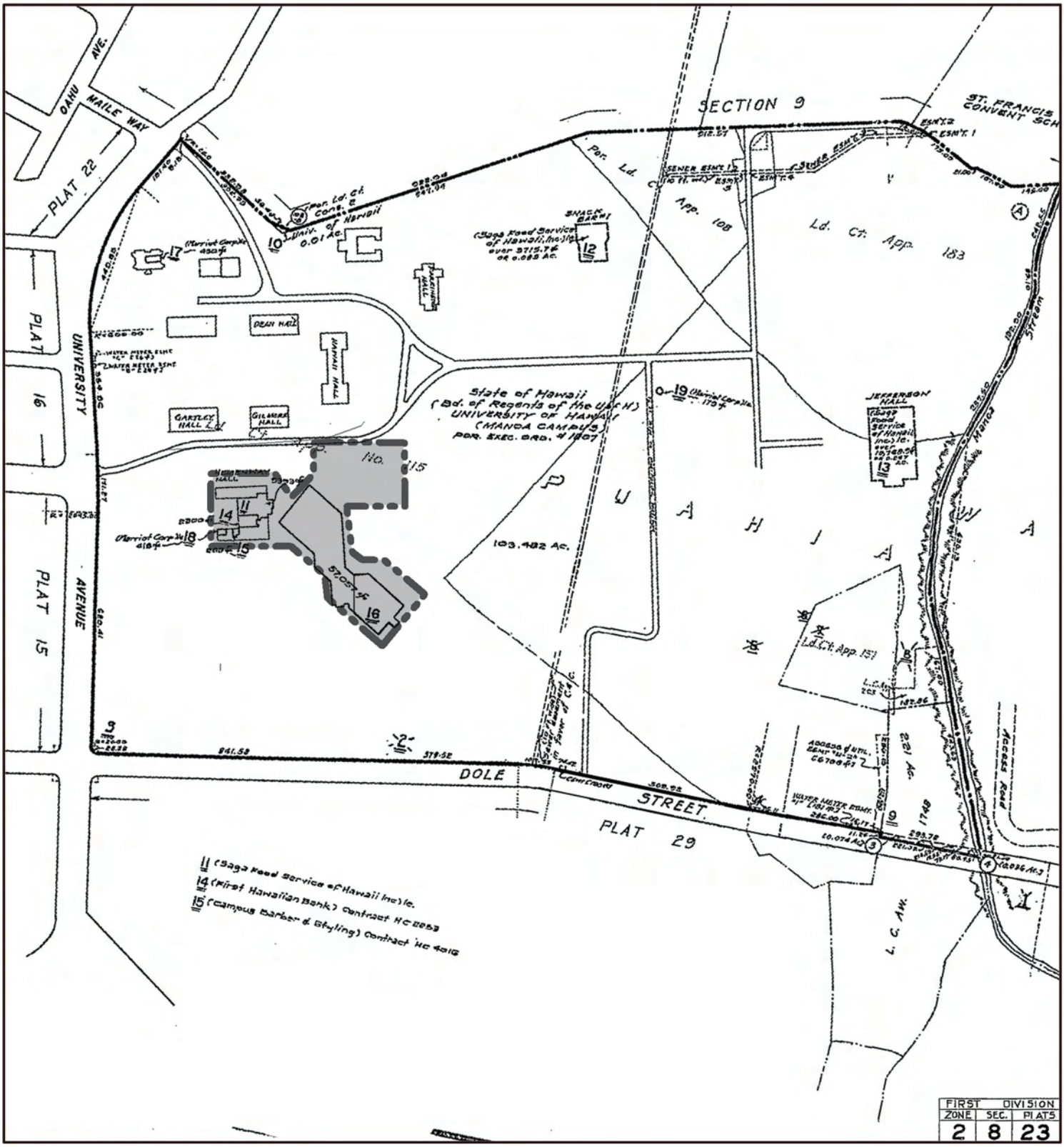


LEGEND

Project Area

Figure 1

Tax Map Key

Campus Center Renovation & Expansion

University of Hawai'i at Mānoa

ISLAND OF O'AHU

NORTH

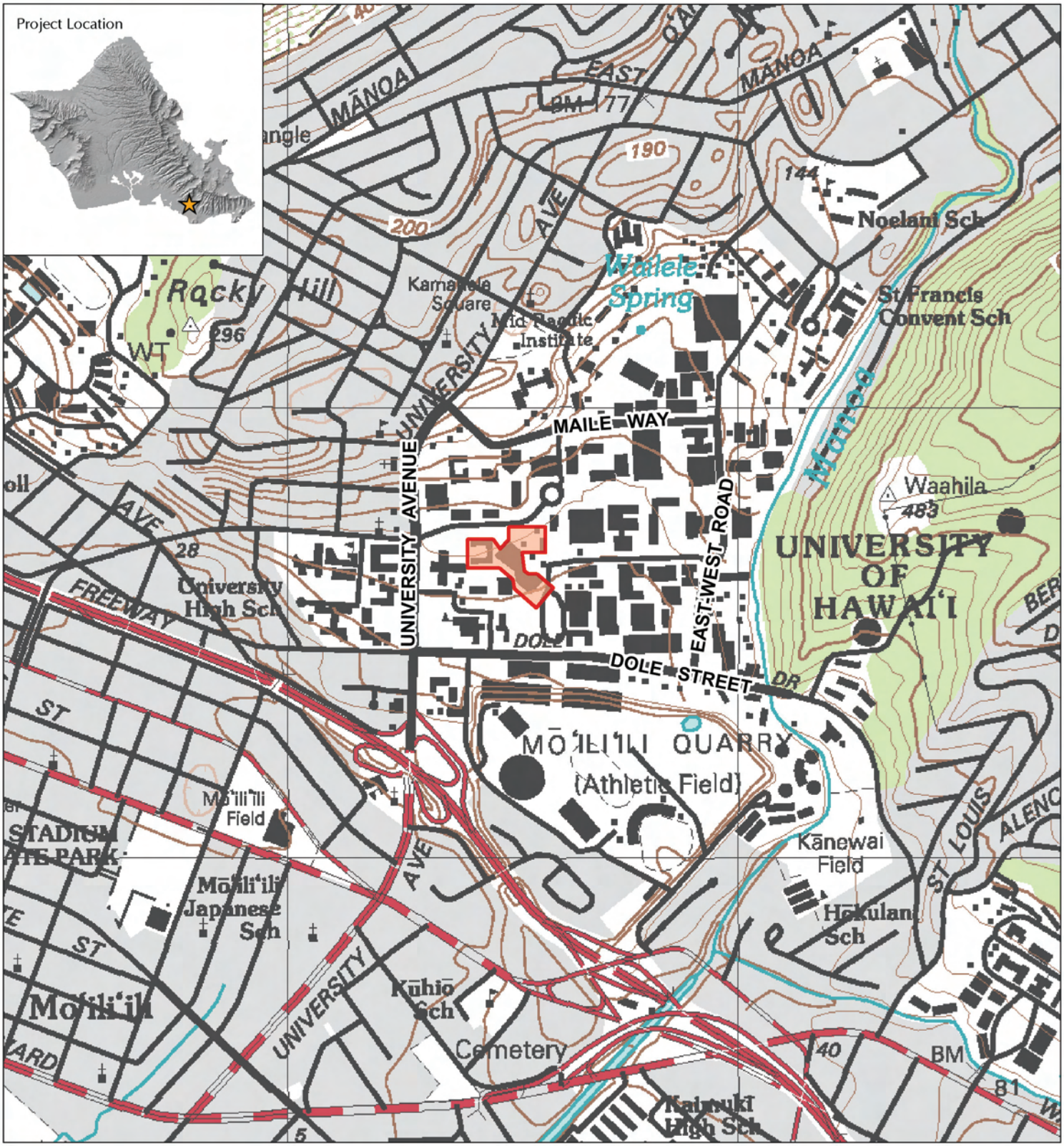
LINEAR SCALE (FEET)

0 200 400 800

PBR HAWAII & ASSOCIATES, INC.

Source: Reality Atlas, State of Hawai'i (2007)

Disclaimer: This graphic has been prepared for general planning purposes only.



LEGEND

Project Area

Figure 2

Regional Location

Campus Center Renovation & Expansion

University of Hawai'i at Mānoa — ISLAND OF O'AHU

NORTH

LINEAR SCALE (FEET)

0 500 1,000 2,000

PBR HAWAII & ASSOCIATES, INC.

Source: U.S. Geological Survey

Disclaimer: This graphic has been prepared for general planning purposes only.

1.4 IDENTIFICATION OF APPLICANT

The University of Hawaiʻi at Mānoa is the project applicant.

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University of Hawaiʻi at Mānoa
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1.5 IDENTIFICATION OF ENVIRONMENTAL CONSULTANT

The environmental consultant is PBR HAWAII & Associates, Inc. dba PBR HAWAII, a sub-consultant under contract with KYA Design Group (KYADG).

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1.6 IDENTIFICATION OF APPROVING AGENCY

The University of Hawaiʻi at Mānoa is the approving agency.

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Associate Vice President for Capital Improvements
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1.7 COMPLIANCE WITH STATE OF HAWAIʻI AND CITY AND COUNTY OF HONOLULU ENVIRONMENTAL LAWS

Preparation of this document falls in accordance with the provisions of Chapter 343, HRS (2007) and Title 11, Chapter 200, Hawai'i Administrative Rules (HAR) pertaining to Environmental Impact Statements. Section 343-5, HRS established nine "triggers" that require either an EA or an Environmental Impact Statement (EIS). The use of State or County lands or funds requires the preparation of an Environmental Assessment.

1.8 IDENTIFICATION OF AGENCIES CONSULTED

Various agencies (or agency documents) were consulted in preparation of this EA. Responses to the pre-consultation are attached in Appendix A.

Federal
Army Corps of Engineers (ACOE)

State of Hawaiʻi
Department of Land and Natural Resources

City and County of Honolulu
Board of Water Supply
Department of Planning & Permitting
Fire Department
Police Department

Private
Hawaiian Electric Company

2.0 PROJECT DESCRIPTION

This section provides background information and a general description of the Campus Center Renovation and Expansion project site.

2.1 LOCATION

The proposed site for the Campus Center Renovation and Expansion is located within the University of Hawaiʻi at Mānoa Upper Campus in urban Honolulu on the Island of Oʻahu, State of Hawaiʻi (Figure 1). Photographs of the site are included as Figures 3A and 3B. Specifically, the project is located south of Campus Road between Sinclair Library, Miller Hall, Kuykendall Hall, and Building 37 (Figure 4).

2.2 DESCRIPTION OF THE CAMPUS CENTER RENOVATION AND EXPANSION

The Campus Center Renovation and Expansion is being designed to provide students with a centrally located, state-of-the-art Recreation Center. The approximately 56,100 SF Recreation Center addition will include spaces for indoor intramural sports, cardio-vascular exercise, fitness center, strength training, multi-purpose exercise rooms, indoor jogging track, and two indoor basketball courts. One of the key components of the Recreation Center addition is its integration with the primary Campus Center structure in the center of the upper campus. To ensure the seamless integration with the existing Campus Center structure, several surrounding buildings will need to be removed and or relocated. The removal of two of the four remaining buildings in the original Engineering Quadrangle[1] will be removed. In addition, two portables (the PEACESAT and Miller Annex buildings) will be removed or relocated. Building 6 (the historic Engineering Materials Testing Laboratory (EMTL), built in 1912) and the current Ka Leo Building, both part of the original Engineering Quadrangle will be preserved in place. Hemenway Hall is being renovated to house some of the displaced organizations currently located in the two portables and in the Engineering Quadrangle.

2.2.1 General Background

Campus Center

Built in 1973, the Campus Center is a four-level, 150,000 SF mixed use building designed as a hub for student programming and activities. The construction of the existing Campus Center facility required the demolition of one of the five original Engineering Quadrangle buildings.

[1] The UHM has been working with the State Historic Preservation Department (SHPD) to minimize the impact the Campus Center Renovation and Expansion will have on the Engineering Quadrangle complex. This is discussed in Section 4.1.

Hemenway Hall

The University of Hawai'i opened Hemenway Hall (original referred to as the "Union Building") in 1939. As the first major non-academic building on campus, Hemenway Hall provided dining space, a lounge area, and student offices. In 1948, a wing was added which contained a barbershop, classrooms, and a recreation hall. The addition also created an enclosed outdoor courtyard used for dining and entertainment. Today, the two-story concrete structure is approximately 42,300 SF of total floor space (plus a 4,000 square foot courtyard area). Hemenway Hall was extensively renovated during the 1970's.

Engineering Quadrangle

Built in 1915, the Engineering Materials Testing Laboratory is the 2nd oldest building on campus. It was built to house the Reihle Universal Testing Machine, a 150,000-pound machine purchased second-hand that was too large to be housed in Hawai'i Hall. Between 1915 and 1928, four single-story concrete buildings were erected to serve as classes and storage for the engineering department. Collectively, these five building became known as the Engineering Quadrangle. One of the buildings was demolished in the early 1970s to make way for the present day Campus Center. The complex was officially named for James Mason Young in 1965. The Engineering Department moved out of the Engineering Quadrangle in 1959 and became known as the College of Engineering. Since 1959, the Engineering Quadrangle has been the home to a variety of tenants. Today, the buildings house the Beau Press, Board of Publications (BOP) offices, Ka Leo O Hawai'i offices and printing, Duplicating Services, and Student Support Services.

Miller Annex Portable Building

The Miller Annex portable building contains the Family Studies Office and several offices for programs in the College of Tropical Agriculture and Human Resources. The final disposition of this building has not yet been determined. It may be moved to an alternate location on campus

PEACESAT Portable Building

The Pan-Pacific Education and Communication Experiments by Satellite (PEACESAT) program is housed in a portable building in the center of the Engineering Quadrangle. The final disposition of this building has not yet been determined. It may be moved to an alternate location on campus.

2.2.2 Environmental Sustainability

The Campus Center Recreation Center addition will attempt to achieve Leadership in Energy and Environmental Design (LEED) certification at the Silver level. The renovation also includes historic preservation criteria and the architects are working closely with the State Historic Preservation Division (SHPD) and campus planners to minimize impact to the historic features of Hemenway Hall, and the Engineering Quadrangle.

Photo 1: Facing southwest towards the Engineering Quad from Miller Hall.

Photo 2: Facing southwest between Engineering Quad buildings PEACESAT Portable.

Photo 3: Facing south towards Miller Annex and the Engineering Quad.

Photo 4: Facing south towards the Campus Center building from Campus Road.

Photo 5: Facing southeast towards the Campus Center building from Campus Road.

Photo 6: Facing South towards Hemenway Hall entrance.

Photo 7: Facing northeast towards the corner of Hemenway Hall.

Photo 8: Facing northeast towards the Campus Center building from the Admin Services 2 building parking lot.

Photo 9: Facing southeast towards the Campus Center building from Hemenway Hall parking lot.

Photo 10: Facing northeast from the Campus Center building towards the Engineering Quad (& Ka Leo offices).

Photo 11: Facing northwest towards the Campus Center building from Krauss Hall.

Figure 3a

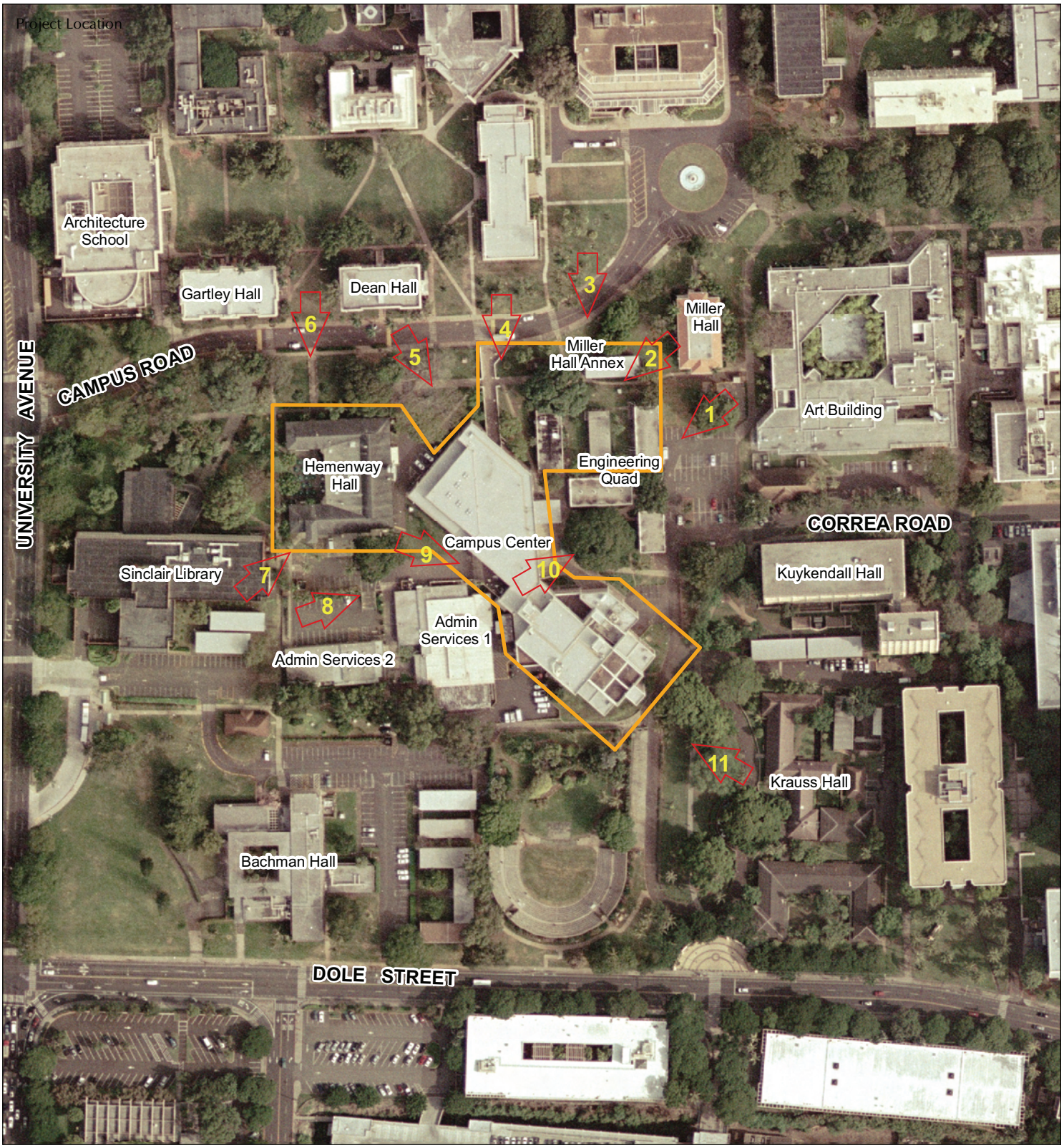
Site Photographs

Campus Center Renovation & Expansion

University of Hawai'i at Mānoa

ISLAND OF O'AHU

PBR HAWAII & ASSOCIATES, INC.



LEGEND

Project Area

8 Photo ID number & direction photo was taken

Figure 3b

Site Photograph Key

Campus Center Renovation & Expansion

University of Hawai'i at Mānoa

ISLAND OF O'AHU

NORTH

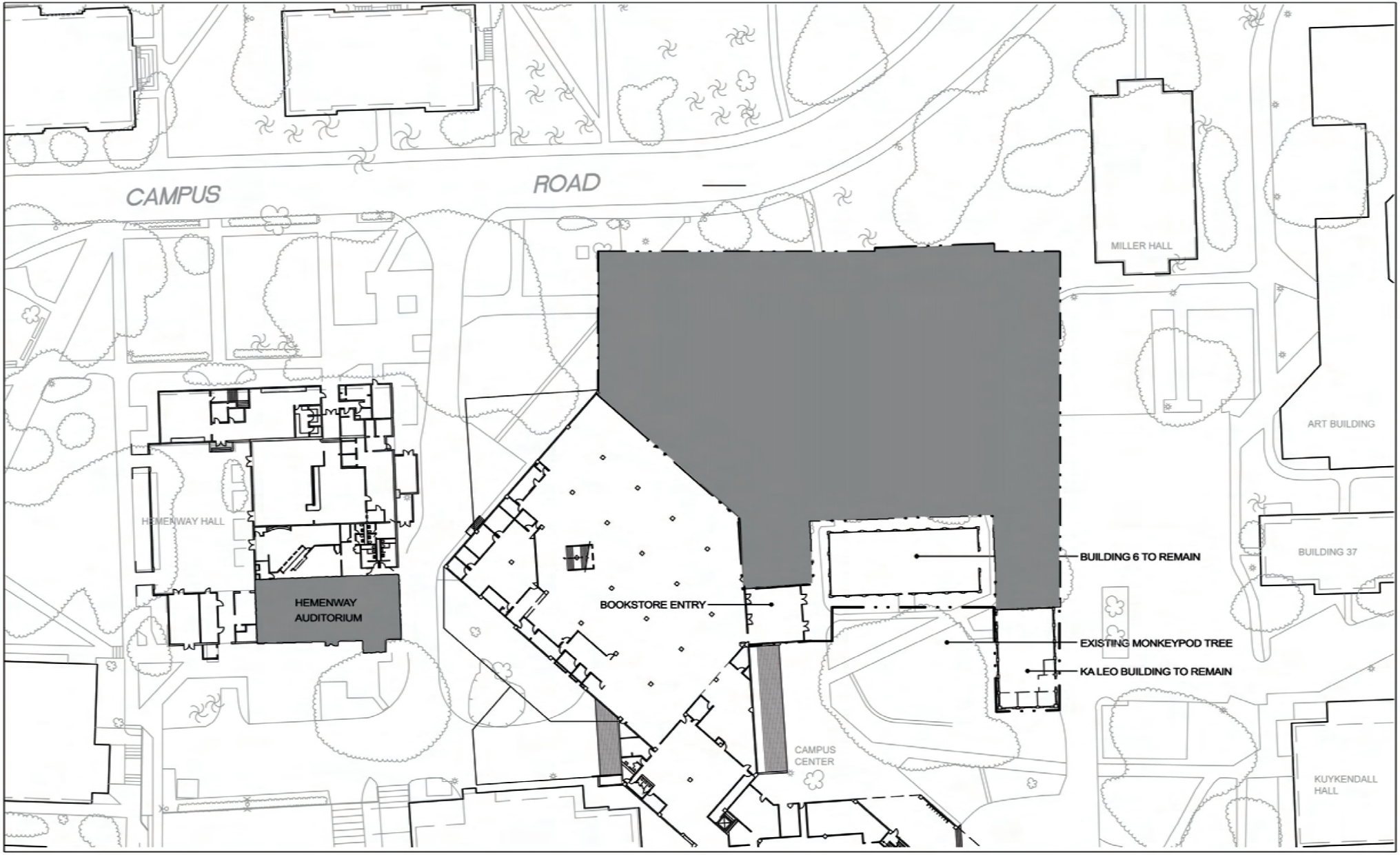
LINEAR SCALE (FEET)

0 100 200 400

PBR HAWAII & ASSOCIATES, INC.

Source: U.S. Geological Survey (2004)

Disclaimer: This graphic has been prepared for general planning purposes only.



LEGEND

Project Area

Figure 4

Site Plan

Campus Center Renovation & Expansion

University of Hawai'i at Mānoa — ISLAND OF O'AHU

NORTH

LINEAR SCALE (FEET)

30' 15' 0' 30' 60'

Source: kya design group

Disclaimer: This graphic has been prepared for general planning purposes only.

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One of the four major themes in the University's LRDP is "UHM – Leader in Environmental Sustainability." To that end, the University is attempting to achieve LEED certification at the Silver level. LEED, or Leadership in Energy and Environmental Design is a nationally-recognized program for certifying the design, construction and operation of high performance green buildings. The Campus Center Renovation and Expansion project will be designed taking the following LEED concepts into consideration:

- Reduce environmental impacts through appropriate site development;
- Develop urban areas with existing infrastructure;
- Reduce pollution impacts through the implementation of transportation alternatives;
- Reduce use of potable water for land irrigation; and
- Maximize water efficiency to reduce water use.
- Ensure that building elements/systems are designed/installed/calibrated as intended;
- Establish minimum level of energy efficiency; and
- Reduction of waste generated and disposed of in landfills via the collection of recyclables and reusable during construction and operation;
- Increase demand in recycled content building materials.
- Prevent of indoor air quality problems through the development of a Construction indoor air quality (IAQ) Management Plan and minimum IAQ performance standards
- Reduce of the quantity of indoor air contaminants;
- Avoid exposure to potentially hazardous chemicals; and

According to the LRDP, existing conditions indicate that students traveling between the Campus Center, Hemenway Hall, Sinclair Library, University Avenue and Metcalf Street walk along Campus Road. Campus Road/Varney Circle is used for parking and as a service road to Hemenway Hall, Student Services Center, and Gartley Hall. The LRDP recommends that vehicular traffic be eliminated from the heart of the Central Campus by closing and converting the portion of Campus Road between Gartley Hall and the Campus Center into a secondary path for access for emergency, maintenance and service vehicles. The LRDP further recommends that this mall (referred to as "East-West Mall" should be developed as a walk through a botanical garden, with a number of informal sitting areas and a few well-defined activity areas. An outdoor sidewalk café covered by an awning or trellis is envisioned for the mauka side of Hemenway Hall along the proposed East-West Mall and west of the Campus Center.

Historic Preservation Considerations - Because Hemenway Hall and the Engineering Quadrangle are considered a historic buildings, modification or removal of these structures, is subject to the approval of the State Historic Preservation Division (SHPD).

2.2.3 Project Implementation

Project construction is expected to occur in three phases. Phase one, already completed, included the renovation of existing Campus Center Facilities, and did not require an assessment of environmental impact. Phase two will include the construction of the Recreation Center and the demolition of the Hemenway Hall auditorium. In addition, Phase Two will include the renovation of a portion of Hemenway Hall to accommodate several organizations displaced from the Engineering Quad. This needs to be completed prior to the construction of the Recreation Center. Phase three will include renovation and modification of the existing Campus Center structure. Construction on phase two is scheduled for the fall of 2009. Phase three would commence upon completion of phase two.

3.0 DESCRIPTION OF THE NATURAL ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATIVE MEASURES

This section describes the existing conditions of the physical or natural environment, potential impacts of the Campus Center Renovation and Expansion to the environment, and mitigation measures to minimize impacts.

3.1 CLIMATE

Oʻahu's geological features heavily influence its climate. The Koʻolau Mountain Range dominates ground-based atmospheric influences within Mānoa Valley. Trade winds are typical of the Hawaiian Islands, blowing predominantly from a northeast direction, and averaging approximately seven (7) miles per hour (mph) (NOAA, no date). These trade winds typically bunch moisture collected over the ocean along the mountain range creating optimal conditions for precipitation. National Weather Service rain gauges sited at Lyon Arboretum in the back of the valley have recorded an average annual rainfall of approximately 160 inches per year. Gauges at the Kapiʻolani Community College record rainfall of approximately 25 inches per year (NWS Website). Rainfall at the project site lies between these two extremes.

Regional temperatures within the city of Honolulu range from 62 degrees Fahrenheit at an extreme low, to 89 degrees Fahrenheit at an extreme high.

Potential Impacts and Mitigation Measures

The Campus Center Renovation and Expansion is not anticipated to have any impact on climatic conditions and no mitigation measures are planned.

3.2 GEOLOGY AND TOPOGRAPHY

Geology

The project site sits at the foot of the Koʻolau Mountain Range – the eroded remnant of the Koʻolau Shield Volcano. The geology under the University of Hawaiʻi at Mānoa is highly influenced by three post-erosional volcanic vents associated with the larger Honolulu Volcanic Series: Puʻu ʻUalakaʻa (Round Top), Puʻu Kākea (Sugarloaf), and Puʻu ʻŌhiʻa (Tantalus). Honolulu Series eruptions did not occur rapidly and at one instance. Rather, they were scattered over a period of hundreds of thousands of years. All three vents are cinder cones derived from Strombolian-type eruptions. The approximately 67,000-year old flow from Puʻu Kākea spread out along Mānoa's valley floor creating a broad and nearly flat surface upon which the University of Hawaiʻi was constructed (Macdonald, 1983).

The Honolulu plain is underlain by a broad elevated coral reef partially covered by alluvium, evidence of higher sea level (approximately 7.5 meters) during an earlier interglacial stage.

Topography

The regional topography of the University of Hawaiʻi at Mānoa campus gently slopes at less than five (5) degrees in a southwesterly direction toward the ocean. The immediate site is partially influenced by its location at the foot of Mānoa Valley's eastern wall, creating the slight slope toward the west at the project site.

Also, because of the large amount of human development on the University campus, the areas around the existing Hemenway Hall, Campus Center, Engineering Quadrangle, Miller Annex and PEACESAT buildings have experienced profuse grading activity, as evidenced by the relatively level nature of the building site where the proposed renovation will occur.

Potential Impacts and Mitigation Measures

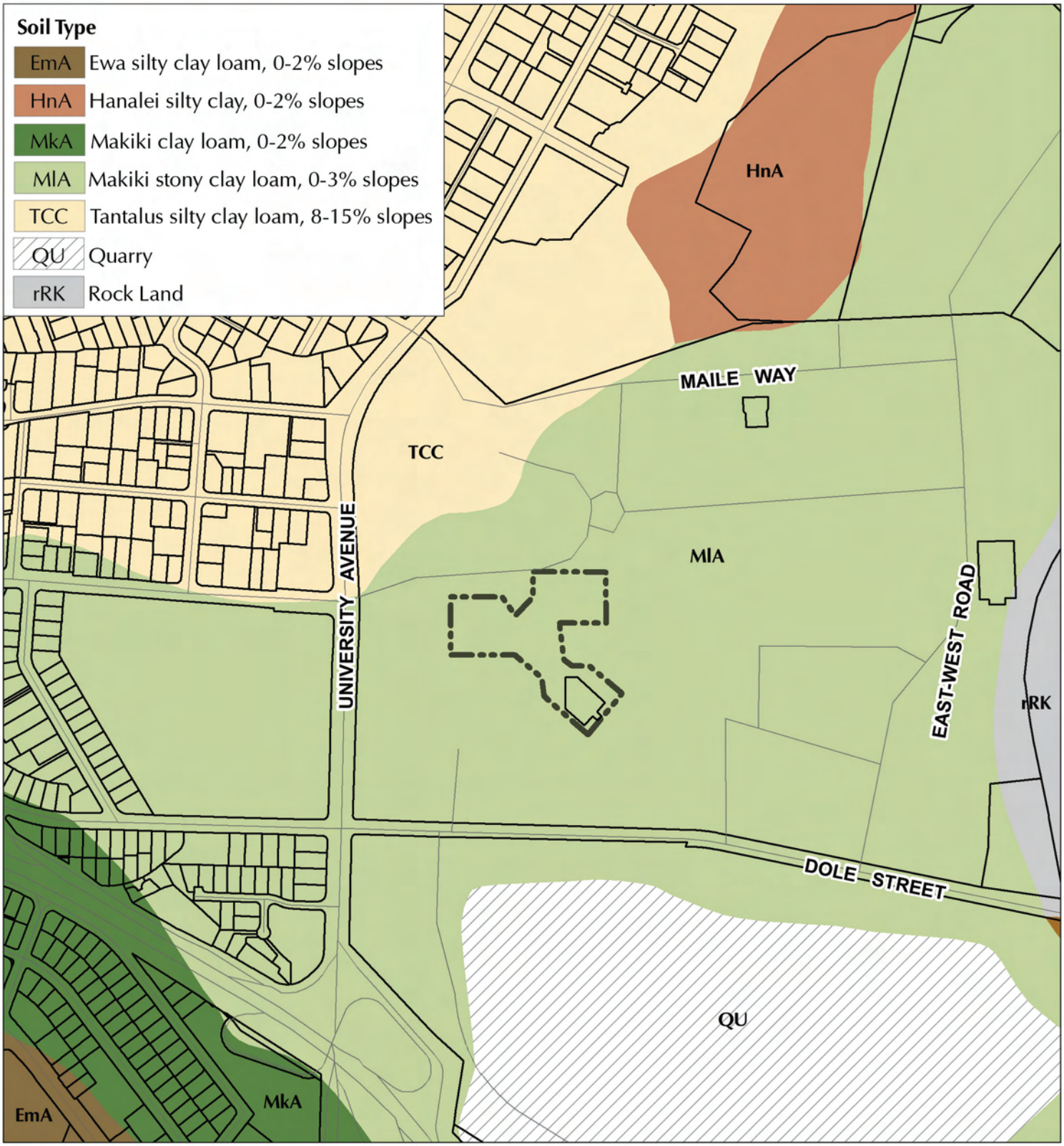
Due to the level conditions of the property, relatively minimal grading of the site will occur prior to renovation. The grading will not change the topographic nature of the Campus Center area relative to the surrounding lands.

3.3 SOILS

Three soil suitability studies prepared for lands in Hawaiʻi principally focus on the relative agricultural productivity of different land types. These studies are: 1) the U.S. Department of Agriculture Natural Resource Conservation Service (NRCS) Soil Survey; 2) the University of Hawaiʻi Land Study Bureau Detailed Land Classification; and 3) the State Department of Agriculture's Agricultural Lands of Importance to the State of Hawaiʻi (ALISH).

3.3.1 Natural Resources Conservation Service (NRCS)

The ***Natural Resource Conservation Service, Soil Survey for the Island of Oʻahu***, classifies the soil of the Campus Center Renovation and Expansion project site as: Makiki Stony Clay Loam, 0-3% Slope (Figure 5). The Makiki series of soils are generally described as consisting of well-drained soils on alluvial fans and terraces. These soils formed in alluvium mixed with volcanic ash and cinders. They are nearly level. Makiki Stony Clay Loam is a neutral to slightly acid soil described as being similar to Makiki Clay Loam, except containing enough stones to hinder cultivation. Makiki Clay Loam is described as having a surface layer is dark brown clay loam about 20 inches thick. The subsoil, about 10 inches thick, is dark-brown clay loam that has subangular blocky structure. It contains cinders and rock fragments. The subsoil is underlain by similar material, about 24 inches thick, that is massive. Below this are volcanic cinders. Makiki Stony Clay Loam is almost entirely in urban use.



LEGEND

Project Area

Figure 5

Soil Classification

Campus Center Renovation & Expansion

University of Hawai'i at Mānoa — ISLAND OF O'AHU

NORTH

LINEAR SCALE (FEET)

0 250 500 1,000

PBR HAWAII & ASSOCIATES, INC.

Source: Natural Resources Conservation Service (2007)

Disclaimer: This graphic has been prepared for general planning purposes only.

3.3.2 Land Study Bureau Detailed Land Classification

The University of Hawaiʻi Land Study Bureau document, ***Detailed Land Classification, Island of Oʻahu,*** classifies soils based on a productivity rating. Letters indicate class of productivity with A representing the highest class and E the lowest. The soils of the Campus Center Renovation and Expansion project site are listed as Unclassified (Figure 6).

3.3.3 Agricultural Lands of Importance to the State of Hawaiʻi (ALISH)

The Agricultural Lands of Importance to the State of Hawaiʻi (ALISH) system classify important agricultural lands as Prime, Unique, or Other Agricultural Land. The Campus Center Renovation and Expansion project site lands are not classified (Figure 7).

3.3.4 Soils Study

Due to the various below-grade conditions on the University campus, geo-technical surveys will be conducted prior to any project involving foundations or new buildings. The results from several soil samples collected from borings advanced near the Campus Center area indicated that the underlying silty clay has a moderate to high expansion potential.

Potential Impacts and Mitigation Measures

The Campus Center Expansion and Renovation will not have a deleterious effect on the soil in the project site. Because soils at the project site are not well suited for crop cultivation, and the site's development history, the proposed development should not impact the availability of agricultural land for cultivation.

The stability of the underlying strata is critical to the integrity of the Campus Center Expansion and Renovation project. Soils engineers will be involved in the design of building footings and subsurface soil modification taking into account the expansion rate of the underlying soil. This may include the removal of high expansion substrate. The foundation of the proposed Recreation Center will be spread footings and continuous footings, and where necessary, bearing directly on moderately weathered basalt. The Hemenway Hall renovation will include constructing a new level concrete floor slab-on-grade. The disposition of excavated soil, has not been determined, however the goal is to re-inter all excavated soil within the University of Hawaiʻi at Mānoa boundaries.

LEGEND

Project Area

Agricultural Productivity Rating

- A - Excellent
- B - Good
- C - Fair
- D - Poor
- E - Very Poor
- Unclassified

Figure 6

Detailed Land Use Classification

Campus Center Renovation & Expansion

University of Hawai'i at Mānoa — ISLAND OF O'AHU

NORTH

LINEAR SCALE (FEET)

0 250 500 1,000

PBR HAWAII & ASSOCIATES, INC.

LEGEND

Project Area

Agriculture Type

- Prime ALISH Land
- Unique ALISH Land
- Other ALISH Land
- Unclassified

Source: State Department of Agriculture (1977)
Disclaimer: This graphic has been prepared for general planning purposes only.

Figure 7
Agricultural Lands of Importance to the State of Hawai'i

Campus Center Renovation & Expansion
University of Hawai'i at Mānoa
ISLAND OF O'AHU

NORTH

LINEAR SCALE (FEET)
0 250 500 1,000

PBR HAWAII & ASSOCIATES, INC.

3.4 FLORA AND FAUNA

The University of Hawaiʻi at Mānoa has been subject to intense human utilization over the past century. Within the immediate proximity of the project site, there are no known habitats for rare, threatened, or endangered flora or faunal species.

There are several large trees within the project area. In 1975, the City and County of Honolulu enacted the Exceptional Tree Law to protect and honor trees in the community. In 2004, the State of Hawaiʻi defined an exceptional tree as a tree, stand or grove of trees with historic or cultural value because of its age, rarity, location, size, beauty or endemic status. There are approximately 24 trees and shrubs within the affected project area (See Existing Plants within the Project Area). Several of these trees meet the definition of an Exceptional Tree. A majority of the 24 trees/shrubs within the affected project area cannot be maintained in place. As proposed, the renovation and expansion will not impact the large Monkey Pod tree at the center of the existing Campus Center building grounds.

Potential Impacts and Mitigation Measures

Whenever possible existing trees and shrubs within the affected project area will be relocated to new locations on campus. In some instances due to the location of existing utilities and other extenuating factors, relocation may not be an option. Decisions to remove or relocate existing trees will be made under the direction of a licensed arborist. Existing trees with a diameter greater than 36 inches that cannot be relocated or do not survive transplantation will be replaced at a minimum of two new trees for one. The type and size of the new replacement trees will be at the discretion of the University of Hawaiʻi Landscape Manager with the approval of a landscape architect and licensed arborist.

The location of the Campus Center Renovation and Expansion is not anticipated to have any significant impact on endangered flora or faunal species. No mitigation measures are planned.

Table 3-1
Existing Plants within the Project Area

QTY	PLANT NAME	HEIGHT	INSTRUCTIONS	LOCATION RELATIVE TO CAMPUS CENTER
Palms				
1	Cocos nucifera (Coconut Palm)	25 feet	Relocate on Campus	north-east
4	Small Palms	various		north-east
Trees				
1	*Spathodea campanulata* (African Tulip)	40 feet	Remove	north-east
1	*Ficus benghalensis* Banyan Tree	60 feet	Relocate on Campus	north-east
1	Banyan Tree	40 feet	Relocate on Campus	north-east
1	Banyan Tree	35 feet	Relocate on Campus	north-east
1	*Artocarpus atilis* (Breadfruit Tree)	30 feet	Relocate on Campus	north-east
1	Breadfruit Tree	15 feet	Relocate on Campus	north-east
1	Breadfruit Tree	30 feet	Relocate on Campus	north-east
1	Breadfruit Tree	30 feet	Relocate on Campus	north-east
1	(*Bauhinia blakeana)* Hong Kong Orchid –	13 feet	Relocate on Campus	north-east
1	(Indian) Banyan Tree	40 feet	Relocate on Campus	north-east
1	*(Samanea samaea)* Yellow Monkeypod –	30 feet	Remain	east north-east
1	Banyan Tree	50 feet	Remain	west south-west
2	Jackfruit Tree - *Artocarpus heterophyllus*	13 feet	Relocate on Campus	west south-west
Shrubs				
MASS	Brexia – *Brexia madagascarensies*	Height - 8' Spread - 20'	Remove	north-east
MASS	Firespike - *Odontonema strictum*	Height - 4' Spread - 4'	Relocate on Campus	north-east
4	Bouganvillea – *Bouganvillea spectabilis*	Various	Relocate on Campus	west south-west

3.5 NATURAL HAZARDS

Natural hazards like flooding, tsunami inundation, hurricanes, earthquakes, and volcanic eruptions have historically impacted Hawaiʻi Island.

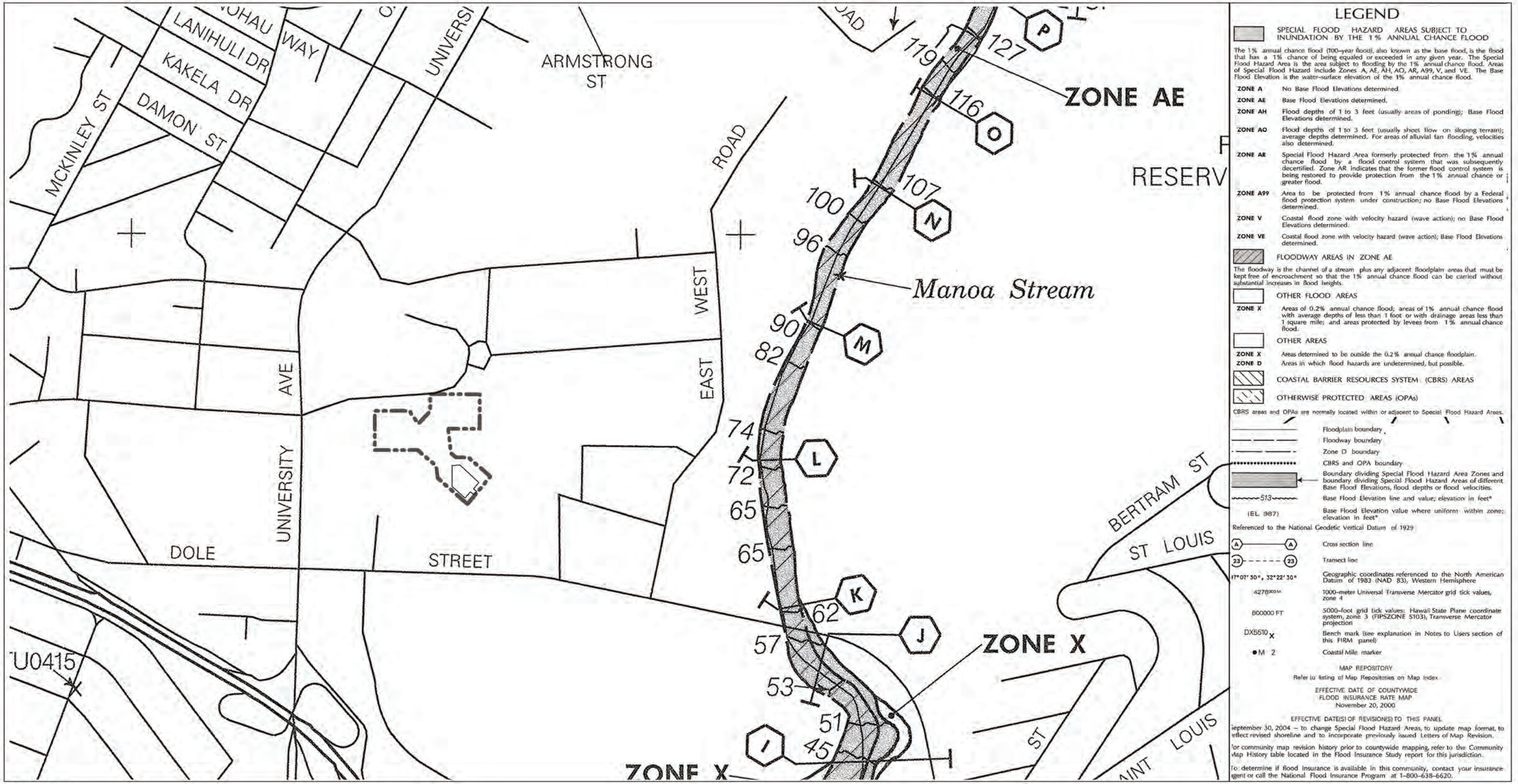
Flooding

According to the Flood Insurance Rate Map (FIRM) prepared by the Federal Emergency Management Agency (FEMA), National Flood Insurance Program, the project site is located in "Zone X", out of the 500-year flood plain (Figure 8).

The site sits in a dry and arid environment where the risks of flooding are low due to a combination of factors, including low rainfall, thin soil layer, slope, and the porosity of the bedrock. During periods of heavy rainfall, localized ponding and some scouring by flowing surface water may occur. However, those conditions typically dissipate as the water rapidly percolates through the substrate.

Although the proposed project site lies outside the denoted flood zone, the Mānoa campus experienced a catastrophic flood event on October 30, 2004. The flood was the result of a 25-year flood event that caused an estimated $80 million in damage to the University of Hawaiʻi, as well $5 million worth of damage to residences upstream of the campus. The Army Corps of Engineers (ACOE) conducted a post-flood, rainfall-runoff and stream hydraulic computer modeling of Mānoa Stream. The model results indicated that Mānoa Stream between Woodlawn and Kahaloa Drives had insufficient channel capacity to contain the flood waters caused by the October 30, 2004 storm event. Flood damage was further aggravated by debris clogged at the East Mānoa Road and Woodlawn Drive bridges over Mānoa Stream. Alternatives evaluated by the ACOE included floodwalls or levees along selected portions of Mānoa Stream channel between the East Mānoa Road and Woodlawn Drive bridges, and creating an artificial channel between East Mānoa Road and Woodlawn Drive.

In October 2007, Austin Tsutsumi & Associates, Inc. (ATA) prepared a report entitled: *Utility Systems Report, University of Hawaii at Manoa, Long Range Development Plan 2007 Update, (Category I), Manoa, Honolulu, Hawaii.* ATA reported that: "The U.S. Department of Agriculture Natural Resources Conservation Services is currently investigating the flood mitigation and restoration of Mānoa Stream in the Mānoa Watershed Project. The project is a partnership between city, state and federal agencies including U.S. Natural Resources Conservation Service (NRCS) and the Mānoa Watershed Project. They expect to have a final Environmental Impact Statement and implementation plan by the end of 2008 with design and implementation to follow thereafter. Through this project, the flood mitigation measures such as the measures suggested in the ACOE's report (e.g., adding a flood wall or levee at the Woodlawn Drive Bridge) will be implemented. It is recommended that the University be represented at the Mānoa Watershed Project meetings to review their recommendations and monitor the Project's implementation of the recommendations in order to coordinate improvements affecting the University's property."



LEGEND

Project Area

Figure 8

Flood Insurance Rate Map

Campus Center Renovation & Expansion

University of Hawai'i at Mānoa — ISLAND OF O'AHU

NORTH

NOT TO SCALE

PBR HAWAII & ASSOCIATES, INC.

After the flood event, the debris at Woodlawn Drive was removed. Mālama O Mānoa has "adopted" the reach of Mānoa Stream between East Mānoa Road and Woodlawn Drive and conduct stream clean-ups quarterly.

To date the FIRM has not been adjusted to take in to account the October 30, 2004 flood and may not be contemplated until the ACOE implements the recommendations of its flood study of Mānoa Stream.

Tsunami

Since the early 1800s, approximately 50 tsunamis have inundated Hawaiʻi's shores. Seven historical events have caused major damage. Two tsunamis were generated locally. The proposed Campus Center Renovation and Expansion is located well outside the defined tsunami inundation area.

Hurricanes

Since 1980, two hurricanes have had a devastating effect on Hawaiʻi: Hurricane ʻIwa in 1982 and Hurricane ʻIniki in 1992. Long-term prediction of future hurricanes is virtually impossible. However, one should reasonably anticipate the prospect of another hurricane impacting the islands.

Earthquake & Volcanic Hazards

In Hawaiʻi, volcanic activity produces most earthquakes in contrast to other areas sitting on tectonic plate margins. Thousands of earthquakes occur in Hawaiʻi each year. However, the vast majority of them are undetectable through normal human senses. A few historical earthquakes have reached moderate and even disastrous magnitudes.

The last earthquakes felt statewide were magnitudes of 6.7 and 6.0. These earthquakes occurred at Kīholo Bay along Hawaiʻi Island's Kona Coast on October 15, 2006. These earthquakes resulted in more than $100 million in damages to the northwest area of Hawaiʻi Island and minimal damage on Oʻahu. From that same event, Oʻahu was also subject to an earthquake induced electrical blackout that paralyzed the City of Honolulu and shut down the Honolulu International Airport for nearly a day.

Potential Impacts and Mitigation Measures

The Campus Center Renovation and Expansion should not have any impact or any deleterious effects on natural hazard conditions and no unique mitigation measures are planned, other than observing the International Building Code and the 1997 Uniform Fire Code in the design of the renovation (to address the potential impacts from hurricanes and earthquakes).

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4.0 DESCRIPTION OF THE HUMAN ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATIVE MEASURES

This section describes the existing conditions of the human environment, potential impacts of the Campus Center Renovation and Expansion, and mitigation measures to minimize any impacts.

4.1 HISTORIC, ARCHAEOLOGICAL AND CULTURAL RESOURCES

4.1.1 Historic Resources

Existing Conditions

The State Historic Preservation Division (SHPD) lists the following University of Hawaiʻi, Mānoa Campus structures as site number 80-14-1352 on the Hawaiʻi Register of Historic Places. These are located in Tax Map Key 2-8-15:01 and 2-8-23:03:

Hawaiʻi Hall,
George Hall,
Dean Hall,
Gartley Hall,
Crawford Hall,
Varney Circle,
Founders Gate,
Andrews Amphitheater,
Wist Hall, and
Pineapple Research Center.

Although eligible, neither the Engineering Quadrangle nor Hemenway Hall have been listed in the Hawaiʻi Register of Historic Places. Due to their age and significance in the history of the University of Hawaiʻi at Mānoa Campus, the State Historic Preservation Department (SHPD) has been consulted regarding the Campus Center Expansion and Renovation Process.

In its present configuration Hemenway Hall is a two-story, concrete structure with approximately 42,300 SF of total floor space (plus a 4,000 square foot courtyard area).

Four of the five Engineering Quadrangle buildings exist today. The fifth building was demolished in the early 1970s to make space for the present Campus Center.

Potential Impacts and Mitigation Measures

Since Hemenway Hall is considered historic, the visual aspects and the external design of building need to be maintained. The proposed project will only impact Hemenway Hall

Auditorium (an addition to the original structure). The auditorium is entirely inside the building and modification to this interior space will not change the overall appearance of the building.

The Engineering Quadrangle is also considered historic.

Engineering Quadrangle Alternative A: In this alternative all four remaining buildings would be demolished. The Campus Center Board and UHM Administration invited Historic Hawaiʻi Foundation (HHF) and State Historic Preservation Division (SHPD), to discuss the needs for the Recreation Center. Both HHF and SHPD expressed concerns regarding the potential impact the location of the Recreation Center would have on these buildings. Some of the student community also expressed concern regarding the lack of a preservation plan for this alternative.

Engineering Quadrangle Alternative B, Preferred Alternative: In this alternative the original Engineering Materials Testing Laboratory and one of the four Engineering Quadrangle buildings built between 1915 and 1928 will be preserved in place. Today those buildings are known as Building 6, and the Ka Leo Building. During the plan design process KYADG consulted with SHPD regarding the four remaining Engineering Quadrangle buildings to determine the best course of action regarding the Campus Center Renovation and Expansion project. SHPD has indicated that the division will support this alternative.

4.1.2 Archaeological Resources

The Campus Center Renovation and Expansion project will include the construction of a Recreation Center addition to the northeast and the Campus Center renovation to the southwest of the existing Campus Center in areas that has been extensively disturbed. In May 2008, Cultural Surveys Hawaiʻi, Inc. (CSH) completed *Archaeological Literature Review and Field Inspection Report for the University of Hawaiʻi at Mānoa Long Range Development Plan Project Mānoa [Waikīkī] Ahupuaʻa, Kona District, Oʻahu Island*. The closest historic property documented near the project site is identified as State Inventory of Historic Place (SIHP) No. 50-80-14-4191. According to CSH, this site is a traditional-style, presumably pre-Contact-era burial discovered during construction activities near Keller Hall. According to Figure 43 of the CSH report, SIHP No. 50-80-14-4191 is located mauka of Keller Hall on the McCarthy Mall-side of the building.

Potential Impacts and Mitigation Measures

Hawaiʻi Revised Statutes Section 6E-8 mandates the review of proposed state projects on historic sites by the State Historic Preservation Division (SHPD). During the pre-consultation process, the SHPD wrote that its Chapter 6E-8 HRS determination is pending ongoing design development. The University of Hawaiʻi will continue to coordinate with SHPD during the design of the proposed project. Please note that higher priority will be placed on addressing those areas of design concern raised in the course of the SHPD

review, and secondarily, conformity with the "major themes" as discussed in the 2007 LRDP Update.

According to CSH, "Given the Keller Hall burial discovery (SIHP No. 50-80-14-4191), in particular, it is possible that as yet undiscovered burials may still be present at some locations on the UHM campus; however, it is fairly difficult to predict with any specific certainty where burials might occur. Recent work in the "Old Quadrangle" portion of campus (McIntosh and Cleghorn 2007), and earlier work near the School of Architecture Building (Jones et al. 1994) did not find burials or any other historic resources; thus, CSH recommends consultation with the SHPD on future excavation projects on the UHM campus."

The University does not anticipate any adverse impact to archeological resources as a result of construction. Based on the extensive landscaping modifications, grubbing and grading activities, and the lack of any archaeological evidence in the vicinity, it is unlikely that the proposed Campus Center Renovation and Expansion will have an adverse impact on any significant archaeological features. The remaining renovations in Hemenway Hall and Campus Center will occur entirely within the existing building structure and should not impact any archaeological deposits. However, should the inadvertent discovery of significant cultural materials and/or burials occur during construction, all work in the immediate area of the find must cease and the SHPD be notified. In addition, a program of precautionary monitoring will be provided to SHPD for construction conducted outside of any existing building's footprint.

4.1.3 Cultural Resources

The project site involves six buildings, walkways and landscaped areas, and does not appear to provide any resources of use or interest to native Hawaiian cultural practitioners, such as food gathering, shelter, tool or weapon making, kapa-making, traditional medicines, lei making, etc.

Potential Impacts and Mitigation Measures

Due to the extensive excavation activities proposed within the location of new Recreation Center, cultural artifacts or burial sites may be encountered. In accordance with Section 6E-46.6, HRS, and Chapter 13-300, Hawai'i Administrative Rules (HAR), should any significant cultural deposits or human skeletal remains be encountered during project construction, work shall stop in the immediate vicinity, and SHPD shall be contacted.

Based on historical research, it is reasonable to conclude that, pursuant to Act 50, the exercise of Hawaiian rights, or any ethnic group, related to gathering, access or other customary activities within the project parcels will not be affected and there will be no direct adverse effect upon cultural practices or beliefs.

4.2 HAZARDOUS MATERIALS

High levels of Chlordane, a pesticide, are known to exist in the soil on the Mānoa campus. Without adequate control this pesticide may pose a risk to workers and/or the general public during demolition. Additionally, areas that will be graded or left as open ground will require control to minimize exposure.

The Campus Center was constructed around 1973. The buildings in the Engineering Quad were constructed between 1912 and 1928. Hemenway Hall was constructed in 1939. Miller Hall Annex was constructed in 1948. The age of the PEACESAT portable is unknown. Due to the age of these structures, hazardous materials, including, but not limited to asbestos, lead-based paint, polychlorinated biphenyls (PCBs), creosote and arsenic are likely to be found throughout the buildings. Without adequate control, renovation and demolition activities may release these hazardous materials to the environment.

Tenant organizations scheduled for relocation or temporary displacement may utilize or generate hazardous material and or waste in association with their day to day operations. Without adequate control, these materials/waste may pose to workers and/or the general public.

Potential Impacts

It is expected that hazardous material will be encountered during construction, demolition and or renovation of buildings within the project area. Hazardous materials are likely to be encountered in soil below ground surface (bgs), within the physical structure of the impacted facilities, and as part of the physical property of individual tenant organizations.

Mitigation Measures

Pesticide Exposure Mitigation:
A soil sampling program will be developed in demolition areas and for any areas that will be graded or left as open ground that workers and later the students may potentially be exposed to.

Hazardous Building Material Mitigation:
Since 2002, the guiding principle of the University of Hawaiʻi is sustainability – living in ways that meet the campus' present needs without limiting the potential of future generations to meet their needs. The UH LRDP 2007 Update has instituted a framework of sustainability guidelines as the basis to develop, evaluate and communicate the integration of sustainability in the development and operation of the UH Mānoa Campus. Prior to demolition, renovation, or removal of a structure within the project area, a survey will be conducted to determine the hazardous building materials present. Based on quantitative data, building materials will be characterized for disposal disposition based on hazard characteristics, and recyclability. A plan for the safe removal of hazardous materials in the building will be developed prior to the removal of existing building

materials. Whenever possible, non-hazardous construction debris will be diverted from disposal through re-use within the project and/or recycling.

Hazardous Material/Waste Mitigation:
A hazardous materials inventory and survey will be conducted in all areas occupied by tenant organizations scheduled for displacement or relocation. A plan for the safe relocation of hazardous materials and disposal of hazardous waste will be developed before any demolition, removal or renovation activities occur. Hazardous waste will only be moved to an approved 90-day accumulation point, or a permitted treatment storage or disposal facility (TSDF). It will not be transferred to tenant organizations' new locations.

4.3 ROADWAYS AND TRAFFIC

As part of the University of Hawai'i at Mānoa Long Range Development Plan 2007 Update (LRDP Update) process, Austin, Tsutsumi & Associates, Inc. (ATA) completed a Traffic Impact Analysis report (TIAR) in October 2007. Also in conjunction with the LRDP update, a consultant, Parking Planners, conducted a Parking Supply/Demand Study and Site Alternatives Evaluation. As part of the overall LRDP Update document, both reports were accepted by the University of Hawai'i Board of Regents in November 2007. The TIAR included an assessment of traffic from the proposed project. Relative to the TIAR, two proposed parking structures were deemed the only part of the LRDP Update that will significantly alter traffic operations along the roadways within the area. This was attributed to the fact that traffic projections for universities are generally based upon student enrollment, which is not projected to increase.

Streets Surrounding the Mānoa Campus

The roadway network in the vicinity of the campus includes:

University Avenue is a six-lane, north-south major collector roadway in the vicinity of UHM. North of Maile Way, the roadway narrows to two lanes. South of the H-1 Freeway, the roadway narrows to four lanes with channelization. In addition to UHM, this roadway serves as one of two primary access roads into Mānoa Valley, which is comprised primarily of residential land uses. South of UHM, on-ramps and off-ramps to the eastbound/westbound H-1 Freeway are provided. University Avenue ultimately terminates at Ala Wai School.

East-West Road is a two-lane UHM campus road that provides access from Dole Street into the UHM's Central Campus.

Lower Campus Road is a three-lane UHM campus road that provides access from Dole Street into the UHM's Lower Campus (and athletic complex) and connects Lower Campus Road, the H-1 Freeway off-ramp, Varsity Place and Old Wai'alae Road.

Dole Street is a four-lane, two-way east-west collector road between University Avenue and East-West Road, where it is otherwise a two-lane collector road.

Metcalf Street is a two-lane, two-way east-west collector road that begins at its intersection with Alexander Street (near H-1 Freeway westbound on-ramp) to the west and terminates at University Avenue, where it continues eastward as Campus Road, which is (blocked off with bollards) inaccessible to vehicles from University Avenue.

Maile Way is a two-lane, two-way east-west minor collector road that begins at its intersection with Oʻahu Avenue and provides vehicular access along the mauka side of the campus from University Avenue through UHM's Central Campus and terminates at its intersection with East-West Road.

TheBus

TheBus, which is the public transportation service provided by the City and County of Honolulu, provides various bus routes to and from the Mānoa Campus. These routes include:

Route A – Express bus service connecting the campus with Waipahu, and several points in-between, including Pearl City, Aloha Stadium, Kalihi Transit Center, Liliha, Downtown, and Ala Moana Shopping Center.

Route F2 – Express bus service connecting the campus with Aloha Tower, allowing riders to utilize TheBoat, a ferry service connecting Aloha Tower with Kapolei (Kalaeloa Barbers Point Harbor).

Route 4 – A bus service that connects Nuʻuanu Valley, Downtown, Punchbowl, Makiki, the Mānoa Campus, Kapahulu, Waikīkī and the Honolulu Zoo.

Route 6 – A bus service that connects Nuʻuanu Valley, Downtown, Ward Center, Ala Moana Shopping Center, Mōʻiliʻili, the Mānoa Campus, and Mānoa.

Route 18 – A bus service that connects the Ala Moana, Makiki, the Mānoa Campus, and Kaimukī.

Route 85A – Express bus service connecting the campus with Kāneʻohe, and several points in-between, including Makiki, Downtown, and Kamehameha Shopping Center.

While a one-way fare is $2.00, monthly and annual adult passes offering unlimited rides are available for $40/month or $440/year respectively. TheBus offers the U-Pass at $100 per semester to UHM students.

Effective July 1, 2007, as the result of legislative action, the University has implemented a Pre-Tax Bus Pass option for University employees. This program is authorized under Section 132(f) of the Internal Revenue Code, known as the Transportation Equity Act for the 21st Century. Eligible University employees living and working on the island of Oʻahu

will be given the opportunity to purchase monthly bus passes through payroll deduction, on a pre-tax basis, thereby saving on FICA, Federal and State income taxes.

Honolulu High-Capacity Transit Corridor Project

The City and County of Honolulu is planning for a high-capacity transit corridor project between Kapolei and the University of Hawaiʻi at Mānoa. The Honolulu High-Capacity Transit Corridor Project (HHCTCP) has evaluated transit alternatives for the 23-mile long corridor between Kapolei and UH Mānoa. On December 22, 2006, the City Council adopted Bill 79 (2006), CD2, FD2 (Ordinance 07-001) which selected the fixed guideway alternative as the Locally Preferred Alternative (LPA). The LPA eventually would include a route between Kapolei and the University of Hawaiʻi at Mānoa, starting at or near the intersection of Kapolei Parkway and Kalaeloa Boulevard, and would continue to UH Mānoa along Kapiʻolani Boulevard. The City and County of Honolulu is undertaking preliminary engineering and, as of this writing, in the process of releasing the draft environmental impact statement for public review.

According to the HHCTCP website (http://www.honolulutransit.org/overview), the City and County of Honolulu Department of Transportation Services (DTS) is studying how to improve the ability of people to move in the highly congested east-west corridor between Kapolei and the University of Hawaiʻi at Mānoa. According to DTS, over sixty percent of Oʻahu's population currently lives within the area served by this corridor, and this area is projected to continue to grow faster than the rest of Oʻahu.

On-Campus Shuttle

UHM Parking Operations provides a free on-campus shuttle bus service for faculty, staff, students and visitors. The Rainbow shuttle bus system consists of various shuttle routes which provide a mode of transportation throughout the campus during the fall and spring semesters, with various routes offered during the day and evening hours. The daylight hour routes are extensive and some routes extend into Mānoa Valley, providing service to the faculty housing in the Valley and Upper Campus, Waʻahila Faculty Housing and into Mōʻiliʻili. The route that includes Mōʻiliʻili serves to supplement TheBus routes that do not quite reach the Mānoa Campus.

The evening hour service serves the student housing overlooking the Makai Campus and is especially important for the security of students, faculty and staff. Modified routes and schedules operate during semester breaks. The On-Campus shuttle would provide students with access to the proposed Recreation Center and other facilities that will be housed at the Campus Center as a result of this project.

Carpooling

While carpooling has long been in an option for commuters, regardless of the destination, the State also offers an organized carpooling program, called Vanpool Hawaiʻi. A

vanpool is a group of 7 to 15 people who share the commute to and from work in a Vanpool Hawaii van. The most successful vanpool programs are ones that have commuters who live and work (or study) in the same geographical area and have similar work/school schedules. Vanpool riders also have the additional benefit of using HOV and Zipper Lanes (rules recently revised to require three or more passengers per vehicle to utilize Zipper Lanes).

Leeward Oahu Transportation Management Association (LOTMA)

LOTMA, a non-profit organization, serves as a transportation resource center and provides ridesharing information and assistance as a free, public service to the community. LOTMA's programs and services are designed to accommodate the growing travel needs of the region, alleviate traffic congestion, and to improve the overall mobility of Leeward and Central Oʻahu's residents, labor force, and the general public. As an advocate for the region's mobility needs, the organization also functions as a vital mechanism to improve communication and cooperation between public and private sectors and facilitate the development and implementation of new and/or improved transportation services

As Hawaiʻi's first transportation management association, LOTMA represents a unified commitment of eleven public and private landowners and developers to accommodate the increasing mobility needs of ʻEwa and Central Oʻahu, alleviate problems of traffic congestion, air pollution and fuel consumption, and improve overall quality of life on Oʻahu. LOTMA's mission is to advocate, develop and implement, in cooperation with government and the community, a coherent program aimed at improving mobility in the Leeward and Central regions of Oʻahu; and to promote and facilitate the development and use of alternative transportation opportunities that will maximize the use of existing and proposed transportation systems in the Leeward/Central region.

Existing Traffic

The hourly turning movement data utilized in TIAR was collected by ATA between Tuesday, April 20 and Thursday, April 22, 2004. Traffic counts were redone at the University Avenue/Dole Street intersection on September 13, 2007. The counts showed a slight decrease in volume during the PM peak hour of traffic, and a negligible increase during the AM peak hour of traffic. Based on traffic count data, ATA determined that the peak hours of traffic were from 6:45 AM to 7:45 AM and 4:30 PM to 5:30 PM on weekdays.

Level of Service (LOS) is a qualitative measure used to describe the conditions of traffic flow at intersections, with values ranging from free-flow conditions at LOS A to congested conditions at LOS F. The Highway Capacity Manual – Special Report 209 (HCM), dated 2000, methods for calculating volume to capacity ratios, delays and corresponding Levels of Service were utilized in the TIAR.

According to the TIAR, the Manual on Uniform Traffic Control Devices, 2003 edition (MUTCD) recommends that successive intersections along a major arterial and within

proximity of less than a half of a mile of each have their timing optimized and coordinated in order to facilitate optimal vehicular flow along the arterial. Currently, most of the signalized intersections along the following arterials meet this criterion:

- South King Street;
- Beretania Street; and
- University Avenue (only between Varsity Place and King Street).

The University Avenue/Dole Street and Dole Street/Lower Campus Road intersections are not currently coordinated. Coordination is accomplished by ensuring that each intersection within the coordinated region is bound by the same cycle length (or multiples thereof), and that the through traffic on the major arterial in the peak direction is allowed to flow at carefully planned offsets through consecutive intersections. This reduces the "stop and go" effect that drivers experience on uncoordinated systems, where red lights sometimes appear at each successive intersection, thus increasing motorist frustration and delay.

As a consequence of coordination and fixed-cycle lengths in general, vehicles traversing the minor approaches and those making the left-turn movement off of the main road often must wait at the intersection, despite the absence of vehicles traversing the main road.

Analysis of Intersections

ATA analyzed several intersections, including, but not limited to the following:

University Avenue/Dole Street - Due to the fact that this intersection serves as a junction point between Mānoa Valley residents accessing the H-1 Freeway and cars accessing the Quarry Parking Lot and Central Campus, congestion occurs at this intersection. One problem observed during the AM peak hour of traffic is that vehicles traveling in the northbound direction queue back beyond the H-1 Freeway off-ramps (approximately 1,000 feet) due to:

- Prohibition of right-turn-on-red in the northbound direction, although an extraordinarily high number of right turns occur (648) during the AM peak hour of traffic;
- Weaving pattern – vehicles exiting the H-1 Freeway off-ramps in the northbound direction along University Avenue do not always make the right-turn. In fact, their destinations may include Saint Francis School, the Mid-Pacific Institute, the University Laboratory School, Mānoa Valley, Maile Way, Mōʻiliʻili, and u-turns towards the south. As these vehicles exit the H-1 Freeway off-ramp, they attempt to move towards the center and left lanes while the prevailing queue hinders this movement. Furthermore, especially during the AM peak hour of traffic, after exiting the H-1 Freeway eastbound and westbound off-ramps, vehicles immediately move towards the left lane in order to make u-turns; and

- Current information indicates that the University Avenue/Dole Street and the Dole Street/Lower Campus Road intersections are not coordinated. This could be a contributing factor to problems at these intersections. The result of this is a vehicular queue that causes queues to extend through the H-1 Freeway off-ramps and onto the Freeway. During the PM peak hour, congestion in the westbound direction queues back beyond the Dole Street/Lower Campus Road intersection and near the Law School Library. This often reduces the ability of vehicles to make the northbound left-turn out of Lower Campus Road onto Dole Street.

University Avenue/Metcalf Street - Vehicles generally flow smoothly through this intersection.

University Avenue/Maile Way - Although analysis indicates that this intersection operates at LOS B during the AM and PM peak hours of traffic, vehicular flow in the northbound is often impeded by:

- Narrowing of University Avenue to two (2) lanes immediately north of the University Avenue/Maile Way intersection;
- Occasional school bus stoppages (near the Mid-Pacific Institute) during the AM peak hour of traffic; and
- Operations at signalized intersection of University Avenue and Kaʻala Street, which incidentally provides access to the Mid-Pacific Institute. No channelized lanes are currently provided at this intersection.

Dole Street/Lower Campus Road - This intersection serves as the highest volume access road into the Makai Campus. Currently, 3,509 parking stalls exist within the Makai Campus. These stalls, in combination with drop-off/pick-up turn arounds at the Music Building and Law School Parking Lot, contribute to the high turning movement volume into and out of this intersection.

During the AM peak hour of traffic, 490 vehicles make the eastbound right-turn into Lower Campus Road. Some of the congestion along University Avenue can be attributed to this.

During the PM peak hour of traffic, approximately 271 vehicles make the northbound left-turn out of Lower Campus Road and westbound onto Dole Street, whereupon they immediately meet the westbound queue generated by the University Avenue/Dole Street intersection.

Dole Street/East-West Road – This intersection operates relatively smoothly during both the AM and PM peak hours of traffic.

Existing Level of Service (LOS) at Representative Intersections

Table 4-1 provides a summary of the existing level of service of the above intersections as observed in the TIAR.

Table 4-1
Existing Traffic Level of Service (LOS) at Representative Intersections

INTERSECTION	LOS – AM	LOS - PM
University Avenue/Dole Street	E	F
University Avenue/Maile Way	B	B
University Avenue/Metcalf Street	A	A
Dole Street/Lower Campus Road	A	F
Dole Street/East-West Road	B	B

The TIAR also notes that currently observed heavy regional traffic at the intersections of South King Street/Beretania Street and University Avenue, Wilder Avenue and Dole Street, Waiʻalae Avenue and St. Louis Heights Drive, and University Avenue and Varsity Place. At the intersection of Dole Street and Lower Campus Road, heavy traffic occurs during the PM Peak hour, with lighter traffic during the AM Peak Hour. Also, the TIAR found the intersections of University Avenue and Maile Way, and Dole Street and East-West Road to operate at acceptable levels.

Potential Impacts and Mitigation Measures

The analysis of traffic impacts must take into account the underlying traffic that would occur in the projected year, without the proposed project. The Year 2017 was selected as the Base Year to reflect the time table for Category 1 of the LRDP (5-10 Years). Base Year 2017 projections were formulated by applying a defacto growth rate to existing hourly vehicular traffic volumes.

Traffic Projections without the Proposed Project

The State Department of Transportation (SDOT) performs 24-hour traffic counts annually at various locations on Oʻahu. Based on this data, it was possible to estimate the prevailing regional growth along King Street and Waiʻalae Avenue, which is predicted to be approximately 1 percent, annually. By the year 2017, this equates to a 10.5 percent increase over existing conditions. No growth was projected near the University, since the LRDP projects that UHM's student enrollment will remain stable, and that not much more residential or commercial development will occur within the area. Not factored into the projections were the possible impacts that rising fuel prices and the implementation of the Honolulu High-Capacity Transit Corridor (HHCTC) (rail transit) may have on reducing vehicle trips.

Projected LOS Without the Proposed Project

Table 4-2 provides a summary of the projected traffic level of service in the Year 2017 at representative intersections.

Table 4-2
Comparison of Existing and Base Year 2017 LOS at Representative Intersections

INTERSECTION	EXISTING LOS – AM	EXISTING LOS - PM	YEAR 2017 LOS – AM	YEAR 2017 LOS - PM
University Avenue/Dole Street	E	F	E	F
University Avenue/Maile Way	B	B	B	B
University Avenue/Metcalf Street	A	A	A	A
Dole Street/Lower Campus Road	A	F	A	F
Dole Street/East-West Road	B	B	B	B

Regional Future Traffic and Intersections Requiring Mitigation Measures.

Based on the defacto growth rate, regional traffic will increase along King Street, Waiʻalae Avenue, and Beretania Street. However, most of the study intersections will experience a relatively stable demand, due to the fact that development and student base within the area is projected to remain constant for all intents and purposes. LOS F conditions will continue to occur at the following intersections:

- South King Street/Beretania Street/University Avenue*
- University Avenue/Varsity Place*
- University Avenue/Dole Street*
- University Avenue/Sinclair Parking Lot*
- Dole Street/Wilder Avenue - (Mitigation would result in the reduction of traffic flowing from the H-1 Freeway on-ramp, which is not recommended. Furthermore, the Dole Street traffic that experiences LOS F exhibits a relatively low demand due to further downstream obstructions and better alternative routes. Therefore, mitigation is not recommended.)
- Dole Street/Lower Campus Road*
- Dole Street/Saint Louis Heights Drive - (While the southeast-bound left-turn currently experiences and will continue to experience LOS F during the AM and PM peak hours of traffic, the demand for this movement is relatively low, and would not warrant a Traffic Signal. Mitigation is not recommended.)
- Waiʻalae Avenue/Saint Louis Heights Drive - Due to limited right-of-way, no geometric improvements can be made at this intersection.

* Indicates that mitigation is proposed.

While mitigation is proposed to address the above intersections with asterisks after them, the remaining intersections will be discussed below.

Dole Street/Wilder Avenue - The northbound approach to this intersection is a busy freeway off-ramp, whose vehicular flow should not be impeded to accommodate minor street traffic.

Wilder Avenue, in general, is congested downstream in the westbound direction during the AM and PM peak hours of traffic due heavy school traffic caused by Punahou and Maryknoll schools. Therefore, no mitigation is recommended for this intersection.

Dole Street/Saint Louis Heights Drive - While turning movement analysis indicates that the eastbound left-turn movement at this intersection will continue to operate at LOS F during the PM peak hour of traffic, this intersection was not observed to be problematic during the AM or PM peak hours of traffic. Furthermore, with only 25(45) vehicles making this turn during the AM(PM) peak hours of traffic, a traffic signal will not be warranted. No mitigation is recommended for this intersection.

Waiʻalae Avenue/Saint Louis Heights Drive - This intersection currently operates at an observed LOS F during the AM and PM peak hours of traffic. However, due to limited right-of-way, no geometric improvements can be made at this intersection.

Specific Mitigation Measures for Future Traffic

As shown in Table 4-2, there is very little difference between existing LOS and the projected LOS. However, ATA recommends a number of mitigation measures (in two phases), as described below.

Phase I - Reconfigure the westbound approach to the University Avenue/Dole Street intersection to incorporate an exclusive left-turn lane, a shared left-turn/through lane, and an exclusive right-turn lane, with lane storage extending approximately 100 feet east of the University Avenue/Lower Campus Road intersection. This mitigation measure may necessitate the relocation of the historic Gateway structures located along University Avenue. The effect of Phase I would be to eliminate over-capacity conditions. However, the southbound left-turn movement would still experience LOS F during the PM peak hour of traffic.

Phase II - Reconfigure the northbound approach to the University Avenue/Dole Street intersection to incorporate three (3) exclusive through lanes and two exclusive right-turn lanes, the rightmost of which would directly connect with the H-1 Freeway westbound off-ramp. In conjunction with this, modify the Dole Street/Lower Campus Road intersection to incorporate one (1) eastbound through lane, an eastbound shared through/right-turn lane, and an exclusive right-turn lane. Note that these modifications could potentially necessitate the relocation of the existing monkeypod trees along University Avenue, and reduce the available parking within the Music Building Complex. Phase II, when implemented without Phase I, would produce a similar result as Phase I, in that over-capacity conditions would be eliminated, and that the southbound left-turn

movement would continue to experience LOS F, while the eastbound and westbound approaches would experience LOS E during the PM peak hour of traffic.

Phase I & II - Analysis indicates that the effect of implementing Phases I and II in combination would improve the overall delay of the intersection from 73.1 (56.6) seconds during the AM (PM) peak hours of traffic to 38.8 (39.9) seconds, with all movements at the intersection operating at LOS E or better during both hour periods. It should be noted that at the Dole Street/Lower Campus Road intersection, the lane modification will reduce the number of lanes that drivers need to cross to enter the Lower Campus Road, thereby reducing capacity reductions caused by weaving movements.

ATA recommends that Phases I and II be implemented as a mitigation measure, while recognizing that the intent of this geometric augmentation would be to improve conditions for vehicles traveling northbound along University Avenue. Although vehicular flow will also improve in the westbound direction during the PM peak hour of traffic, such benefits would generally be realized locally, given that existing bottlenecks occur downstream at the following locations:

- University Avenue/H-1 Freeway eastbound on-ramp
- University Avenue/H-1 Freeway westbound on-ramp
- South King Street/Beretania Street/University Avenue
- Dole Street/Wilder Street
- University Avenue, south of Maile Way

Mitigation of these problems would require costly modifications, including improving congestion along the entire corridor. The H-1 Freeway, Beretania Street, and South King Street would all have to be widened to accomplish this. However, the implementation of the proposed rail transit system will ultimately reduce future vehicular traffic demand.

Turning Movement Restriction - During field observations, it was noted that along South King Street, east of University Avenue, and University Avenue in the Varsity Area, vehicular flow was hampered by the allowing of left-turns into driveways and small side streets.

Varsity Area - Vehicles turning left from the southbound direction cause other vehicles to switch lanes to maneuver around them. Due to the lack of an acceptable gap in northbound traffic, these vehicles often cause those behind them to arrive at the South King Street/Beretania Street/University Avenue intersection after the signal indication has turned red. The resulting flow interruptions have major implications along University Avenue in this area, due to the fact that the current cycle length at that intersection is 170 seconds. Effectively, all of the vehicles impacted by this problem will be delayed by an additional two minutes, fifty seconds as the traffic signal cycles through all of its phases again. Operations at the University Avenue/Varsity Place intersection are also affected by this problem.

Similarly, in the northbound direction left-turns impede the flow of the approximately 1,000 vehicles (for both AM and PM peak hours of traffic) traveling in the northbound direction, sometimes reducing the upstream capacity of the South King Street/Beretania Street/University Avenue intersection.

South King Street – University Avenue to Humane Society - South King Street, east of University Avenue has become a bottleneck for eastbound traffic during the PM peak hour of traffic. It has been observed that vehicles traveling eastbound along South King Street are affected by vehicles making left-turns into driveways, and at the signalized intersection near the Seven Eleven/Aloha Gas station.

Based on the conditions described above, ATA recommends that a dialogue be initiated between community members and the City to assess the potential for left-turn prohibitions during the PM peak hour of traffic for:

- Northbound and southbound University Avenue traffic, south of Varsity Place, and north of King Street
- Eastbound South King Street traffic, east of University Avenue and west of the Humane Society.

It is recognized that the merit of this mitigation measure will have to be balanced with the needs of the local community and businesses.

It should be noted that should these prohibitions be implemented, they would not eliminate LOS F at the South King Street/Beretania Street/University Avenue intersection. However, they would improve the efficiency of the intersection and the capacity of University Avenue and South King Street in the area.

University Avenue/Sinclair Library Driveway - While this intersection experiences a relatively low turning movement volume and operates at LOS B, the bus traffic that passes through the turnaround often have difficulty making the westbound left-turn out of the driveway. Therefore, ATA recommends that a traffic signal be installed to facilitate this movement. In conjunction with this, ATA recommends that the bus stop located along University Avenue, just north of Dole Street be relocated to the existing bus turnaround at this intersection.

University Avenue/Maile Way - Although analysis indicates that this intersection operates at LOS C (B) during the AM (PM) peak hours of traffic, existing operations have been observed to be worse, especially during the AM peak hour of traffic, where vehicles destined towards the Mid-Pacific Institute and St. Francis cause the downstream intersection (Kaʻala Street) to be overburdened. Currently, this intersection only provides a single lane at each approach, with no channelization (turning lanes). ATA recommends that a dialogue be initiated between community members and the City to assess the feasibility for widening the segment of University Avenue between Kaʻala Street and Maile Way to incorporate a second northbound lane. This lane would terminate at Kaʻala Street as an exclusive right-turn lane.

Traffic Signal Coordination along University Avenue and Dole Street/Lower Campus Road - All of the signalized intersections along University Avenue between Dole Street and Maile Way, and the Dole Street/Lower Campus Road intersection are within approximately 1,000 feet or less of each other. Therefore, in order to facilitate flow between these intersections, ATA recommends that the following intersections be coordinated:

- University Avenue/Maile Way
- University Avenue/Metcalf Street
- University Avenue/Sinclair Library Parking Lot (New Signal)
- University Avenue/Dole Street
- Dole Street/Lower Campus Road

Projected LOS With Mitigation Measures

Table 4-3 provides a summary of the projected traffic level of service after proposed mitigation measures in the Year 2017 at representative intersections.

Table 4-3
Comparison of Existing and Year 2017 LOS (With and Without Mitigation Measures) at Representative Intersections

Intersection	Existing LOS – AM	Existing LOS - PM	Year 2017 w/o Mitigation LOS – AM	Year 2017 w/o Mitigation LOS - PM	Year 2017 w/ Mitigation LOS – AM	Year 2017 w/ Mitigation LOS - PM
University Avenue/ Dole Street	E	F	E	F	D	D
University Avenue/ Maile Way	B	B	B	B	C	A
University Avenue/ Metcalf Street	A	A	A	A	A	B
Dole Street/Lower Campus Road	A	F	A	F	A	B
Dole Street/East-West Road	B	B	B	B	B	B

Traffic Impacts Associated with Implementation of the Proposed Project and the Rest of the Updated LRDP

While the LRDP Update includes two new parking structures, the number of students is not projected to increase as a result of these additions. Ultimately, as based on standard methods for generating trips for universities, this would mean that the number of vehicular trips generated by the implementation of the updated LRDP, including the proposed project, will remain the same. However, a redistribution of the existing trips will occur, in this case more heavily concentrating traffic at the University Avenue/Dole Street, Dole Street/Lower Campus Road, and Dole Street/East-West Road intersections. However, given the improvements recommended in Base Year 2017 Mitigation Measures, these intersections will continue to operate at LOS E or better and under capacity. As stated earlier, one caveat to this statement is that downstream conditions along University Avenue and subsequently the H-1 Freeway, Beretania Street, and South King Street will continue to experience congestion, and may therefore limit the incoming/outgoing capacity in the area. No improvements beyond those recommended in Base Year 2017 Mitigative Measures are recommended. Improvements at the Old Waiʻalae Road Entrance/Exit and at the Varsity Place were investigated by ATA, and are generally not recommended.

No additional onsite parking for the Campus Center Renovation and Expansion will be included as part of the project. Parking associated with the project is accommodated within the overall campus parking system. Currently, there are several parking areas near Varsity Circle and along Campus Road. The University intends for the Campus Center Complex and Hemenway Hall to be part of a larger pedestrian plaza area that eventually will be completely void of vehicular traffic.

4.4 NOISE

The Campus Center Renovation and Expansion project will produce increased noise levels both during construction and also during operation of the new Recreation Center. The nearest public school that may be impacted by noise generated as a result of this project is the University Laboratory School (less than 2,000 feet away from the Campus Center Area).

4.4.1 Construction Noise

Potential Impacts and Mitigation Measures

Construction activities for the Campus Center Renovation and Expansion will inevitably create temporary noise impacts. The building contractor may employ mitigation measures to minimize those temporary noise impacts including the use of mufflers and implementing construction curfew periods. Pursuant to Chapter 11-46, Hawaiʻi Administrative Rules, all project activities must comply with all community noise controls. The Mānoa Campus was not constructed all at once and has gradually developed. As each building was constructed, classes in the surrounding buildings

presumably experienced the temporary inconvenience of louder construction noise during some classes. It is assumed that most students and instructors adapted to these temporary inconveniences. The closest elementary school is the University Laboratory School but buildings of the UH School of Education and Sinclair Library will effectively attenuate noise from the construction site. Probably more distracting noise sources for the University Laboratory School elementary school students are other students within the School as well as traffic along Metcalf Street and University Avenue.

4.4.2 Operation Noise

The existing noise levels at and immediately adjacent to the proposed site mimic those typical of a campus with relatively longer periods of quiet, with periods of noise when students are changing classes.

Potential Impacts and Mitigation Measures

The Campus Center Renovation and Expansion, Recreation Center addition will increase the noise generated within the general Campus Center Area. Noise will be generated from three different types of source sources. One substantial noise generator is the need for a chilled water system to serve the Recreation Center. The facility will require a 200-ton water-cooled chiller, cooling tower, and pumps located in a new mechanical plant. As a method of reducing noise, the existing Campus Center chiller will be replaced with a larger capacity system housed within the current chiller room. As an added benefit modifying the existing system will result in improved energy efficiency; and reduced construction and long-term maintenance costs. The second noise-generating source is rotating or reciprocating equipment; and active piping or ducting. To reduce the noise impact, spring support and isolation systems will be utilized. In addition, with the exception of emergency generator equipment, reciprocating equipment will not be utilized in the Recreation Center.

The Recreation Center is being designed with a 900-person capacity. The increase in people both in and around the Campus Center will contribute to the increase in noise. To provide adequate insulation of noise generated within both the Recreation Center and the other renovation sites, acoustical insulation will be utilized in the walls and ceiling spaces to control noise transmission in both the new and renovated spaces. The Campus Center is currently the heart of the upper campus. As such, noise generated by people outside the new or renovated facilities is not expected to significantly increase ambient outdoor noise levels around surrounding buildings.

The new tenants of the proposed Hemenway Hall auditorium renovation are currently located in the Engineering Quadrangle buildings. Once in operation, the Hemenway Hall renovation will generate noise consistent with current operational noise levels of the existing tenants in the Engineering Quadrangle buildings. No mitigation measures are proposed as the noise generated as a result of the renovation represents no substantial change from current noise occurrences and will not impact the University Laboratory School.

4.5 AIR QUALITY

The State's good air quality is largely a function of the predominant tradewinds blowing from the northeast. The typical tradewind pattern blows man-made and volcanic pollutants out from metro Honolulu toward the ocean. However, during non-tradewind periods, both man-made and volcanic pollutants tend to accumulate on island impacting both visibility and air quality (increase in SOx and particulates). Since 2002, the guiding principle of the University of Hawai'i has been sustainability, with a goal to meet the campus' present needs without limiting the potential of future generations to meet their needs. The UH LRDP 2007 update has instituted a framework of sustainability guidelines as the basis to develop, evaluate and communicate the integration of sustainability in the development and operation of the UH Mānoa Campus.

4.5.1 Indoor Air Quality

The proposed Recreation Center addition will increase the indoor space available for occupation by approximately 56,000 SF. The addition will include facilities for indoor intramural sports, cardio-vascular exercise, strength training, multi-purpose exercise rooms, indoor jogging, indoor basketball. These activities will affect the quality of indoor air. The renovation of both the existing Campus Center facilities and Hemenway Hall Auditorium will require the installation of new materials that may impact indoor air quality within these structures.

Potential Impacts and Mitigation Measures

The Sustainability Guidelines from the LRDP state:

> *All development should encourage a healthy living environment both indoors and outside. EPA reports that the air in new buildings can be ten times more polluted than outdoor air. Poor indoor air quality is caused partly by the off-gassing of chemicals found in many synthetic building materials. It is also caused by mold and mildew that build up in poorly designed and maintained heating and cooling systems. This problem is minimized with natural ventilation.*

In an effort to achieve LEED certification at the silver level, the proposed project will incorporate the following LEED Indoor Quality criteria and strategies

- Design ventilations systems to meet or exceed the minimum outdoor air ventilation rates as described by Ventilation for Acceptable Indoor Air Quality standards.
- Minimize exposure of building occupants, indoor surfaces and ventilation air distribution systems to Environmental Tobacco Smoke (ETS) by prohibiting smoking in buildings and locating any exterior designated smoking areas at least 25 feet away from entries, outdoor air intakes and operable windows.
- Provide capacity for ventilation system monitoring to help sustain occupant comfort and well-being.

- Use paints, adhesives, carpets, that have low volatile organic compounds (VOCs).
- Use no-added formaldehyde insulation or wood products.

In addition, to ensure optimal energy conservation, the indoor air quality will be monitored and the amount of outside air entering the building will be regulated according to the air quality.

4.5.2 Outdoor Air Quality

Potential Impacts and Mitigation Measures

The University recognizes the potential for impacts to air quality during construction. This could occur from additional traffic generated by construction vehicles, machinery, and dust generated during construction.

An effective dust control plan will be implemented as necessary. All construction activities will comply with the provisions of Title 11, Chapter 59, HAR related to Ambient Air Quality Standards and Section 11-60.1-33, HAR related to Fugitive Dust. Measures to control dust during various phases of construction include:

- Providing an adequate water source at the site prior to start-up construction activities;
- Irrigating the construction site during periods of drought or high winds;
- Landscaping and rapid covering of bare areas, including slopes, starting from the initial grading phase;
- Disturbing only the areas of construction that are in the immediate zone of construction to limit the amount of time that the areas will be subject to erosion;
- Providing adequate dust control measures during weekends, after hours, and before daily start-up of construction activities; and
- Installing silt screening in the areas of disturbance.

As previously noted, the UH LRDP 2007 update has instituted a framework of sustainability guidelines as the basis to develop, evaluate and communicate the integration of sustainability in the development and operation of the UH Mānoa Campus.

4.6 VISUAL RESOURCES

The proposed building renovation is located in the middle of the University campus surrounded by buildings similar in height and mass. The City and County of Honolulu's Primary Urban Center Development Plan does not recognize any view planes encompassing the project site that requires consideration and accommodation.

The 3-story Campus Center is located in the middle of campus surrounded by buildings of mixed height and mass. The existing structures adjacent to the project area are the

Andrews Amphitheater, Art Building (3-stories), Administrative Service Buildings 1 and 2 (1-story each), Bachman Annex (1-story), Dean Hall (2-stories), Krauss Annex 1 and 2 (1-story), Kuykendall Hall (4-stories), Miller Hall (3-stories), and Varney Circle. The City and County of Honolulu's Primary Urban Center Development Plan does not recognize any view planes encompassing the construction site that require consideration and accommodation.

Potential Impacts and Mitigation Measures

The dense nature of the University campus, and the proposed addition is expected to be compatible with mass and height of surrounding buildings will not induce adverse impacts to any recognized view planes. From University Avenue (west of the site), the Recreation Center will likely to remain mostly obscured from view due to existing trees along Campus Road as well as by several existing buildings. The new facility will be highly visible from Campus Road and Miller Hall to the north; the remaining Engineering Quadrangle buildings to the south; and the Art building, Building 37, and Kuykendall Hall to the east. The University's own design review process will help ensure that the proposed renovation and expansion are architecturally compatible with surrounding structures. Because no visually adverse impacts are expected, no additional mitigation measures are proposed.

4.7 SOCIAL & ECONOMIC CHARACTERISTICS

According to the 2000 Census, the population of City and County of Honolulu numbered 876,156 individuals. The most recent American Community Survey conducted for City and County in 2006 by the Census Bureau accounted for 909,863 residents, representing a 4% increase in population. Approximately 19% of the City and County residents have obtained a bachelor's degree or higher. Approximately 65% of the City and County residents actively participate in the workforce, with the median household income reported at $51,914 per year.

Honolulu is the State's center of commerce and industry. In addition, it is the most densely populated urban area both on Oʻahu and in the state. According to the American Community Survey of 2006, City and County of Honolulu residents are slightly older, more likely to have a college degree and a higher per capita income than residents of Hawaiʻi's other Counties. The proposed project site is located within the County Administrative District V which includes Kapahulu, Kaimukī, Pālolo Valley, St. Louis Heights, Mānoa, Mōʻiliʻili, McCully, Kakaʻako, Ala Moana and Makiki neighborhoods. These neighborhoods are largely residential with housing types ranging from single family dwellings, to low, mid- and high-rise multi-family dwellings. Institutional uses are scattered throughout these neighborhoods, with the University of Hawaiʻi, being the most dominant institutional use in the vicinity. Small commercial nodes service the neighborhoods, predominantly along arterial and collector streets.

Potential Impacts and Mitigation Measures

In 2001, KYADG conducted a series of seven focus group sessions to determine what activities and services the campus population would like to have available at the Campus Center that are not currently provided. The proposed project was then designed taking into account the information generated during these sessions.

The proposed project will enhance recreational opportunities at the University of Hawaiʻi. The Campus Center Renovation and Expansion project will serve to modernize the heart of campus by consolidating recreation and leisure activities in a centralized location. As the Mānoa Campus is often criticized as being a "commuter campus," the proposed project will enhance student "life" and activity around the Campus Center. The proposed project will provide additional eateries, study, meeting and lounge spaces with technology access, as well as a recreation facility designed for a variety of individual and intramural activities. This will help to modernize the campus as well help attract students from Hawaiʻi and mainland United States as well as international students, who plan to reside in UHM student housing. The University serves as an important economic driver for the local neighborhoods where students, faculty and administration staff utilize retail and commercial services. Because the renovation and expansion project will supplement an existing facility, it is not expected to increase the number of Oʻahu's residents. The scope of the construction project will contribute positively to the construction industry and the expanded facilities, including retail shops and recreation center, may contribute more jobs for UH students and/or Oʻahu residents.

4.8 INFRASTRUCTURE AND UTILITIES

4.8.1 Potable Water System

The existing Mānoa Campus is served by the City's Board of Water Supply (BWS) system. In October 2007, Austin Tsutsumi & Associates, Inc. (ATA) prepared a report entitled: *Utility Systems Report, University of Hawaii at Manoa, Long Range Development Plan 2007 Update, (Category I), Manoa, Honolulu, Hawaii*. ATA reported that there are several water meters on campus that connect to the BWS system. The two main meters on the central campus are located near Burns Hall on Dole Street and just north of Kennedy Theatre on East-West Road. Water for the Campus Center area is currently supplied by the existing Board of Water Supply (BWS) 4-inch waterline that runs north-south between the Campus Center and the Engineering Quadrangle.

Potential Impacts and Mitigation:

ATA reported that since the last LRDP, some of the water lines that were inadequate for fire flow have been improved. One of the areas where deficiencies were improved was Hemenway Hall. The Campus Center area continues to have water distribution deficiencies due to fire hydrant spacing not meeting standards, thereby, reducing fire protection coverage. The proposed project will include the installation of the necessary

fire hydrants and ensure adequate flow necessary to meet current fire protection requirements. A new 6-inch tap will be made to the existing 8-inch waterline located at the southeast side of the proposed building to service the fire protection system.

The proposed project will increase water consumption due the addition of 11 showers, 13 sinks, 16 toilets/urinals, and two 60-pound washing machines in the new Recreation Center. During the pre-consultation process, the City and County of Honolulu Board of Water Supply indicated that waterlines in the vicinity of the project site have adequate capacity and adequate pressures to accommodate the Campus Center Renovation and Expansion's domestic and fire protection water demands.

The location of the existing BWS waterline is within the design footprint of the proposed Recreation Center. To ensure future access to this water main, it will be relocated outside of the proposed building footprint to the east.

Domestic water quality will be compromised if controls to prevent backflow, and cross-connection to non-potable water supplies are inadequate. The maximum peak flow capacity of the proposed water lines is 160 gallons per minute (gpm). As part of the Campus Center Renovation and Expansion, backflow and cross-connection prevention requirements will be met prior to building occupancy to ensure water quality is not compromised. In addition, a pressure reducing valve will be provided to reduce the supply pressure upon entrance into the building(s).

The design of the proposed water system modification shall comply with the *Water System Standards*, Board of Water Supply, City & County of Honolulu, dated 2002; the *Uniform Plumbing Code*, 1997 Edition, as copyrighted and published by the International Association of Plumbing and Mechanical Officials Uniform Plumbing Code; Department of Health, Title 11, Chapter 11, Sanitation; and the ADA Compliance Guidebook.

Water Usage

According to The Long Range Development Plan University Of Hawaiʻi , Mānoa Campus 2007 Update, Draft Environmental Assessment/ Plan Review Use (LRDP 07DEA/PRU),

> *Since 2002, the guiding principle of the University of Hawaiʻi has been "sustainability." In this light, UH and BWS signed a memorandum of understanding in 2003 to establish a program for reducing water and wastewater use at the Mānoa Campus. The goal of the program is to reduce water consumption by 10% annually through the development of a Water Management Plan that will include analyzing the campus' existing water system, identifying mitigation measures to reduce water use and monitoring water consumption*

While the Water Management Plan is still in development, it is programmed to be developed as part of 2007 LRDP process. In October 2008, the University of Hawaiʻi at

Mānoa Facilities Management released its *University of Hawai'i at Mānoa Energy Strategy 2008-2015* report (ES08-15). One of the goals of this strategy is water self-sufficiency by 2050. The Campus Center Renovation and Expansion is being designed to meet the water reduction goals of the LRDP and the Energy Strategy 2008-2015.

Mitigation

Landscape and Irrigation – According to the 2007 Utilities System Report developed by ATA water from the Makai Campus Quarry could provide an onsite source of irrigation water for the Mānoa Campus. In addition, modifying landscape choices utilizing native and xeric plant can substantially reduce or eliminate irrigation requirements. The irrigation control should also be high-efficiency and/or climate-based.

Low-flow plumbing fixtures – The University is currently undergoing campus-wide renovation project that includes the replace of existing fixtures with low-flow fixtures. In addition, all new buildings should be constructed with low-flow fixtures.

Education – The University currently conducts research, curriculum development and community service projects aimed at water conservation. These will continue through the LRDP.

Monitoring

Water usage should be monitored on a regular basis to determine if the mitigation measures are working. This can also help determine trouble spots in the buildings or water system.

4.8.2 Wastewater System

The Campus Center, Engineering Quadrangle and Hemenway Hall sanitary sewage system are connected the municipal system via a 60-inch sewer tunnel on Dole Street. The existing sanitary sewer lines on the Mānoa Campus have no known problems.

Potential Impacts and Mitigation Measures

The LRDP 07DEA/PRU states:

> *…there are three areas with potential capacity problems on or near campus, Dual sewer lines mauka of the Agricultural Engineering Building, Metcalf Street, University Avenue near King Street… the dual 24 inch sewer lines may be near capacity,*

The Recreation Center expansion will increase the current effluent as a result of the installation of 11 showers, 13 sinks, 16 toilets/urinals, and two 60-pound washing machines. The fixtures installed will incorporate water conservation devices such as flow

restrictors. Wherever possible, installed equipment will incorporate water conservation design elements. The sewer system appears to be adequate to accommodate the needs of the renovated building. However, a sewer connection application is required with the Department of Planning and Permitting, Wastewater Branch, to determine adequacy of existing sewer lines. In addition, conservation efforts will reduce sewage effluent from buildings Campus Center Renovation and Addition. Since many of the students who will be users of the proposed facility either reside on campus and/or utilize existing recreational facilities on the Makai Campus, some of the wastewater generated at the proposed Recreation Center is already being collected and treated by the municipal wastewater system.

4.8.3 Drainage System

The proposed Recreation Center Addition site will encompass impervious surface areas associated with the rooftops of the Engineering Quadrangle, sidewalks, and pervious surface areas associated with landscaping, and portable structures. Although Miller Annex and the PEACESAT portables have impervious rooftops, the structure design allows storm water to collect (and infiltrate) under the buildings. There will be a net increase in storm water runoff generated due to an increase in impervious surface area, a result of the removal of Miller Annex, the PEACESAT building, and the landscaping between the Engineering Quadrangle, Miller Annex and PEACESAT buildings.

Potential Impacts and Mitigation Measures

The *1995 Long Range Utilities Plan Update, Drainage and Sewer Systems*, prepared by Fukunaga and Associates, Inc. dated September 1995 has identified the portion of drainline from Miller Hall to Dole Street as hydraulically inadequate for existing and future conditions.

Storm water runoff generated on the roof of the proposed building will be collected and discharged via a new direct connection to the existing drainline running north-south along the east side of the Engineering Quadrangle. The proposed Recreation Center building footprint encompasses the existing Engineering Quadrangle, PEACESAT portable, Miller Annex and landscaped areas between these buildings. The proposed building will not overly the existing drainline. There will be a net increase in storm water runoff. However, no significant impact to the drainage system is expected due to the increase.

One of the goals of the LRDP is to increase the permeable surface area from 40% to 60% of the campus grounds as well as increasing canopy cover from 20% to 30%. A decrease in the impervious surface area on campus will increase infiltration of rainwater reducing runoff. In general, an increase in canopy cover also increases the infiltration rate. This project has been designed to minimize canopy loss by relocating or preserving in place most of the trees within the proposed Campus Center Renovation and Expansion footprints (see Table 3-1). The additional runoff generated from an increase in impervious surface area created as a result of the proposed project will be channeled to the relief drain.

The proposed project will create an increase in impervious surface area. Whenever feasible, vegetated roof cover, bioswales and permeable walkways with storm water retention capacity in the gravel layers will be implemented to decrease the impervious surface area.

The relief drain is expected to improve drainage from the Campus Center area.

The proposed project will result in the disturbance of over one (1) acre of land area. Therefore, a National Pollutant Discharge Elimination System (NPDES) permit will be required. Best Management Practices (BMP) will be implemented to prevent pollution and protect the environment. Temporary erosion control measures will be installed prior to any demolition and/or construction activities. Structural BMPs to include silt fence at the downstream perimeter of the project site and sediment control filters at drain inlets.

4.8.4 Electrical and Communications Systems

Existing underground electrical lines serve the Campus Center area via the University's primary electrical distribution system. Telecommunication services are provided from the University's fiber network and telephone switch.

Potential Impacts and Mitigation Measures

Existing underground electrical lines serving the Campus Center area will be extended into the Recreation Center addition, Hemenway Hall renovation and Campus Center renovation. Similarly, telecommunication services will be provided from the University's fiber network and telephone switch.

During the pre-consultation process, HECO was notified, but did not comment on the project.

The proposed project will not have any significant adverse impact on existing electrical and communication systems. As previously noted, since 2002, the guiding principle of the University of Hawaiʻi is sustainability – living in ways that meet the campus' present needs without limiting the potential of future generations to meet their needs.

In October 2008, University of Hawaiʻi Facilities Management released the *University of Hawaiʻi at Mānoa Energy Strategy 2008-2015* report (ES08-15). The goals of the energy strategy include

- 30% energy reduction by 2012
- 50% energy reduction by 2015
- 25% of energy from renewables by 2020
- Energy and Water Self-sufficient by 2050

The UH LRDP 2007 update has instituted a framework of sustainability guidelines as the basis to develop, evaluate and communicate the integration of sustainability in the development and operation of the UH Mānoa Campus. The Sustainability Guidelines from the LRDP state:

ENERGY EFFICIENCY

Energy efficiency is a cornerstone of any sustainable building project. Power generation and use of energy are major contributors to air pollution and utility costs. According to the School of Architecture, UHM consumes approximately 120 million KWhr/year, which equals to about 6,000 KWhr/Student/Year. Improving energy efficiency and using renewable energy sources are effective ways to reduce environmental and economic impacts associated with excessive energy use and fossil fuel energy use. Reduction of energy use also has the benefits of lowering utility expenses.

Examples of LEED Criteria and Strategies:

- *Design the building envelope, HVAC, lighting and other systems to maximize energy performance. Establish the minimum level of energy efficiency for the proposed building and systems.*
- *Use a computer simulation model to assess energy performance and identify the most cost-effective energy efficiency measures.*
- *Specify new HVAC equipment that uses no CFC refrigerants and conduct an inventory to identify equipment that uses CFC refrigerants and provide a replacement schedule for these refrigerants to reduce ozone depletion.*
- *Assess the project for non-polluting and renewable energy potential including solar, wind, geothermal, low-impact hydro, biomass and bio-gas strategies.*
- *Verify that the building's energy related systems are installed, calibrated and perform according to the project requirements, basis of design and construction documents. Develop a Measurement & Verification Plan to evaluate building and/or energy system performance, such as metering equipment, tracking of performance and monitoring.*
- *Encourage the development and use of grid-source, renewable energy technologies on a net zero pollution basis.*
- *Minimize use of air-conditioning with natural ventilation design…*

The Campus Center Renovation and Expansion is being designed utilizing LEED criteria and strategies to meet the energy efficiency goals of the LRDP and the energy reduction and self-sufficiency goals of the ES08-15.

4.8.5 Solid Waste

The Campus Center Renovation and Expansion project will likely increase the volume of solid waste generated over that of the current facility.

Potential Impacts and Mitigation Measures

The proposed project will create additional food service facilities, recreation and lounge facilities that will increase the amount of refuse generated. Since 2002, the guiding principle of the University of Hawai'i is sustainability – living in ways that meet the campus' present needs without limiting the potential of future generations to meet their needs. As such the university has created an atmosphere conducive to recycling through ease of access to recycling collection and education. A goal of the recycling program is the reduction of solid waste generation. This is accomplished through the paper recycling program, annual recycling/landfill diversion goals, equipment transfer/donation program, electronics recycling, and the sustainability award program. The University has been a leader in recycling education and landfill diversion. In addition, the University of Hawai'i at Mānoa has partnered with the City and County of Honolulu's *Recycle Hawaii* program by installing a community recycling bin near Hale Aloha Dormitory. Some of the solid waste currently generated in student housing areas, or at the Makai Campus (or even off-campus) will be generated at the proposed project (once in operation), but no net increase in solid waste generation is expected. Additionally, while the Campus Center Renovation and Expansion project will increase waste from generated in the new Recreation Center facility, the student population is not expected to increase, therefore the quantity of waste generated on campus is not expected to change significantly.

The proposed project will generate solid waste during construction. The contractor will be required to dispose of all waste in compliance with Department of Environmental Management requirements.

The University will incorporate provisions for the expanded facility into the existing solid waste management plan. As previously noted, since 2002, the guiding principle of the University of Hawai'i is sustainability – living in ways that meet the campus' present needs without limiting the potential of future generations to meet their needs. The UH LRDP 2007 update has instituted a framework of sustainability guidelines as the basis to develop, evaluate and communicate the integration of sustainability in the development and operation of the UH Mānoa Campus. The Sustainability Guidelines from the LRDP state:

> ***MATERIALS AND RESOURCES***
> *Facilitate the reduction of waste that is hauled to and disposed of in landfills by making it convenient to recycle. Reduce construction waste by extending the life cycle of existing building stock, which reduces environmental impacts of new buildings as they relate to materials manufacturing and transport. Divert construction, demolition and land-clearing debris from disposal in landfills by redirecting recyclable resources back to the manufacturing process. Responsible construction waste management can lower costs through material efficiencies in design and disposal fees. Use environmentally appropriate materials in design and construction of infrastructure and buildings, and increase demand for building materials and products that are sustainably extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from transportation.*

Examples of LEED Criteria and Strategies:

- *Provide convenient facilities for recycling collection. Proper design of collection areas is critical to making recycling easy, sanitary and useful.*
- *Consider reuse of existing, previously occupied buildings, including structure, envelope and interior non-structure elements.*
- *Adopt a construction waste management plan and recycle and/or salvage at least 50-75% of non-hazardous construction and demolition debris.*
- *Use building materials or products that have been sustainably extracted, harvested or recovered, as well as manufactured, within 500 miles of the project site.*
- *Use rapidly renewable building materials and products (made from plants that are typically harvested within a ten-year cycle or shorter, such as bamboo, wool or cotton).*
- *Use a minimum of 50% of wood-based materials and products, which are certified in accordance with the Forest Stewardship Council's (FSC) Principles and Criteria, for wood building components*

Solid waste disposal will be in accordance with the guidelines set forth by the county's Department of Environmental Services.

4.9 PUBLIC SERVICES AND FACILITIES

Police Protection

The site is located within Honolulu Police Department District 7.

Fire Protection

The Mānoa Fire Station and McCully Fire Stations are each within a mile of the University of Hawaiʻi Campus. There are three fire hydrants in the vicinity of the existing Campus Center. The BWS standards established the required fire flow of 2,000 gallons per minute with 20 psi residual pressure.

Health Care Services

On campus, near the guard station on East-West Road, is the University Health Services Mānoa (UHSM). UHSM is a unit within the Office of Student Affairs under the Vice Chancellor for Students. It was established in 1932 and has been at its present location, since 1964. The UHSM is staffed by physicians, nurse clinicians, nurses, and other support staff. A wide range of medical services and programs are offered. These include the General Medical Clinic, the Women's Health Clinic, Sports Medicine, dermatology, pharmacy, clinical laboratory, student training, employment and volunteer opportunities.

Although its primary service population are the students of UH Mānoa, many services are also available to faculty and staff members, and students from other campuses. Its hours are limited to normal business hours. Kapiʻolani Medical Center, which includes emergency services, is located at 1319 Punahou Street, is less than a mile from the University of Hawaiʻi campus.

Recreational Facilities

Recreational facilities near the Campus Center area include on-campus recreational opportunities (primarily located on the Makai Campus) as well as City facilities such as Kānewai Community Park, Mānoa District Park, Mōʻiliʻili Park, and Old Stadium Park.

Schools

A number of public and private elementary, middle and high schools are located in the vicinity of the UHM campus including University Laboratory School, Our Redeemer Elementary School, Lutheran High School, Mid-Pacific Institute, Hōkūlani Elementary School and Noelani Elementary School.

Potential Impacts and Mitigation Measures

The University does not anticipate the proposed project will generate an increased demand on existing public services as the proposed project involves the renovation and expansion of existing buildings. The University has its own campus security system, including security guards.

There will be an occasional and unavoidable demand for fire protection services, but the proposed project will be designed with sprinkler systems that should help to enhance the fire-fighting capabilities of the City and County of Honolulu Fire Department. Civil and appropriate construction plans will be provided to Honolulu Fire Department for review to ensure that all fire, life and safety requirements are satisfied. The addition of new fire hydrants and an expansion of the existing water service to the campus center area will occur as part of this project. The fire hydrant placement and the Fire Department access road requirements should meet the requirements of the Honolulu Fire Department as well as the 2003 International Building Code (IBC) that was adopted by the City and County of Honolulu in 2007. During the pre-consultation process, the Honolulu Fire Department wrote that it "has no objections to the proposed project."

There will be an occasional and unavoidable demand for medical services, but there appears to be adequate facilities on campus and nearby (including the nearby Fire Stations) to address most emergency health care needs.

The primary objective of this project is the development of a Recreation Center that is co-located with the Campus Center. This will help to reduce the demand for intramural and informal recreational facilities in the Makai Campus and County parks in the surrounding areas. The reduced demand on County parks will have a positive impact on non-students who utilize Kānewai Community Park, Mānoa District Park, Mōʻiliʻili Park, and Old Stadium Park.

The proposed use is not anticipated to create any additional demand on existing schools.

5.0 LAND USE CONFORMANCE

State and City and County of Honolulu land use plans and policies and required permits and approvals relevant to the Campus Center Renovation and Expansion are described below.

5.1 STATE OF HAWAIʻI

5.1.1 State Land Use Law, Chapter 205, Hawaiʻi Revised Statutes

The State Land Use Law (Chapter 205, HRS), establishes the State Land Use Commission (LUC) and authorizes this body to designate all lands in the State into one of four districts: Urban, Rural, Agricultural, or Conservation. These districts are defined and mapped by the State Land Use Commission in order to ensure compatibility with neighboring land uses and protection of public health.

The Campus Center Renovation and Expansion is located within the State Urban District (Figure 9).

5.1.2 Coastal Zone Management Act, Chapter 205A, Hawaiʻi Revised Statutes

The Coastal Zone Management Area, as defined in Chapter 205A, HRS, includes all the lands of the State. Therefore, the proposed Campus Center Renovation and Expansion lies within the Coastal Zone Management Area.

The Coastal Zone Management (CZM) Program aims to provide recreational opportunities, protect historic resources, protect scenic and open space resources, protect coastal ecosystems, provide facilities for economic development, reduce hazards, and manage development. Program objectives and applicability to the proposed Campus Center Renovation and Expansion are discussed below:

RECREATIONAL RESOURCES

Objective: Provide coastal recreational opportunities accessible to the public.

Policy A: Improve coordination and funding of coastal recreational planning and management; and

Policy B: Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:

(i) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;

(ii) Requiring replacement of coastal resources having significant recreational value, including but not limited to surfing sites, fishponds, and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable;

(iii) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;

(iv) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;

(v) Ensuring public recreational uses of County, State, and Federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;

(vi) Adopting water quality standards and regulating point and nonpoint sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;

(vii) Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and

(viii) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and County authorities; and crediting such dedication against the requirements of section 46-6.

Discussion: The proposed Campus Center Renovation and Expansion will be located inland, away from the shoreline (approximately 1.7 miles from the nearest coastline); therefore, it is anticipated that there will be no effect on existing coastal or inland recreational resources.

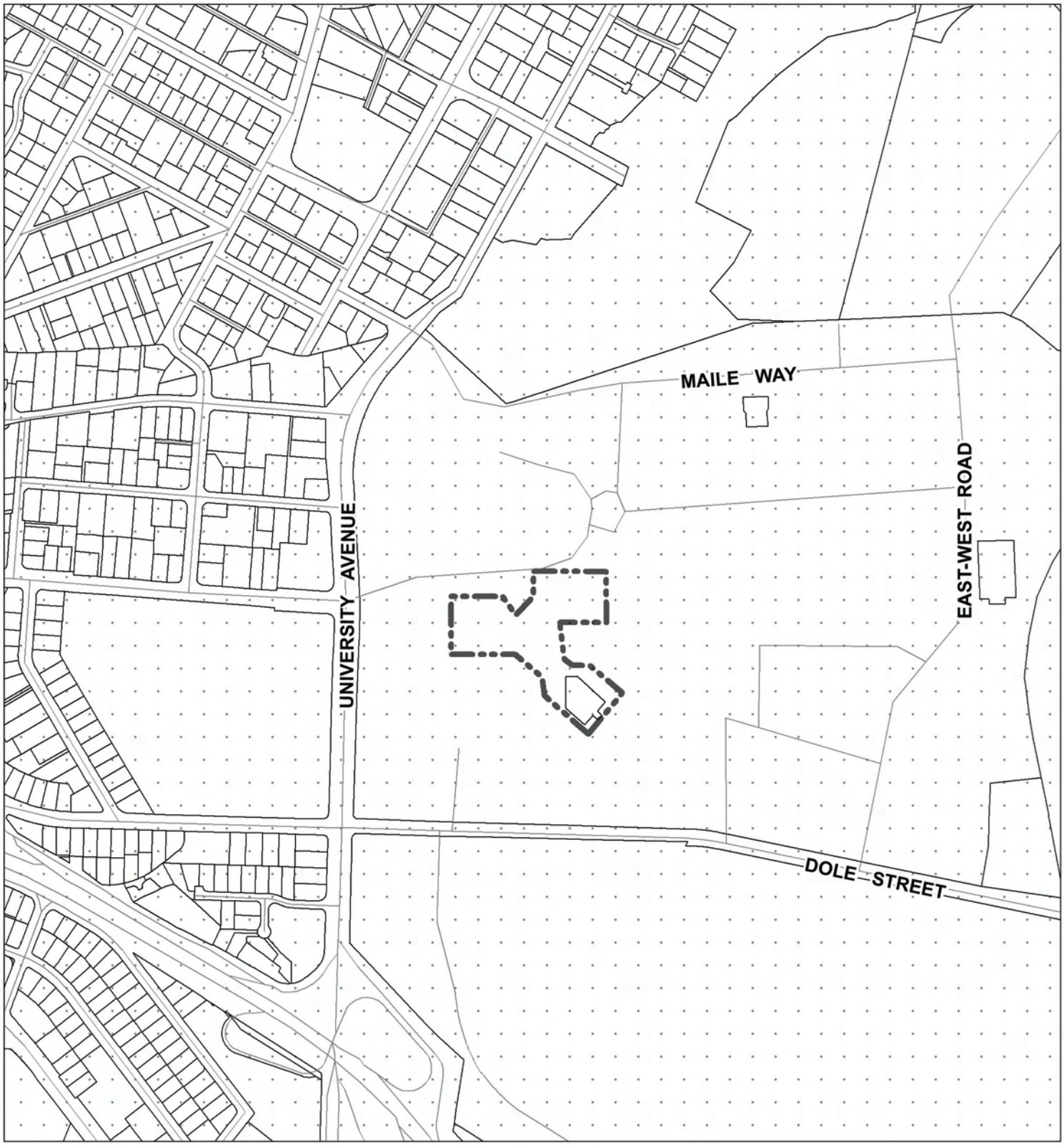
HISTORIC RESOURCES

Objective: Protect, preserve and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

Policy A: Identify and analyze significant archaeological resources;

Policy B: Maximize information retention through preservation of remains and artifacts or salvage operations; and

Policy C: Support State goals for protection, restoration, interpretation, and display of historic resources.



LEGEND

Project Area

District

- Agricultural
- Conservation
- Rural
- Urban

Source: State Land Use Commission (2006)
Disclaimer: This graphic has been prepared for general planning purposes only.

Figure 9

State Land Use Districts

Campus Center Renovation & Expansion

University of Hawai'i at Mānoa — ISLAND OF O'AHU

NORTH

LINEAR SCALE (FEET)
0 250 500 1,000

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Discussion: Due to the extensive disturbance this site has experienced for development and subsequent redevelopment, it is unlikely that subsurface archaeological or cultural resources are present. Should any archaeological or cultural remains be encountered during construction, all work in the immediate vicinity of the find will cease and the State Historic Preservation Division will be contacted for establishment of appropriate mitigation in accordance with Chapter 6E, Hawai'i Revised Statutes.

While the State Historic Preservation Division (SHPD) does not list the Engineering Quadrangle or Hemenway Hall on the Hawai'i Register of Historic Places. Both are considered historic, and the visual aspects of the theses facilities will be preserved where possible. The exterior of Hemenway Hall will not be modified. The proposed project alternative was chosen to minimize the impact on the Engineering Quadrangle by reducing the number of buildings slated for demolition from four to two. The historic Engineering Materials Testing Laboratory, the second oldest building on campus will be preserved in place along with one other Engineering Quadrangle facility.

SCENIC AND OPEN SPACE RESOURCES

Objective: Protect, preserve and, where desirable, restore or improve the quality of coastal scenic and open space resources.

Policy A: Identify valued scenic resources in the coastal zone management area;

Policy B: Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;

Policy C: Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and

Policy D: Encourage those developments which are not coastal dependent to locate in inland areas.

Discussion: The proposed Campus Center Renovation and Expansion will be located inland, away from the shoreline; therefore, it is anticipated that there will be no effect on the quality of the coastal scenic resources.

COASTAL ECOSYSTEMS

Objective: Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.

Policy A: Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;

Policy B: Improve the technical basis for natural resource management;

Policy C: Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;

Policy D: Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and

Policy E: Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.

Discussion: Best Management Practices (BMPs) will be employed during construction to reduce erosion of soils and fugitive dust during construction. Controlling runoff particularly will ensure that the construction will not increase inputs of sediment into Mānoa Stream. In addition, due to the size of the project (disturbance of over 1 acre), the construction project will operate under a NPDES permit. Since the Campus Center complex and Hemenway Hall are located nearly two miles from the ocean; it is anticipated that over the long term there will be no effect on the quality of the coastal ecosystems.

ECONOMIC USES

Objective: Provide public or private facilities and improvements important to the State's economy in suitable locations.

Policy A: Concentrate coastal dependent development in appropriate areas;

Policy B: Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor industry facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and

Policy C: Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:

(i) Use of presently designated locations is not feasible;
(ii) Adverse environmental effects are minimized; and
(iii) The development is important to the State's economy.

Discussion: The Campus Center Renovation and Expansion contributes to Hawaiʻi's economy through the improvement of a public higher educational facility. The proposed renovation project is not dependant on coastal resources and therefore is located away from the shoreline on the University campus.

COASTAL HAZARDS

Objective: Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.

Policy A: Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and non-point source pollution hazards;

Policy B: Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and non-point source pollution hazards;

Policy C: Ensure that developments comply with requirements of the Federal Flood Insurance Program; and

Policy D: Prevent coastal flooding from inland projects.

Discussion: The proposed Campus Center Renovation and Expansion location nearly two miles inland from the coastline virtually negates any potential detriment to the quality of coastal ecosystems as a result of construction.

MANAGING DEVELOPMENT

Objective: Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

Policy A: Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;

Policy B: Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements; and

Policy C: Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process.

Discussion: Due to the project's inland location approximately 2 miles away from the shoreline, it should not be considered a "significant coastal development." Its benign

location relative to the coastline should not require an involved public participation process concerning coastal effects, although this EA provides an opportunity for input.

PUBLIC PARTICIPATION

Objective: Stimulate public awareness, education, and participation in coastal management.

Policy A: Promote public involvement in coastal zone management processes;

Policy B: Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities; and

Policy C: Organize workshops, policy dialogues, and site- specific mediations to respond to coastal issues and conflicts.

Discussion: The project's mauka location, and distance from the shoreline provides a difficult segue toward relevant discussions on coastal zone management. This Environmental Assessment provides a means for public input.

BEACH PROTECTION

Objective: Protect beaches for public use and recreation.

Policy A: Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion;

Policy B: Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and

Policy C: Minimize the construction of public erosion-protection structures seaward of the shoreline.

Discussion: The proposed Campus Center Renovation and Expansion will be located nearly two miles from the ocean. Due to the project site's relatively far distance from the shoreline, no adverse impact to area beaches is anticipated.

MARINE RESOURCES

Objective: Promote the protection, use, and development of marine and coastal resources to assure their sustainability.

Policy A: Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;

Policy B: Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;

Policy C: Assert and articulate the interests of the State as a partner with Federal agencies in the sound management of ocean resources within the United States exclusive economic zone;

Policy D: Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and

Policy E: Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.

Discussion: The proposed Campus Center Renovation and Expansion will be located nearly two miles from the ocean. Due to the project site's relatively far distance from the shoreline, no adverse impact to area marine resources is anticipated.

5.1.3 Hawaiʻi State Planning Act, Chapter 226, Hawaiʻi Revised Statutes

The Hawaiʻi State Plan, Chapter 226 HRS (2007) provides guidelines for the future growth of the State of Hawaiʻi. The Hawaiʻi State Plan identifies goals, objectives, policies, and priorities for allocating the State's resources, including public funds, services, human resources, land, energy, and water. The plan was enacted to achieve "a desired physical environment, characterized by beauty, cleanliness, quiet, stable natural systems, and uniqueness, that enhances the mental and physical well-being of the people." Chapter 226 HRS (2007).

Discussion: Planning objectives outlined in Chapter 226 support the proposed Campus Center Renovation and Expansion project. Section 226-20 promotes cooperation among public and private sectors in accommodating the total health needs of individuals throughout the State. Section 226-21 sets forth goals relating to the support of educational programs and activities that enhance personal development, physical fitness, recreation, and cultural pursuits of all groups. Section 226-23 sets forth goals relating to both the availability of sufficient resources to provide for recreational needs and adequate and accessible physical fitness programs to promote the physical and mental well-being of Hawaii's people. The renovation and expansion of the University of Hawaiʻi's Campus Center, and Hemenway Hall are consistent with the State's goals to enrich the lifestyles of Hawaiʻi people by the advancement of the mental and physical well-being.

5.2 CITY AND COUNTY OF HONOLULU PLANS

5.2.1 Oʻahu General Plan

The Oʻahu General Plan is the policy document for the long-range development of the Island of Oʻahu. The Oʻahu General Plan is a statement of general conditions to be sought in the 20 year planning horizon and policies to help direct attainment of the plan's objectives.

Specific General Plan goals and policies applicable to the proposed Campus Center Renovation and Expansion project are discussed below.

Health and Education

Objective C – To make Honolulu the center of higher education in the Pacific.

Policies

(1) Encourage continuing improvement in the quality of higher education in Hawaii.

(2) Encourage the development of diverse opportunities in higher education.

Discussion: The Campus Center Renovation and Expansion supports these policies by renovating and enlarging an established facility for higher education.

5.2.2 Primary Urban Center Development Plan

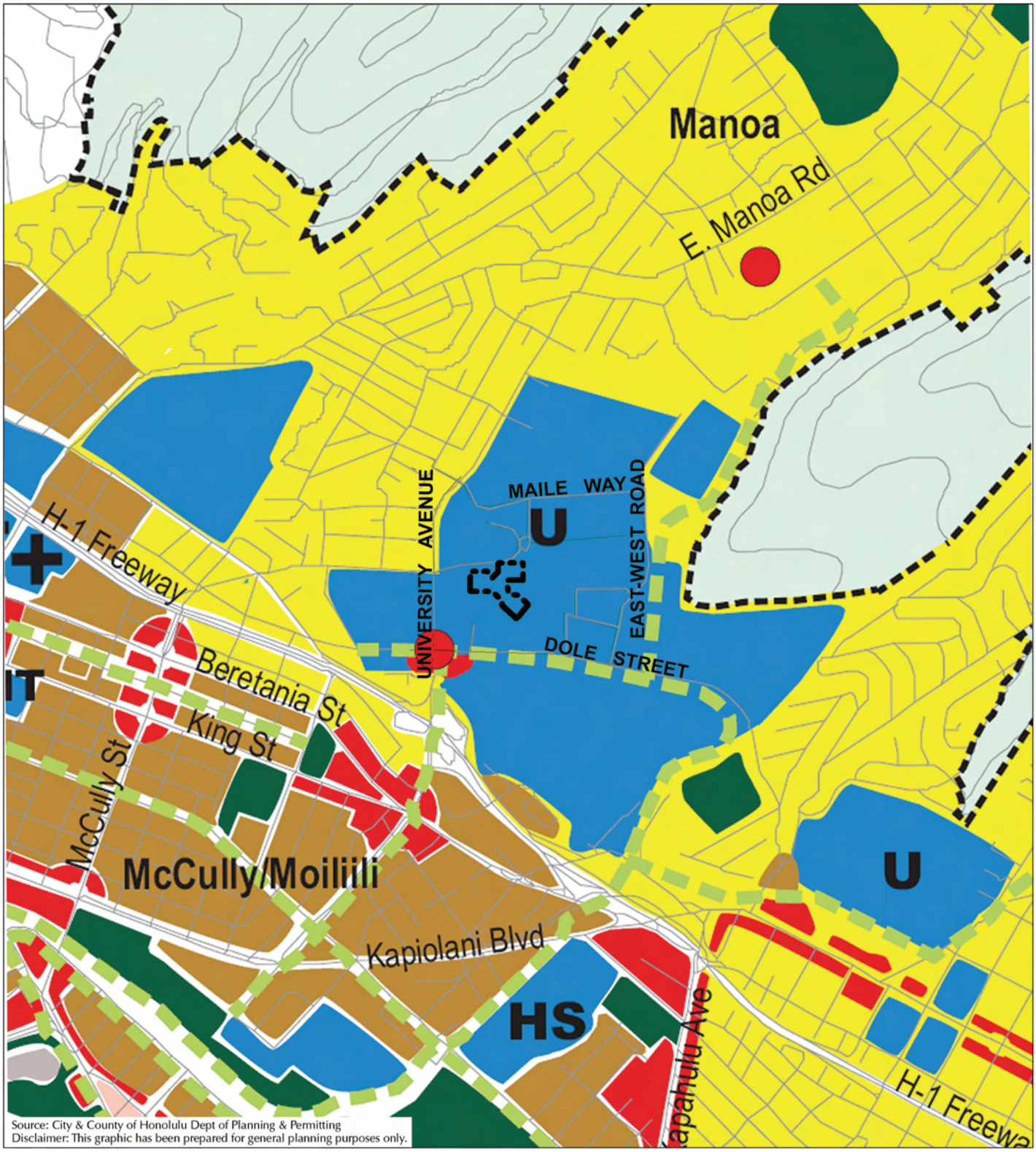
The City and County of Honolulu has adopted the Primary Urban Center Development Plan as one of eight community-oriented plans to guide public policy, investment and decision making through the 2025 planning horizon. The document contains policies specific to Honolulu's primary urban center. These policies are then implemented through ordinances such as the Land Use Ordinance (zoning code).

The Primary Urban Center Development Plan includes a policy to, "support the development of a high quality educational system of schools and post-secondary institutions that increase the attractiveness of the Primary Urban Center as a place to live and work…"

Discussion: The expansion and renovation of the Campus Center and Hemenway Hall at the University of Hawaiʻi's main campus in Mānoa contributes to the continuation of a vibrant, campus community in the heart of the city (Figure 10).

5.2.3 Land Use Ordinance

The Land Use Ordinance implements the goals and objectives of the Oʻahu General Plan and the Primary Urban Center Development Plan. All lands within the City and



LEGEND

- Project Area
- Community/Neighborhood Commercial
- Urban Community Boundary
- Pedestrian Network
- Major Parks and Open Space
- Lower-Density Residential
- Medium and Higher-Density Residential/Mixed Use
- District Commercial
- Resort
- Institutional
- Preservation
- Military
- U College/University
- + Hospital/Medical Center
- INT Intermediate School (State)
- HS High School (State)

Figure 10

Primary Urban Center Development Plan

Campus Center Renovation & Expansion

University of Hawai'i at Mānoa — ISLAND OF O'AHU

NORTH

NOT TO SCALE

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County of Honolulu are zoned into specific districts. According to the Department of Planning and Permitting, the project site is zoned Residential (R-5). According to Sec. 21-3.70 of the Land Use Ordinance (LUO):

> *The purpose of the residential district is to allow for a range of residential densities. The primary use shall be detached residences. Other types of dwellings may also be allowed, including zero lot line, cluster and common wall housing arrangements. Nondwelling uses which support and complement residential neighborhood activities shall also be permitted.…The intent of the R-7.5, R-5 and R-3.5 districts is to provide areas for urban residential development.*

According to the LUO Master Use Table (Table 21-3), universities and colleges are permitted in all zoning districts regulated by the City and County of Honolulu with Plan Review Use (PRU) approval.

Discussion: The Campus Center Renovation and Expansion is consistent with the purposes of the R-5 land use district in that it is part of a long-established university campus (Figure 11). The University is currently operating under PRU No. 88/PRU-3 (Resolution No. 89-411, CD-2), which was initially approved on December 13, 1989, for the Five-Year Master Plan for the expansion of the University of Hawaiʻi Mānoa campus." The campus gives the Mānoa and Mōʻiliʻili neighborhoods their identity and the proposed renovation and expansion of the heart of campus will serve to contribute to the vitality of these communities.

5.2.4 Long Range Development Plan, University of Hawaiʻi at Mānoa, 2007 update

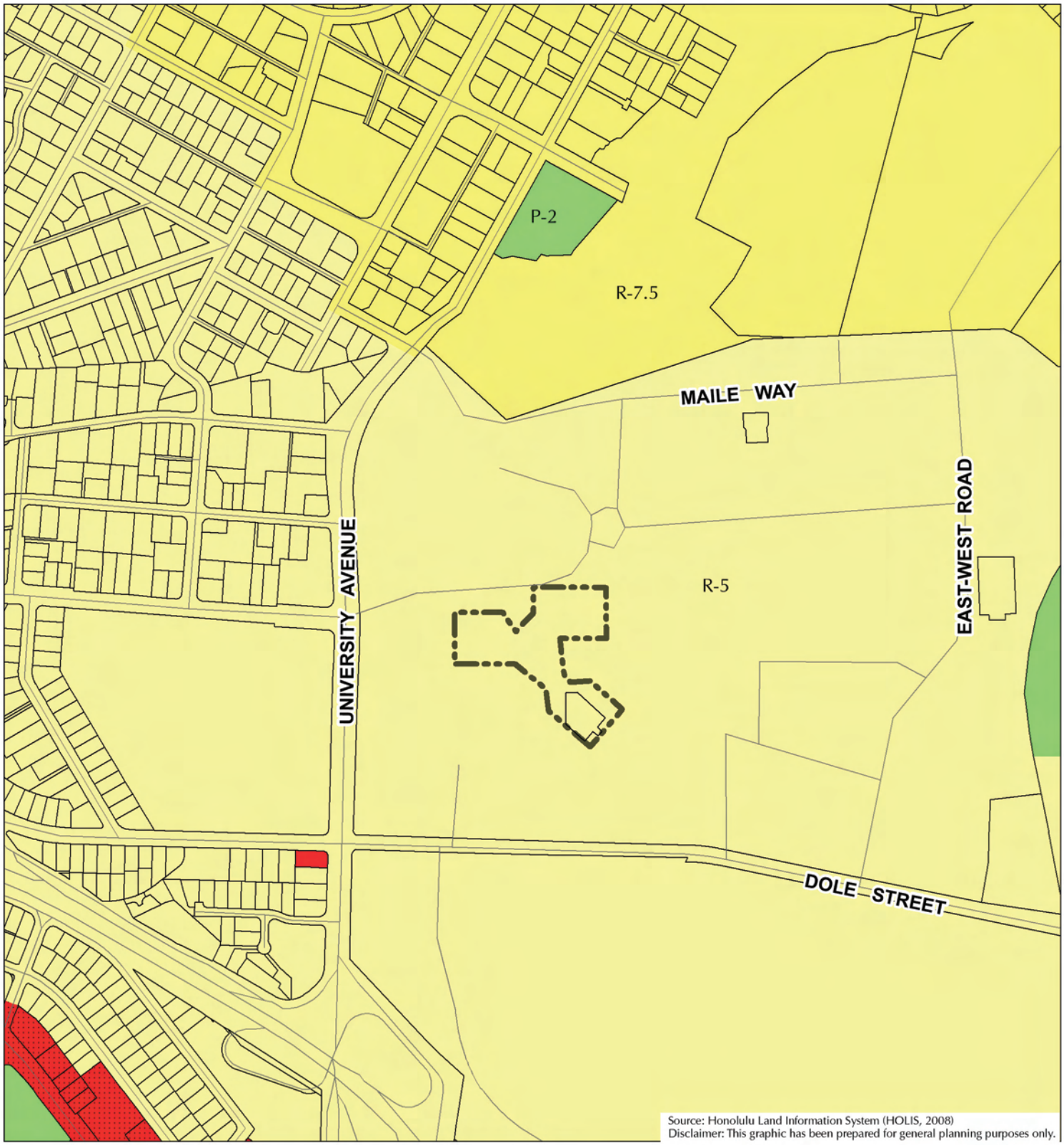
The Long Range Development Plan (LRDP) was initially adopted by the Board of Regents in 1987. The plan, amended and updated four times since 1987, has served as the guiding document for campus redevelopment. The LRDP reverses the existing orientation on campus from vehicles to pedestrians by proposing to remove roads and parking facilities from the heart of the Central Campus to peripheral locations while providing for the addition of approximately 3,000 parking spaces and approximately three million additional square feet of new construction. In addition to the Campus Center Renovation and Expansion Project, the following projects are proposed in the LRDP for development over the next ten years; additional instruction facilities at Henke Hall and the College of Education; additional research space at the Biomedical facility and Mauka Campus, replacement facilities for Klum Gym, Johnson Hall and Hale Noelani; expansion of the Law School Library; additional space at Bilger Hall; new faculty housing; new KHET media facilities; expansion of Kennedy Theatre; renovation of Gartley Hall; additional parking structures; and an addition at the School of Hawaiian Knowledge. The construction of these projects not covered under PRU No. 88/PRU-3 (Resolution No. 89-411, CD-2) as well as the Campus Center Renovation and Expansion Project are subject to City Council approval of the new Plan Review Use application as required by the LRDP.

5.3 LIST OF REQUIRED PERMITS AND APPROVALS

Required permits and approvals are outlined in Table 5-1, below.

Table 5-1
Required Permits and Approvals

AGENCY	PERMIT/APPROVAL
STATE OF HAWAIʻI	
Department of Health	• NPDES
Department of Land and Natural Resources, Historic Preservation Division	• Section 6E, Hawaiʻi Revised Statutes (HRS) Review
CITY AND COUNTY OF HONOLULU	
Department of Planning and Permitting	• Building Permit
Department of Planning and Permitting	• Plan Review Use permit
Department of Planning and Permitting	• Grading Permit
Department of Environmental Services	• Industrial Wastewater Discharge Permit
Department of Environmental Services	• Air Conditioning/Ventilation Permit
Department of Environmental Services	• Noise Permit for Construction Activities
Department of Environmental Services	• Noise Permit for Stationary Sources



LEGEND

Project Area

Zoning Description

- B-2 Community Business District
- BMX-3 Community Business District Mixed Use
- P-2 General Preservation District
- R-5 Residential District
- R-7.5 Residential District

Figure 11

City & County of Honolulu Zoning

Campus Center Renovation & Expansion

University of Hawai'i at Mānoa — ISLAND OF O'AHU

NORTH

LINEAR SCALE (FEET)
0 250 500 1,000

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6.0 ALTERNATIVES

In compliance with the provisions of Section 11-200-17(f), HAR relating to Environmental Impact Statements, an environmental assessment must discuss potential alternatives to the proposed action.

The alternatives considered include:

6.1 NO ACTION

The no-action alternative is no change to the existing buildings. Under this alternative, the Campus Center would not be renovated or expanded. The remaining buildings in the Engineering Quadrangle would remain in place, and Hemenway Hall would not be renovated. Students would continue to share recreation facilities with the athletic department that are not centrally located. Due to the lack of centralized facilities, the safety of students and faculty would continue to be at risk during evening hours. In addition, any unfulfilled recreational demands would occur off campus, including at nearby County parks.

6.2 ALTERNATIVES

As noted in Section 4.1.1 of this Environmental Assessment, the primary aspect of the Campus Center Renovation and Expansion project is the development of the Recreation Center. The removal of two of the Engineering Quadrangle buildings, removal or relocation of Miller Annex and PEACESAT, and the renovation of Hemenway Hall are all necessary to facilitate the construction of the Recreation Center in the preferred location, northeast of the existing Campus Center.

It is presumed that the visibility of the facility at the heart of campus will have a positive impact upon student life and reinforce this area as the social center of the University of Hawaiʻi at Mānoa. Due to the centralized location, the Campus Center Renovation and Expansion is projected to increase student activity and pedestrian traffic in the area. This will benefit the existing Campus Center, Hemenway Hall and other nearby facilities. The hours of operation of the new Recreation Center will expand the availability of late night activities on campus. The existing Campus Center will extend current facility operating hours to enhance student service offerings in the evenings. The preferred alternative will allow a majority of the late night activities to be concentrated in one area.

Since the start of the project, several alternatives were explored and tested for feasibility and are compiled below. The evaluation of alternatives took into consideration the most feasible location of the Recreation Center based on its proximity to the existing Campus Center, impact to buildings listed on the historic registry, and the availability of a space large enough to accommodate the proposed project. These alternatives are described in greater detail below:

Alternative A. In this alternative, the Recreation Center is not co-located with the Campus Center, but rather at Makai Campus. Locating the Recreation Center at the Makai Campus would provide Athletics and Kinesiology an opportunity to utilize portions of the Recreation Center, since they do not have the funding to build new facilities for their needs. There is limited area to build a Recreation Center on the Makai Campus, as Athletics and Kinesiology also have needs for this limited amount of space for their future expansion needs.

Alternative B. In this alternative, the Recreation Center is constructed along the southwest corner of the Campus Center. Co-location with the existing Campus Center provides visibility of the facility - creating a potentially positive impact upon student life and reinforcing this area as the social center of the University. Placing the Recreation Center on the southwest corner of the Campus Center does not meet the goals of the LRDP. This area is required for a potential classroom or administrative building site. Locating the Recreation Center southwest will also require the demolition of the old post office and two additional buildings. Also, this area is limited in size and will require a taller facility with a smaller building footprint that is more visible from University Avenue.

Alternative C. Placing the Recreation Center to the south of the Campus Center would encroach on Andrews Amphitheater, which is a registered historic site. However, the visibility of the facility at the heart of campus will have a positive impact upon student life and reinforce this area as the social center of the University similar to that of the preferred alternative.

Alternative D. The Engineering Quadrangle. As noted in Section 4.1.1, the development in the area of the proposed project site has two alternatives:

Engineering Quadrangle Alternative D-1: In this alternative all four remaining buildings would be demolished. Both HHF and SHPD expressed concerns regarding the potential impact the location of the Recreation Center would have on these buildings. Some of the student community also expressed concern regarding the lack of a preservation plan for this alternative.

Engineering Quadrangle Alternative D-2: In this alternative the original Engineering Materials Testing Laboratory, and one of the four Engineering Quadrangle buildings built between 1915 and 1928 will be preserved in place. Today those buildings are known as Building 6, and the Ka Leo Building. During the plan design process, KYADG consulted with SHPD regarding the four remaining Engineering Quadrangle buildings to determine the best course of action regarding the Campus Center Renovation and Expansion project.

Of the above alternatives, it was determined that Alternative D-2 would most: 1) consolidate and enhance campus student life and activity in the center of the campus; 2) allow the expansion of future administrative or classroom facilities southwest of the Campus Center; 3) reduce the impact of the Campus Center expansion on Andrews

Amphitheatre; and 4) provide adequate area for the proposed facility without the need for a taller building. Despite the impact on the remaining Engineering Quadrangle buildings, SHPD has indicated that it will support this alternative.

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7.0 FINDINGS, SUPPORTING REASONS, AND ANTICIPATED DETERMINATION

To determine whether the Campus Center Renovation and Expansion may have a significant impact on the physical and human environment, all phases and expected consequences of the proposed project have been evaluated, including potential primary, secondary, short-range, long-range, and cumulative impacts. Based on this evaluation, the Approving Agency (University of Hawai'i at Mānoa) is expected to issue a Finding of No Significant Impact (FONSI) for the Campus Center Renovation and Expansion project. The supporting rationale for this anticipated finding is presented in this chapter.

7.1 PROBABLE IMPACT, INCLUDING CUMULATIVE IMPACTS

Cumulative impacts are impacts on the environment that result from the action when added to other past, present, and foreseeable future actions by other agencies or persons. As discussed throughout this document, the University has recently completed an update of the Long Range Development Plan (LRDP) to guide campus development in the next five to ten years. Assumed cumulative impacts could be those related to increased traffic and greater demand on water, sanitary sewer and storm drainage capacity. However, the projects outlined in the LRDP are based on current space and activity needs on campus. They are not based on any anticipated increase in enrollment during the five to ten year planning horizon.

One of the major themes in the current LRDP is Environmental Sustainability. The LRDP Design Guidelines emphasize that campus structures further conserve resources through energy efficiency, water conservation, recycling and other environmentally sensible practices. Ostensibly, the design guidelines' environmental sustainability theme will result in renovations and expansions that make buildings more energy efficient, improve storm water conveyance practices and encourage alternative transportation. In addition, all new buildings will be subject to an Environmental Assessment and the development of the projects will include appropriate mitigation measures to address any impacts.

Based on the fact that the University's LRDP looks to replace and renovate existing structures using environmentally sensible design and construction, it is assumed that the cumulative impacts will be minimal. UH is committed to reducing its carbon footprint, and has voluntarily begun reporting green house gas emissions. According to the Vice Chancellor for Administration, Finance, and Operations, Kathleen Cutshaw,

> *By measuring our green house gas emissions it furthers UH's commitment to energy reduction by giving us the data necessary to take further steps to reduce our energy use by 30% by the year 2012*

Social-economic impacts resulting from the proposed projects are anticipated to be beneficial. Construction will generate employment and economic opportunities.

Renovation and expansion of the Campus Center Complex and Hemenway Hall will allow the University of Hawaiʻi to continue to provide quality education with improved recreational and social opportunities for the campus population. Overall, the net cumulative impact is expected to have a positive effect on the campus, the Mānoa neighborhood and greater Honolulu.

Several other facilities have recently been proposed for the University of Hawaiʻi at Mānoa campus. They include the Performing Arts Facility and the Gartley Hall Renovation. Based on an evaluation of each project's Final Environmental Assessment by the Approving Agency (University of Hawaiʻi at Mānoa), a FONSI was issued. The following is a brief summary of each of these projects.

The Performing Arts Facility will be located mauka of Correa Road between the existing Kennedy Theatre, Keller Hall and Physical Science Building. Since 1987, the University has contemplated a parking structure behind Kennedy Theatre and an "addition" to the Kennedy Theatre (University of Hawaiʻi Mānoa Long Range Development Plan (December 1987). The Performing Arts Facility site is approximately 1.6-acres immediately behind the existing Kennedy Theatre and currently used as a visitor parking area. The proposed expansion includes additional studio, rehearsal, classroom, shops, performance and theatre spaces. The addition will also partially wrap around the existing theatre. Preliminary plans call for a six-story structure with a basement including approximately 60,000 SF of net program area, and approximately 480 parking stalls. As envisioned in the University's Long Range Development Plan, the new parking structure will be integrated with the expanded theatre facilities. The result will be a larger performing arts center and over three times the current on-site parking capacity.

The renovation of Gartley Hall is in the historic quadrangle of the University of Hawaiʻi Mānoa Campus and is listed on the Hawaiʻi Register of Historic Places. Gartley Hall is a historic building which is in need of: environmental remediation, structural modifications, improvements for greater accessibility, as well as greater sustainability features/measures. This project is in the beginning stages of the design process, and construction is not anticipated to begin until March 2010 at the earliest. The proposed renovation of Gartley Hall will not increase the number of students who are currently attending classes within the building, nor increase the number of students attending the University of Hawaiʻi Mānoa Campus

In addition to these projects, the Unviersity of Hawaiʻi released the LRDP 07DEA/PRU for public comment in September 2008. The LRDP was updated to reflect current and upcoming educational priorities. Future buildings and projects are projected into the plan as well as several new "major themes" through a process of consultation with campus administration, students, faculty and community members. Continuing the theme of previous LRDP's, the LRDP Update reverses the existing orientation on campus from vehicles to pedestrians by proposing to remove roads and parking facilities from the heart of the Central Campus to peripheral locations while providing for the addition of approximately 3,000 parking spaces and approximately three million additional square feet of new construction. The following projects are proposed in the LRDP Update for

development over the next ten years; additional instruction facilities at Henke Hall and the College of Education; additional research space at the Biomedical facility and Mauka Campus, replacement facilities for Klum Gym, Johnson Hall and Hale Noelani; expansion of the Law School Library; additional space at Bilger Hall; new faculty housing; new KHET media facilities; additional parking structures; and an addition at the School of Hawaiian Knowledge. The Campus Center Renovation and Expansion, Gartley Hall Renovation, and Performing Arts Facility projects were also included in the LRDP Update.

7.2 SIGNIFICANCE CRITERIA

Based upon the previous information presented in this document the proposed permitting and construction of the Campus Center Renovation and Expansion will likely have no significant environmental impacts. This determination is based upon the Significance Criteria outlined in Chapter 343, HRS, as amended and Title 11 Chapter 200 HAR 1996, discussed below.

(1) ***Involves an irrevocable commitment to loss or destruction of any natural or cultural resource;***

The site's status as six existing buildings plus prior land disturbance suggests that the site is absent of any resources potentially subject to irrevocable loss as a result of construction.

(2) ***Curtails the range of beneficial uses of the environment;***

The Campus Center Renovation and Expansion will not curtail the range of beneficial uses of the environment as the site is currently developed.

(3) ***Conflicts with the State's long term environmental policies or goals and guidelines as expressed in Chapter 344, HRS; and any revisions thereof and amendments thereto, court decisions, or executive orders;***

The Environmental Policies enumerated in Chapter 344, HRS, and NEPA promote conservation of natural resources, and an enhanced quality of life for all citizens. The proposed Campus Center Renovation and Expansion will not significantly impact natural resources due to the fact that the site is already developed with six buildings.

(4) ***Substantially affects the economic or social welfare of the community or State;***

The Campus Center Renovation and Expansion will positively influence social welfare by enhancing higher education opportunities by improving campus activities and student life, while reducing the demand and competition for recreational facilities at nearby County parks.

(5) ***Substantially affects public health;***

The potential impacts related to noise, air or water quality during construction will be addressed through construction management practices in compliance with Federal, State and County requirements. The University's self-imposed mandate in the LRDP to build sustainably will help to ensure that the renovated building will not negatively affect public health during its operation.

(6) ***Involves substantial secondary impacts, such as population changes or effects on public facilities;***

The University anticipates no increase in student population as a result of the Campus Center Renovation and Expansion. The project is proposed to address needs at the current and planned enrollment levels.

(7) ***Involves a substantial degradation of environmental quality;***

No substantial environmental degradation is anticipated. The University has committed itself to a development theme of environmental sustainability, adopted into the LRDP design standards. The project will need to meet minimum applicable statutes and regulations as well as the more stringent self-imposed sustainability requirements.

(8) ***Is individually limited but cumulatively has considerable effect on the environment, or involves a commitment for larger actions;***

The proposed action will not have any substantial negative secondary impacts on the environment. The Campus Center Renovation and Expansion project is consistent with the University's Long Range Development Plan, a public document developed with input by University stakeholders, including the community. This project will not commit the University or the City and County of Honolulu public facilities to any other larger actions, and will not generate any additional actions having a cumulative effect on the environment.

(9) ***Substantially affects a rare, threatened or endangered species or its habitat;***

The Campus Center Renovation and Expansion will occupy a site that is already committed to four permanent and two portable structures. The site contains no habitat for rare, threatened or endangered plant or animal species.

(10) ***Detrimentally affects air or water quality or ambient noise levels;***

Air Quality: No State or Federal air quality standards will be violated during or after the renovation of Campus Center Renovation and Expansion.

Water Quality: No State or Federal water quality standards will be violated during or after the renovation of Campus Center Renovation and Expansion.

Ambient Noise Levels: Construction activities for the development of the property will inevitably create temporary noise impacts. The University's contractors may employ mitigation measures to minimize those temporary noise impacts including the use of mufflers and implementing construction curfew periods. Pursuant to Chapter 11-46, Hawai'i Administrative Rules, the project activities will comply with all community noise controls. Operational noise generated will be properly permitted and insulated.

(11) ***Affects or is likely to suffer damage by being located in an environmentally sensitive area, such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters;***

The project site does not lie in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, estuary, freshwater or coastal waters. Likewise, the Campus Center Renovation and Expansion is not anticipated to have any impact on any natural hazard conditions and no mitigation measures are planned.

(12) ***Substantially affects scenic vistas and view planes identified in County or State plans or studies; or,***

No view planes or scenic vistas identified by the State or County will be impacted by the renovation projects or the Recreation Center Addition.

(13) ***Requires substantial energy consumption.***

The proposed project will increase energy consumption, but may direct some energy consumed at other locations (such as student housing areas, the Makai Campus or even off-campus, to the proposed project. As previously mentioned, energy saving design elements will be integrated into the design of the project.

7.3 ANTICIPATED DETERMINATION

On the basis of impacts and mitigation measures examined in this document and analyzed under the above criteria, it is anticipated that the Campus Center Renovation and Expansion will not have a significant effect on the physical or human environments. Pursuant to Chapter 343, HRS, the approving agency, the University of Hawai'i at Mānoa, anticipates a Finding of No Significant Impact (FONSI).

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APPENDIX A
PRE-CONSULTATION LETTERS AND RESPONSES

POLICE DEPARTMENT

CITY AND COUNTY OF HONOLULU

801 SOUTH BERETANIA STREET · HONOLULU, HAWAII 96813
TELEPHONE: (808) 529-3111 · INTERNET: www.honolulupd.org

MUFI HANNEMANN
MAYOR

BOISSE P. CORREA
CHIEF

PAUL D. PUTZULU
KARL A. GODSEY
DEPUTY CHIEFS

OUR REFERENCE BS-KP

October 22, 2008

Ms. Malia M. Cox
PBR Hawaii and Associates, Inc.
ASB Tower, Suite 650
1001 Bishop Street
Honolulu, Hawaii 96813-3484

Dear Ms. Cox:

This is in response to your letter of October 16, 2008, requesting comments on the Pre-Consultation, Draft Environmental Assessment, for the proposed Campus Center Renovation and Expansion project at the University of Hawaii at Manoa.

This project should have no significant impact on the facilities or operations of the Honolulu Police Department.

If there are any questions, please call Major Robert Green of District 7 at 529-3362 or Mr. Brandon Stone of the Executive Bureau at 529-3644.

Sincerely,

BOISSE P. CORREA
Chief of Police

By
DEBORA A. TANDAL
Assistant Chief of Police
Support Services Bureau

PBR HAWAII
& ASSOCIATES, INC.

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GRANT T. MURAKAMI, AICP
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Wailuku, Hawai'i 96793-1271
Tel: (808) 242-2878

November 21, 2008

Mr. Boisse P. Correa, Police Chief
Police Department, City and County of Honolulu
801 South Beretania Street
Honolulu, Hawaii 96813

Attn: Ms Debora A. Tandal

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED CAMPUS CENTER RENOVATION AND EXPANSION, UNIVERSITY OF HAWAI'I AT MĀNOA, HONOLULU, ISLAND OF O'AHU DRAFT ENVIRONMENTAL ASSESSMENT

Dear Ms. Tandal,

Thank you for your letter dated October 22, 2008 (your reference number BS-KP). We acknowledge you assessment that the project should have no significant impact on the facilities or operations of the Honolulu Police Department.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you have any questions regarding this project, please do not hesitate to contact me at (808) 521-5631.

Sincerely,

PBR HAWAII
Malia M. Cox

CC: Katherine Kealoha, Office of Environmental Quality Control
Bruce Teramoto, University of Hawai'i at Mānoa

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

October 27, 2008

Ms. Malia M. Cox
PBR Hawaii & Associates, Incorporated
1001 Bishop Street, ASB Tower Suite 650
Honolulu, Hawaii 96813-3484

Dear Ms. Cox:

Subject: Your Letter Dated October 20, 2008 on the Environmental Assessment Pre-Consultation for UH Campus Center Renovations, TMK 2-8-023:003

Thank you for the opportunity to comment on the proposed UH Campus Center Renovations.

The existing water system is presently adequate to accommodate the proposed renovations and expansion. However, please be advised that this information is based upon current data and, therefore, the Board of Water Supply reserves the right to change any position or information stated herein up until the final approval of your building permit application. The final decision on the availability of water will be confirmed when the building permit application is submitted for approval.

When water is made available, the applicant will be required to pay our Water System Facilities Charges for resource development, transmission and daily storage.

The on-site fire protection requirements should be coordinated with the Fire Prevention Bureau of the Honolulu Fire Department. The proposed project is subject to Board of Water Supply cross-connection control and backflow prevention requirements prior to issuance of the Building Permit Application.

If you have any questions, please contact Robert Chun at 748-5443.

Very truly yours,

KEITH S. SHIDA
Program Administrator
Customer Care Division

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1787 Wili Pa Loop, Suite 4
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Tel: (808) 242-2878

November 21, 2008

Mr. Keith S. Shida, Principal Executive, Customer Care Division
Board of Water Supply,
630 South Beretania Street
Honolulu, Hawaii 96813

Attn: Mr. Robert Chun

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED CAMPUS CENTER RENOVATION AND EXPANSION, UNIVERSITY OF HAWAI'I AT MĀNOA, HONOLULU, ISLAND OF O'AHU DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Chun,

Thank you for your letter dated October 27, 2008. We offer the following response to your comments.

1. We acknowledge your statement that based on current data, the existing water system is adequate to accommodate the proposed development. We acknowledge that the Board of Water Supply (BWS) reserves the right to change its assessment and the final decision on the availability of water will be confirmed when the building permit application is submitted for approval.

2. We acknowledge that UHM will be required to pay the BWS Water System Facilities Charges for resource development, transmission and daily storage.

3. Please be assured that on-site fire protection requirements will be coordinated with the Fire Prevention Bureau of the Honolulu Fire Department.

4. We acknowledge that Board of Water Supply Cross-Connection Control and Backflow Prevention requirements will be fulfilled prior to the issuance of the building permit.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you have any questions regarding this project, please do not hesitate to contact me at (808) 521-5631.

.

Sincerely,

PBR HAWAII
Malia M. Cox

CC: Katherine Kealoha, Office of Environmental Quality Control
Bruce Teramoto, University of Hawai'i at Mānoa

DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU

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MUFI HANNEMANN
MAYOR

HENRY ENG, FAICP
DIRECTOR

DAVID K. TANOUE
DEPUTY DIRECTOR

2008/ELOG-2583(lk)

October 29, 2008

Ms. Malia M. Cox
PBR Hawaii & Associates, Inc.
1001 Bishop Street
ASB Tower, Suite 650
Honolulu, Hawaii 96813-3484

Dear Ms. Cox:

Subject: Pre-Assessment Consultation
University of Hawaii at Manoa
2444 Dole Street – Manoa
Tax Map Key 2-8-23: 3

This is in response to your October 16, 2008 letter, requesting comments on the proposed Campus Center renovation and addition at the University of Hawaii at Manoa. The project includes the expansion of the Campus Center, including a new recreation facility; the renovation of the Hemenway Hall auditorium; the removal of two (2) of the four (4) buildings in the Engineering Quadrangle; and, the removal or relocation of the PEACESAT and Miller Annex.

The project is proposed under the Long Range Development Plan 2007 Update for the University of Hawaii, Manoa Campus, which will require a new Plan Review Use (PRU) permit. Therefore, the proposed project will be reviewed in conjunction with the new PRU permit application.

If you have any questions, please contact Lynne Kauer of our staff at 768-8016.

Very truly yours,

Henry Eng, FAICP, Director
Department of Planning and Permitting

HE:fm

g:\landuse\posseworkingdirectory\lkauer\08lg2583.doc

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November 21, 2008

Mr. Henry Eng, Director
Department of Planning & Permitting, City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Attn: Lynne Kauer

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED CAMPUS CENTER RENOVATION AND EXPANSION, UNIVERSITY OF HAWAI'I AT MĀNOA, HONOLULU, ISLAND OF O'AHU DRAFT ENVIRONMENTAL ASSESSMENT

Dear Ms. Kauer,

Thank you for your letter dated October 29, 2008 (your reference number 2008/ELOG-2583(lk)). We offer the following response to your comments.

We acknowledge your assessment that the Campus Center Renovation and Expansion has been proposed under the Long Range Development Plan 2007 Update (LRDP) for the University of Hawai'i Mānoa Campus and that this plan will require a new Plan Review Use (PRU) permit. In September 2008, the University prepared a Draft Environmental Assessment/Plan Review Use for the LRDP. The University has been informed that the proposed project will be reviewed in conjunction with the new PRU permit application

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you have any questions regarding this project, please do not hesitate to contact me at (808) 521-5631.

Sincerely,

PBR HAWAII
Malia M. Cox

CC: Katherine Kealoha, Office of Environmental Quality Control
Bruce Teramoto, University of Hawai'i at Mānoa

HONOLULU FIRE DEPARTMENT

CITY AND COUNTY OF HONOLULU

636 South Street
Honolulu, Hawaii 96813-5007
Phone: 808-723-7139 Fax: 808-723-7111 Internet: www.honolulu.gov/hfd

MUFI HANNEMANN
MAYOR

KENNETH G. SILVA
FIRE CHIEF

ALVIN K. TOMITA
DEPUTY FIRE CHIEF

October 30, 2008

Ms. Malia Cox
PBR Hawaii & Associates, Inc.
American Savings Bank Tower
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Ms. Cox:

Subject: Preconsultation for Draft Environmental Assessment
Proposed Campus Center Renovation and Expansion
University of Hawaii at Manoa
Honolulu, Oahu, Hawaii
Tax Map Key: 2-8-023: 003 (Portion)

In response to your letter of October 16, 2008, regarding the above-mentioned subject, the Honolulu Fire Department (HFD) reviewed the material provided and requires that the following be complied with:

1. Provide a fire apparatus access road for every facility, building, or portion of a building hereafter constructed or moved into or within the jurisdiction when any portion of the facility or any portion of an exterior wall of the first story of the building is located more than 150 feet (45 720 mm) from fire apparatus access as measured by an approved route around the exterior of the building or facility. (1997 Uniform Fire Code, Section 902.2.1.)

2. Provide a water supply, approved by the county, capable of supplying the required fire flow for fire protection to all premises upon which facilities or buildings, or portions thereof, are hereafter constructed or moved into or within the county.

   On-site fire hydrants and mains capable of supplying the required fire flow shall be provided when any portion of the facility or building is in

excess of 150 feet (45 720 mm) from a water supply on a fire apparatus access road, as measured by an approved route around the exterior of the facility or building. (1997 Uniform Fire Code, Section 903.2, as amended.)

3. Submit civil drawings to the HFD for review and approval.

Should you have any questions, please call Battalion Chief Socrates Bratakos of our Fire Prevention Bureau at 723-7151.

Sincerely,

KENNETH G. SILVA
Fire Chief

KGS/SK:bh

PBR HAWAII
& ASSOCIATES, INC.

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November 21, 2008

Mr. Kenneth G. Silva, Fire Chief
Fire Department, City and County of Honolulu
636 South Street
Honolulu, Hawaii 96813-5007

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED CAMPUS CENTER RENOVATION AND EXPANSION, UNIVERSITY OF HAWAI'I AT MĀNOA, HONOLULU, ISLAND OF O'AHU DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Silva,

Thank you for your letter dated October 30, 2008. We offer the following response to your comments.

1. Fire apparatus access roads shall be designed and constructed in accordance with the Uniform Fire Code, Section 902.2.1, as amended.
2. Water infrastructure shall be designed and installed in accordance with the Uniform Fire Code, section 903.2, as amended.
3. Civil drawing will be submitted to your department for your review and approval.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you have any questions regarding this project, please do not hesitate to contact me at (808) 521-5631.

.

Sincerely,

PBR HAWAII
Malia M. Cox

CC: Katherine Kealoha, Office of Environmental Quality Control
Bruce Teramoto, University of Hawai'i at Mānoa

APPENDIX B
TRAFFIC IMPACT ANALYSIS REPORT

TRAFFIC IMPACT ANALYSIS REPORT
UNIVERSITY OF HAWAII AT MANOA
LONG RANGE DEVELOPMENT PLAN
2007 UPDATE (CATEGORY I)

Manoa, Honolulu, Hawaii

October 26, 2007

Prepared for:

Group 70 international

Austin, Tsutsumi & Associates, Inc.
Civil Engineers • Surveyors
501 Sumner Street, Suite 521
Honolulu, Hawaii 96817-5031
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E-mail: atahnl@atahawaii.com
Honolulu • Wailuku, Hawaii

TRAFFIC IMPACT ANALYSIS REPORT
University of Hawaii at Manoa Long Range Development
Plan 2007 Update (Category I)
Manoa, Honolulu, Hawaii

Prepared for

Group 70 International

Prepared by
Austin, Tsutsumi & Associates, Inc.
Civil Engineers • Surveyors
Honolulu • Wailuku, Hawaii

October 26, 2007

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APPENDICES

TRAFFIC IMPACT ASSESSMENT REPORT

University of Hawaii at Manoa

Long Range Development Plan 2007 Update (Category I)

Manoa, Honolulu, Hawaii

I. INTRODUCTION

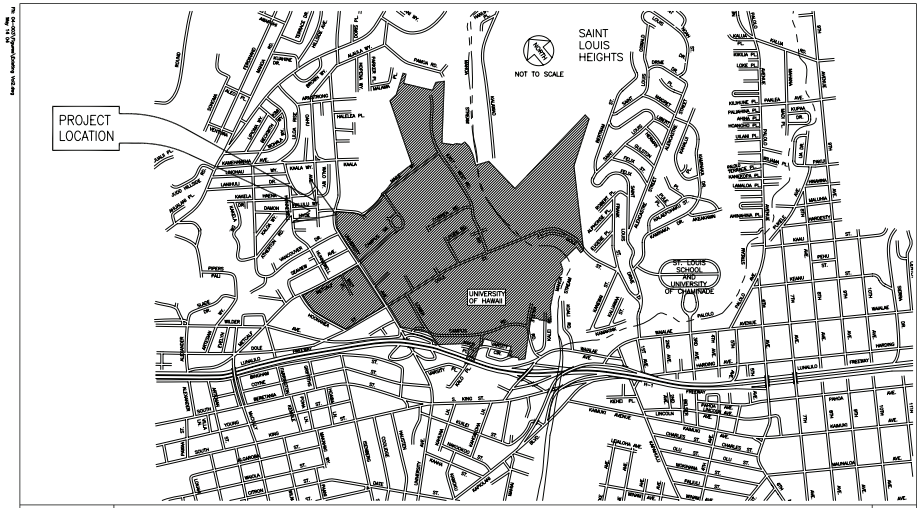
This report documents the findings of a traffic study conducted by Austin, Tsutsumi & Associates, Inc. (ATA) to evaluate the potential traffic impacts resulting from the University of Hawaii Long Range Development Plan 2007 Update – Category I, which shall be referred to hereinafter as "LRDP".

A. Background

As stated in the LRDP, throughout its early years, the University of Hawaii at Manoa (UHM) was developed without the benefit of a formalized development plan. In 1987, the first LRDP was completed and adopted, with the goal of coordinating growth and removing vehicular traffic from the center of its campus. The LRDP was subsequently updated in 1994, and is in the process of being updated for a second time.

B. Location

The University of Hawaii, Manoa Campus (UHM) is situated at the entrance to Manoa Valley, and is bordered by the communities of Saint Louis Heights, Moiliili, and Manoa. The H-1 Freeway lies just south of UHM. Figure 1 shows the project location.



C. Project Description

The intent of this report is to assess the potential traffic impacts arising from the LRDP. The current plan includes numerous building and parking improvements, including:

- Law School Expansion
- Campus Center Expansion to the Northeast
- Instruction Building and Henke Hall Site
- Kennedy Theatre Expansion
- **Parking Structure at Kennedy Theatre (480 parking Stalls)**
- **Parking Structure IIB/Bookstore (900 Parking Stalls)**
- Research Buildings – North and East of Biomedical Building
- Research Space – Infill of South Courtyard of Biomedical Building
- Research Buildings – Mauka Campus
- Instruction Building – College of Education
- I.T.S. – Bilger Hall Addition, Phase II
- Media Facilities at KHET Site
- Johnson Hall – Replacement Dormitory
- Hale Noelani – Replacement Dormitory
- Faculty Housing – Waahila Ridge or Mauka Campus
- Klum Gym Replacement
- School of Hawaiian Knowledge

Relative to traffic analysis, the additional parking structures will be the only part of the LRDP that will significantly affect traffic operations along the roadways within the area. This is due to the fact that traffic projections for

Universities are generally based upon student enrollment, which is not projected to increase (see Section IV). See Figure 2 for Site Plan.

D. Study Methodology

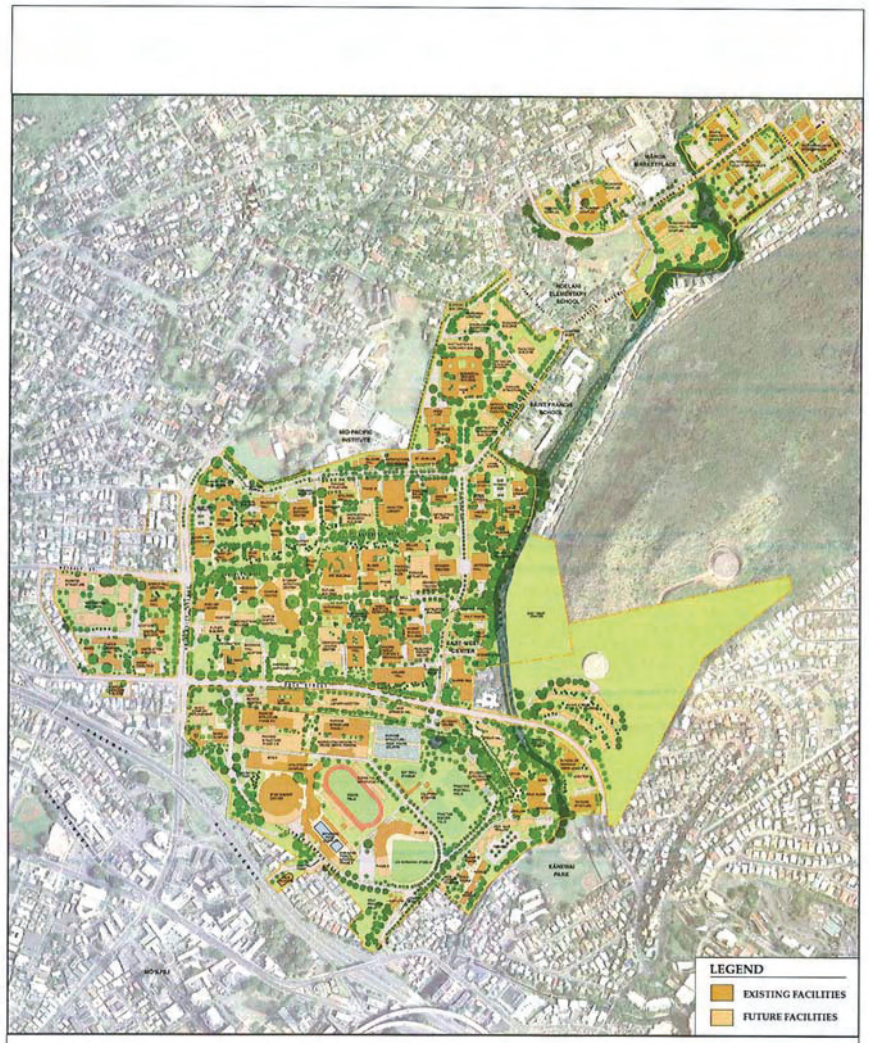
This study will address the following:

1. Existing traffic operating conditions at key locations within the study area.
2. Base Year 2017 (buildout year for LRDP) traffic projections (without LRDP) including traffic generated by a defacto growth rate. Note: LRDP Category I includes improvements for a timeframe of 5-10 years.
3. Identify potential traffic mitigation measures for the Base Year 2017 Traffic.
4. Trip generation and traffic assignment characteristics.
5. Determination of the impact of Project-generated traffic.

Recommendations for roadway improvements or other mitigative measures, as appropriate, to reduce or eliminate the adverse impacts resulting from traffic generated by the LRDP.

E. Definitions

- **Base Year 2017** – describes scenario where vehicular traffic volumes for the year 2017 are projected without the traffic generated by the LRDP. In simple terms, this is the "no-build" or "do-nothing" alternative.
- **High, or Heavy Turning Movement Volume –** a subjective term that for this report; shall be used to describe conditions where the turning movement volume forms a significant component of the traffic processed through the intersection, and noticeably reduces capacity along the main arterial. This term can apply to a single heavy turning movement, or the collective effect of all turning movements.
- **Mitigation** – applies to recommendations aimed at improving unsatisfactory traffic conditions (i.e. LOS = F, volume/capacity ratio>1) experienced as a result of Base Year 2017 conditions.
- **Year 2017 with Project** – describes estimated vehicular traffic volumes for the year 2017 with the traffic generated by the LRDP.



UNIVERSITY OF HAWAII AT MANOA
LRDP UPDATE 2007

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

SITE PLAN

FIGURE 2

- **Level-of-Service (LOS)** – as based on The Highway Capacity Manual – Special Report 209 (HCM), dated 2000, LOS is a qualitative measure used to describe the conditions of traffic flow at intersections. Values range from LOS A (minimal delay) to LOS F (congested).
- **Trips** – for the purposes of this report, vehicular trips traversing the roadway network. Note that this term can also signify other modes of transportation, however vehicular trips will be the only trips considered in this report.
- For a complete glossary of terms, refer to Appendix E.

II. EXISTING CONDITIONS

A. General

UHM has been divided into three (3) distinct areas throughout the LRDP as follows:

The Central Campus is bounded by University Avenue, Dole Street, East-West Road, Maile Way, and extends mauka to Pamoa Road, between Mid-Pacific Institute and Saint Francis School. The other part of the Central Campus is the College of Education, which is bounded by University Avenue, Metcalf Street, Hoonanea Street, and Dole Street. Vehicular access to the Central Campus is provided via the Dole Street/East-West Road and University Avenue/Maile Way intersections.

The Upper Campus is bounded by Maile Way, Mid-Pacific Institute, Pamoa Road residences, and Saint Francis School.

The Makai Campus, also called the "Quarry" or "Lower Campus" is bounded by Dole Street, University Avenue, the H-1 Freeway, and Manoa Stream. Access to the Makai Campus is provided via Lower Campus Road at Dole Street, Old Waialae Road at Kalei Road, Varsity Place in Varsity Circle, and a direct off-ramp connection from the westbound H-1 Freeway.

B. Roadway System

The following are brief descriptions of the existing roadway network in the vicinity of UHM:

University Avenue is a six-lane, north-south major collector roadway in the vicinity of UHM. North of Maile Way, the roadway narrows to two (2) lanes. South of The H-1 Freeway, the roadway narrows to four (4) lanes with channelization.

In addition to UHM, this roadway serves as one (1) of two (2) primary access roads into Manoa Valley, which is comprised primarily of residential land uses. South of UHM, on-ramps and off-ramps to the Eastbound/Westbound H-1 Freeway are provided.

University Avenue ultimately terminates at Ala Wai School.

H-1 Freeway is a six-lane divided freeway in the vicinity of UHM. On-ramps and Off-ramps to University Avenue and Old Waialae Road are provided in the vicinity of UHM.

South King Street is a five-lane, one-way eastbound major arterial west of University Avenue. East of University Avenue, the road combines with its westbound couplet Beretania Street and continues as a six-lane, two-way Major Arterial, eventually terminating at its intersection with Kapahulu Avenue.

Beretania Street is a three-lane, one-way westbound arterial west of University Avenue. Beretania Street begins at University Avenue when it recombines with South King Street.

Waialae Avenue is a six-lane, two-way east-west arterial roadway in the vicinity of UH Manoa. Contra-flow operation occurs during PM peak hour of traffic.

East-West Road is a two-lane UHM campus road that provides access from Dole Street onto the heart of UHM's campus.

Dole Street is a four-lane, two-way east-west collector road between University Avenue and East-West road, where it is otherwise a two-lane collector road.

Saint Louis Drive is generally a two-lane, two-way north-south collector road. South of its intersection with Dole Street, this road provides one lane in the northbound direction, and three lanes in the southbound direction.

Metcalf Street is a two-lane, two-way east-west collector road that begins at its intersection with Alexander Street (near H-1 Freeway Westbound On-Ramp) to the west and terminates at University Avenue, where it continues eastward as Campus Road, which is incidentally inaccessible to vehicles from University Avenue.

Maile Way is a two-lane, two-way east-west minor collector raod that begins at its intersection with Oahu Street and terminates within the University Campus at its intersection with East-West Road.

Varsity Place is a two-lane, two-way, east-west county road that begins at its intersection with University Avenue and terminates at its intersection with Varsity Circle.

Old Waialae Road is a three-lane, one-way westbound arterial road, which begins at Waialae Avenue to the East and ends at near the.Humane Society.

Figure 3 shows the existing lane configuration at the study intersections.

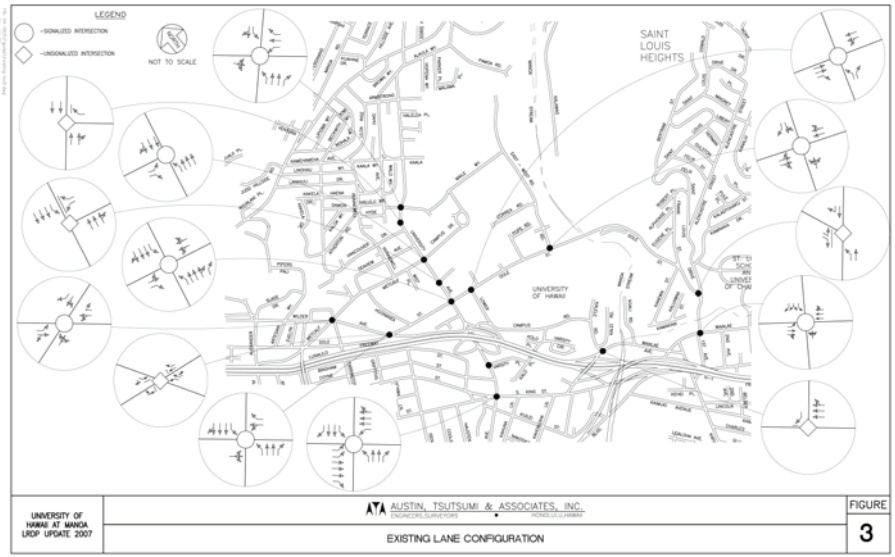
C. Existing Traffic Volumes

The hourly turning movement data utilized in this report was collected by ATA between Tuesday, April 20 and Thursday, April 22, 2004. Traffic Counts were redone at the University Avenue/Dole Street intersection on September 13, 2007. The counts showed a slight decrease in volume during the PM peak hour of traffic, and a negligible increase during the AM peak hour of traffic.

Due to proximity to UHM, the following intersections were studied:

- King Street/Beretania Street/Waialae Avenue/University Avenue (signalized)
- University Avenue/Dole Street (signalized)
- University Avenue/Sinclair Parking Lot (signalized)
- University Avenue/Metcalf Street (signalized)
- University Avenue/School of Architecture entrance/exit (unsignalized)
- University Avenue/Maile Way (signalized)

- Wilder Street/Dole Street (unsignalized)
- Wilder Street/Metcalf Street (signalized)
- Dole Street/Lower Campus Road (signalized)
- Dole Street/East-West Road (signalized)
- Dole Street/Saint Louis Heights Drive (unsignalized)
- Waialae Avenue/Saint Louis Heights Drive (signalized)
- University Avenue/Varsity Place (signalized)



UNIVERSITY OF HAWAII AT MANOA LRDP UPDATE 2007

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS/SURVEYORS HONOLULU, HAWAII

EXISTING LANE CONFIGURATION

FIGURE 3

Based on traffic count data, the peak hours of traffic were determined to be from 6:45 AM to 7:45 AM and 4:30 PM to 5:30 PM on weekdays. The traffic count data is provided in Appendix A. See Figure 3 for existing lane configurations.

D. Existing Traffic Conditions Analysis and Observations

Level of Service (LOS) is a qualitative measure used to describe the conditions of traffic flow at intersections, with values ranging from free-flow conditions at LOS A to congested conditions at LOS F. The Highway Capacity Manual – Special Report 209 (HCM), dated 2000, methods for calculating volume to capacity ratios, delays and corresponding Levels of Service were utilized in this study. LOS definitions for signalized intersections are provided in Appendix B.

The Manual on Uniform Traffic Control Devices, 2003 edition (MUTCD) recommends that successive intersections along a major arterial and within proximity of less than a half of a mile of each have their timing optimized and coordinated in order to facilitate optimal vehicular flow along the arterial. Currently, most of the signalized intersections along the following arterials meet this criterion:

- South King Street,
- Beretania Street,
- University Avenue (only between Varsity Place and King Street)

The University Avenue/Dole Street and Dole Street/Lower Campus Road intersections are not currently coordinated. Coordination is accomplished by ensuring that each intersection within the coordinated region is bound by the same cycle length (or multiples thereof), and that the through traffic on the major arterial in the peak direction is allowed to flow at carefully planned offsets (see Appendix E for definition) through consecutive intersections. This reduces the "stop and go" effect that drivers experience on uncoordinated systems, where red lights sometimes appear at each successive intersection, thus increasing motorist frustration and delay.

As a consequence of coordination and fixed-cycle lengths in general, vehicles traversing the minor approaches and those making the left-turn movement off of the main road often must wait at the intersection, despite the absence of vehicles traversing the main road.

Methodology

Analysis for the study intersections was performed using Synchro, which is able to prepare reports based on the methodologies prescribed by the HCM. These reports contain control delay results, as based on intersection lane geometry, signal timing (including coordination and actuated minimums and maximums), and hourly traffic volume. Based on the vehicular delay at the intersection, a LOS is assigned (see Appendix B) as a qualitative measure of performance. These results, as confirmed or refined by field observations, constitute the technical analysis that will form the basis of the recommendations outlined in this report.

Regional Analysis

UHM lies at the base of Manoa, which is a primarily residential town, to which access provided solely through University Avenue and Punahou Street. Relative to vehicular travel to and from the campus, much of the regional traffic arrives via the H-1 Freeway, King Street, Beretania Street, or Waialae Avenue. During the AM and PM peak hours of traffic, regional congestion occurs along all of these major roads, which is consistent with conditions throughout much of the urbanized areas of Oahu.

Results of Intersection Analysis

The analysis and observations described below are based on prevailing conditions during the time at which the data was collected in 2004, and reassessed in 2007, with little noticeable change. Hereinafter, observations that are expressed as ongoing and current shall represent the conditions that prevailed at the times during which field observations were taken in 2004 and 2007.

South King Street/Beretania Street/University Avenue

In addition to the Manoa and UHM traffic, this intersection experiences a heavy regional component along South King Street and Beretania Street during the peak hours of traffic. During the PM peak hour of traffic, queues in the eastbound direction along King Street at times extend beyond Star Market (approximately 1,000 feet) in all lanes.

Although other potential bottlenecks exist downstream along South King Street, one hindrance to vehicular flow in the eastbound direction near this intersection is the permitting of left-turns into driveways despite the absence of channelized left-turn lanes. This occurs between University Avenue and the Humane Society. This decreases the effective capacity of South King Street, as left-turning vehicles wait for openings in opposing traffic, which are few and far between.

Westbound traffic along South King Street and Beretania Street in this area is generally constrained due to the prevailing regional congestion caused by commuters during the afternoon peak hour of traffic. Successive downstream bottlenecks occur at McCully Street, Punahou Street, Piikoi Street, and Ward Avenue. Traffic generally queues back to the humane society.

As a result of this prevailing congestion, northbound and southbound traffic along University Avenue are also affected, wherein southbound traffic often must wait for two (2) or more traffic signal cycles before passing through the intersection.

University Avenue/Dole Street

Due to the fact that this intersection serves as a junction point between Manoa Residents, students accessing the Quarry Parking Lot and Central Campus, Moiliili residences, and the H-1 Freeway, congestion occurs here.

One problem observed during the AM peak hour of traffic is that vehicles traveling in the northbound direction queue back beyond the H-1 Freeway off-ramps (approximately 1000 feet) due to:

- Prohibition of right-turn-on-red in the northbound direction, although an extraordinarily high number of right-turns occur (648) during the AM peak hour of traffic;
- Weaving pattern – vehicles exiting the H-1 Freeway off-ramps in the northbound direction along University Avenue do not always make the right-turn. In fact, their destinations may include Saint Francis School, the Mid Pacific Institution, the University Lab School, Manoa, UHM's Maile Way Gate, Moiliili, and U-turns towards the south. As these vehicles exit, they attempt to move towards the center and left lanes while the prevailing queue hinders this movement. Furthermore, especially during the AM peak hour of traffic, after exiting the H-1 Freeway eastbound and westbound Off-Ramps, vehicles immediately move towards the left lane in order to make u-turns;
- Current information indicates that the University Avenue/Dole Street and the Dole Street/Lower Campus Road intersections are not coordinated. This could be a contributing factor to problems at these intersections.

The result of this is a vehicular queue that causes queues to extend through the H-1 Freeway off-ramps and onto the Freeway.

During the PM peak hour, congestion in the westbound direction queues back beyond the Dole Street/Lower Campus Road intersection and near the Law School Library. This often reduces the ability of vehicles to make the northbound left-turn out of Lower Campus Road onto Dole Street.

University Avenue/Sinclair Parking Lot

This intersection serves the Sinclair Library and Bachman Hall Parking Lots and the Bus Turnaround. The entering/exiting volume is relatively low. However, it has been observed that the busses have difficulty making westbound left-turn onto University Avenue.

University Avenue/Metcalf Street

Vehicles generally flow smoothly through this intersection.

University Avenue/School of Architecture Entrance/Exit

Vehicles generally flow smoothly through this intersection, which operates as right-in/right-out.

University Avenue/Maile Way

Although analysis indicates that this intersection operates at LOS B during the AM and PM peak hours of traffic, vehicular flow in the northbound is often impeded by:

- Narrowing of University Avenue to two (2) lanes immediately north of the University Avenue/Maile Way intersection,
- Occasional School Bus Stoppages (near the Mid-Pacific Institute) during the AM peak hour of traffic, and
- Operations at signalized intersection of University Avenue and Kaala Street, which incidentally provides access to the Mid-Pacific Institute. No chanellized lanes are currently provided at this intersection.

Wilder Avenue/Dole Street

While the high-volume H-1 Freeway off-ramp movements experience relatively unimpeded flow, through and left-turning traffic along Dole Street experience LOS F. Furthermore, downstream congestion occurs along Wilder Avenue during the PM peak hour of traffic.

Wilder Avenue/Metcalf Street

According to HCM analysis, this intersection operates at LOS E or better on all approaches during the AM and PM peak hour of traffic. However, downstream congestion does occur along Wilder Avenue in the westbound direction during the PM peak hour of traffic and in the eastbound direction during the AM peak hour of traffic.

Dole Street/Lower Campus Road

This intersection serves as the highest volume access road into the Makai Campus. Currently, 3,509 parking stalls exist within the Makai Campus. These stalls, in combination with drop-off/pick-up turn-around's at the Music Building

and Law School Parking Lot, contribute to the high turning movement volume into and out of this intersection.

During the AM peak hour of traffic, 490 vehicles make the eastbound right-turn into Lower Campus Road. Some of the congestion along University Avenue can be attributed to this.

During the PM peak hour of traffic, approximately 271 vehicles make the northbound left-turn out of Lower Campus Road and westbound onto Dole Street, whereupon they immediately meet the westbound queue generated by the University Avenue/Dole Street intersection.

Dole Street/East-West Road

This intersection operates relatively smoothly during both the AM and PM peak hours of traffic.

Dole Street/Saint Louis Heights Drive

Although traffic making the southeastbound left-turn experience LOS F during the PM peak hour of Traffic, the volume for this movement is low. Furthermore, traffic was observed to operate relatively smoothly at this intersection, with no significant queues occurring during the AM and PM peak hours of traffic.

Waialae Avenue/Saint Louis Heights Drive

During the AM peak hour of traffic, congestion was observed to occur in the westbound direction, where queues were observed to extend as far as 10th Avenue during the AM peak hour of traffic, primarily in the right and center lanes.

During the PM peak hour of traffic, similar congestion occurs in the westbound direction along Waialae Avenue. Although there is a brief reprieve west of Saint Louis Drive, congested conditions resume along Old Waialae Road, the H-1 Freeway and King Street further westward.

University Avenue/Varsity Place

Traffic at this intersection is affected by downstream conditions at the South King Street/Beretania Street/University Avenue intersection. Westbound queues sometimes extend as far back as Varsity Circle. To exacerbate matters, the left-turn movements into driveways and side streets are allowed in the

northbound and southbound direction immediately south of this intersection along University Avenue. Due to the absence of left-turn lanes along University Avenue, the capacity of this roadway segment is decreased significantly, primarily during the PM peak hour of Traffic.

Figure 4 shows the existing traffic volumes and overall LOS for the study intersections. See Table 1 for LOS for at individual turning movements.

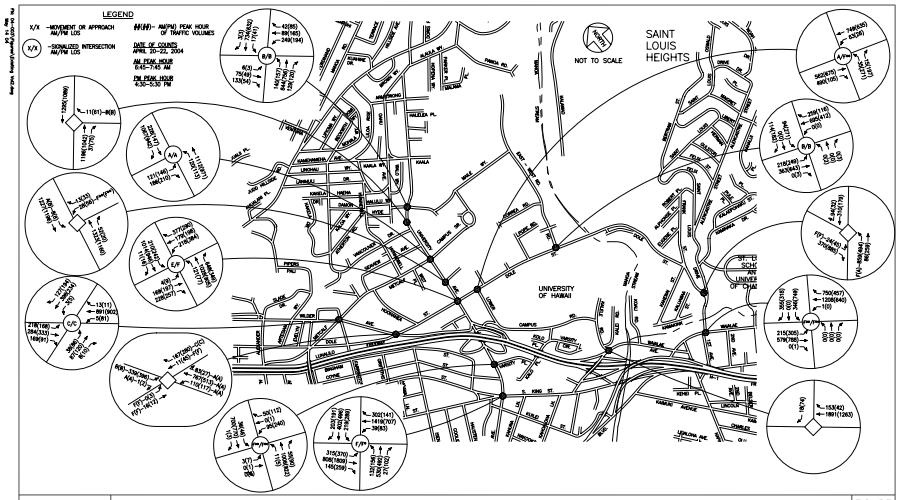


TABLE 1
Existing Level of Service Summary

Intersection	Existing AM LOS	Existing PM LOS
South King Street/Beretania Street/University Avenue		
EB LT	F	E
EB TH	C	D
EB RT	B	C
WB LT	F	F
WB TH/RT	F*	D
NB LT	F	F*
NB TH	F	F
NB RT	D	D
SB LT	F*	F*
SB TH	D	D
SB RT	D	D
OVERALL	*F*	*F**
University Avenue/Varsity Place		
EB LT/TH/RT	C	C
WB LT/TH	D	D
WB RT	C	C
NB LT	A	A
NB TH	A	A
NB RT	A	B
SB LT	A	A
SB TH	A	A
OVERALL	*F***	*F***
University Avenue/Dole Street		
EB LT/TH	D	E
EB RT	D	D
WB LT/TH/RT	E	F
NB LT	E	E
NB TH/RT	F*	F*
NB RT	B	B
SB LT	E	E
SB TH/RT	D	D
OVERALL	*E*	*F*
University Avenue/Sinclair Parking Lot		
WB LT	F**	F**
SB LT	B	A

* V/C ratio > 1.0
** Effective LOS F Due to Downstream Conditions

TABLE 1
Existing Level of Service Summary

Intersection	Existing AM LOS	Existing PM LOS
University Avenue/Metcalf Street		
EB LT	C	B
EB RT	C	B
NB LT	A	B
NB TH	A	A
SB TH/RT	A	A
OVERALL	*A*	*A*
University Avenue/School of Architecture		
WB RT	B	B
University Avenue/Maile Way		
SEB LT/TH/RT	C	B
NWB LT	E	C
NWB TH	C	B
NWB RT	B	B
NEB LT	C	B
NEB TH	A	A
NEB RT	A	A
SWB LT	A	A
SWB TH/RT	B	A
OVERALL	*B*	*B*
Dole Street/Wilder Street		
EB LT/TH	F	F
WB TH	F	F
WB RT	C	C
NB LT/TH	A	A
SB LT	B	B
Wilder Street/Metcalf Street		
EB LT/TH/RT	C	E
WB TH/LT	D	C
WB RT	B	B
SEB LT	B	B
SEB TH/RT	B	A
NWB LT/TH/RT	C	C
OVERALL	*C*	*C*
Dole Street/Lower Campus Road		
EB TH	A	A
EB RT	A	A
WB LT/TH	A	A
NB LT	C	F**
NB RT	C	B
OVERALL	*A*	*F***

* V/C ratio > 1.0
** Effective LOS F Due to Downstream Conditions

TABLE 1
Existing Level of Service Summary

Intersection	Existing AM LOS	Existing PM LOS
Dole Street/East-West Road		
EB LT/TH	B	A
WB TH/RT	B	C
NB LT/TH/RT	A	B
SB LT/TH	C	B
SB RT	C	B
OVERALL	*B*	*B*
Dole Street/Saint Louis Heights Drive		
NB LT	F	A
SEB LT	F	F
Waialae/Saint Louis Heights Drive		
EB LT	D	F*
EB TH	A	A
WB TH/RT	F*	D
SB LT	B	C
SB TH	B	C
SB RT	B	B
OVERALL	*E*	*C*

* V/C ratio > 1.0
** Effective LOS F Due to Downstream Conditions

III. BASE YEAR 2017 SCENARIO *(see section I.D. for definition)*

*Base Year 2017 = (Existing Traffic * Growth Factor)*
Where Growth Factor = (1 + defacto growth rate) ^ 10

The Year 2017 was selected as the Base Year to reflect the time table for Category 1 of the LRDP (5-10 Years). Base Year 2017 projections were formulated by applying a defacto growth rate, described in the following section, to existing hourly vehicular traffic volumes.

A. Defacto Growth Rate

The State Department of Transportation (SDOT) performs 24-hour traffic counts annually at various locations on Oahu. Based on this data, it was possible to estimate the prevailing regional growth along King Street and Waialae Avenue, which is predicted to be approximately 1 percent, annually. By the year 2017, this equates to a 10.5 percent increase over existing conditions. No growth was projected near the University, since the LRDP projects that UHM's student enrollment will remain stable, and that not much more residential or commercial development will occur within the area.

B. Base Year 2017 Traffic and Analysis

Based on the defacto growth rate, regional traffic will increase along King Street, Waialae Avenue, and Beretania Street. However, most of the study intersections will experience a relatively stable demand, due to the fact that development and student base within the area is projected to remain constant for all intents and purposes.

LOS F conditions will continue to occur at the following intersections:

- South King Street/Beretania Street/University Avenue*
- University Avenue/Varsity Place*
- University Avenue/Dole Street*
- University Avenue/Sinclair Parking Lot*
- Dole Street/Wilder Avenue
- Dole Street/Lower Campus Road*
- Dole Street/Saint Louis Heights Drive

- Waialae Avenue/Saint Louis Heights Drive

* Indicates that Mitigation is proposed in Section III C.

While mitigation is proposed to address the intersections with asterisks after them, the remaining intersections will be discussed below.

Dole Street/Wilder Avenue

The northbound approach to this intersection is a busy freeway off-ramp, whose vehicular flow should not be impeded to accommodate minor street traffic. Wilder Avenue, in general, is congested downstream in the westbound direction during the AM and PM peak hours of traffic due heavy school traffic caused by Punahou and Maryknoll schools. Therefore, no mitigation is recommended for this intersection.

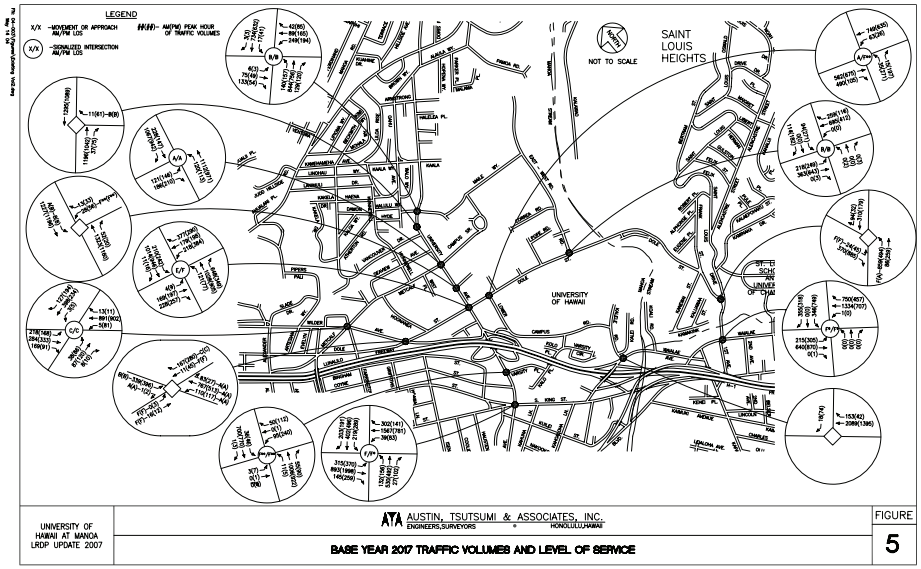
Dole Street/Saint Louis Heights Drive

While turning movement analysis indicates that the eastbound left-turn movement at this intersection will continue to operate at LOS F during the PM peak hour of traffic, this intersection was not observed to be problematic during the AM or PM peak hours of traffic. Furthermore, with only 25(45) vehicles making this turn during the AM(PM) peak hours of traffic, a traffic signal will not be warranted. No mitigation is recommended for this intersection.

Waialae Avenue/Saint Louis Heights Drive

This intersection currently operates at an observed LOS F during the AM and PM peak hours of traffic. However, due to limited right-of-way, no geometric improvements can be made at this intersection.

See Figure 5 for Base Year 2017 traffic volumes and Overall LOS.



C. Base Year 2017 Mitigative Measures

The Base Year 2017 mitigative measures are designed to improve conditions at intersections that are projected to operate unsatisfactorily during Base Year 2017, regardless of whether or not the LRDP is implemented.

University Avenue/Dole Street and Dole Street/Lower Campus Road Intersections

Mitigation is recommended to improve operating efficiency of this intersection. As discussed earlier, during the AM peak hour of traffic, there is a lack of capacity in both the northbound and westbound directions that generates vehicular queues that extend onto the H-1 Freeway's Westbound and Eastbound off-ramps at times, ultimately causing a safety hazard along the H-1 Freeway, as fast-moving vehicles encounter vehicles in queue. The improvements recommended below seek to reduce this congestion.

Intersection analysis indicates that that traffic in the northbound direction is and will continue to operate beyond its capacity. This problem can be addressed by the following modifications:

Phase I

Reconfigure the westbound approach to the University Avenue/Dole Street intersection to incorporate an exclusive left-turn lane, a shared left-turn/through lane, and an exclusive right-turn lane, with storage extending approximately 100 feet east of the University Avenue/Lower Campus Road intersection. This mitigative measure could potentially necessitate the relocation of the historic Gateway structures located along University Avenue.

The effect of Phase I would be to eliminate over-capacity conditions. However, the southbound left-turn movement would still expericnce LOS F during the PM peak hour of traffic.

See Figure 6 for existing lane configuration, and Figure 7 for Phase I modifications.

Phase II

Reconfigure the northbound approach to the University Avenue/Dole Street intersection to incorporate three (3) exclusive through lanes and two exclusive right-turn lanes, the rightmost of which would directly connect with the H-1 Freeway Westbound Off-Ramp. In conjunction with this, modify the Dole Street/Lower Campus Road intersection to incorporate one (1) Eastbound through lane, an eastbound shared through/right-tum lane, and an exclusive right-turn lane. Note that these modifications could potentially necessitate the relocation of the existing monkeypod trees along University Avenue, and reduce the available parking within the Music Building Complex.

Phase II, when implemented without Phase I, would produce a similar result as phase I, in that over-capacity conditions would be eliminated, and that the southbound left-turn movement would continue to experience LOS F, while the eastbound and westbound approaches would experience LOS E during the PM peak hour of traffic.

Phase I & II

HCM analysis indicates that the effect of implementing phases I and II in combination would improve the overall delay of the intersection from 73.1 (56.6) seconds during the AM (PM) peak hours of traffic to 38.8 (39.9) seconds, with all movements at the intersection operating at LOS E or better during both periods. It should be noted that at the Dole Street/Lower Campus Road intersection, the lane modification will reduce the number of lanes that drivers need to cross to enter the Lower Campus Road, thereby reducing capacity reductions caused by weaving movements.

It is recommended that Phases I and II be implemented as a mitigative measure, while recognizing that the intent of this geometric augmentation would be to improve conditions for vehicles traveling northbound along University Avenue. Although vehicular flow will also improve in the westbound direction during the PM peak hour of traffic,

such benefits would generally be realized locally, given that existing bottlenecks occur downstream at the following locations:

- University Avenue/H-1 Freeway Eastbound On-ramp
- University Avenue/H-1 Freeway Westbound On-ramp
- South King Street/Beretania Street/University Avenue
- Dole Street/Wilder Street
- University Avenue, south of Maile Way

Mitigation of these problems would require costly modifications, including improving congestion along the entire corridor. The H-1 Freeway, Beretania Street, and South King Street would all have to be widened to accomplish this. However, the implementation of the Rapid Transit System will ultimately reduce future vehicular traffic demand.

See Figure 8 for an illustration of Phases I and II.

Figure 6: Existing Lane Configuration at University Avenue Intersections with Dole Street and Lower Campus Road

Figure 7: Phase I Modifications

Figure 8: Phases I and II Modifications

Turning Movement Restriction

During field observations, it was noted that along South King Street, east of University Avenue, and University Avenue in the Varsity Area, vehicular flow was hampered by the allowing of left-turns into driveways and small side streets.

Varsity Area

Vehicles turning left from the southbound direction cause other vehicles to switch lanes to maneuver around them. Due to the lack of an acceptable gap in northbound traffic, these vehicles often cause those behind them to arrive at the South King Street/Beretania Street/University Avenue intersection after the signal indication has turned red. The resulting flow interruptions have implications along University Avenue in this area, due to the fact that the current cycle length at that intersection is 170 seconds. Effectively, all of the vehicles impacted by this problem will be delayed by a additional two minutes, fifty seconds as the traffic signal cycles through all of its phases again. Operations at the University Avenue/Varsity Place intersection are also affected by this problem.

Similarly, in the northbound direction left-turns impede the flow of the approximately 1000 vehicles (for both AM and PM peak hours of traffic) traveling in the northbound direction, sometimes reducing the upstream capacity of the South King Street/Beretania Street/University Avenue intersection.

South King Street – East of University Avenue

South King Street, east of University Avenue has become a bottleneck for eastbound traffic during the PM peak hour of traffic. It has been observed that vehicles traveling eastbound along South King Street are affected by vehicles making left-turns into driveways, and at the signalized intersection near the Seven Eleven/Aloha Gas station.

Based on the conditions described above, it is recommended that a dialogue be initiated between community members and the City to assess the potential for left-turn prohibitions during the PM peak hour of traffic for:

- Northbound and southbound University Avenue traffic, south of Varsity Place, and north of King Street
- Eastbound South King Street traffic, East of University Avenue and west of the Humane Society.

It is recognized that the merit of this mitigative measure will have to be balanced with the needs of the local community and businesses.

It should be noted that should these prohibitions be implemented, they would not eliminate LOS F at the South King Street/Beretania Street/University Avenue intersection. However, they would improve the efficiency of the intersection and the capacity of University Avenue and South King Street in the area.

University Avenue/Sinclair Library Driveway

While this intersection experiences a relatively low turning movement volume and operates at LOS B, the bus traffic that passes through the turnaround often have difficulty making the westbound left-turn out of the driveway. Therefore, it is recommended that a traffic signal be installed to facilitate this movement. In conjunction with this, it is recommended that the bus stop located along University Avenue, just north of Dole Street be relocated to the existing bus turnaround at this intersection.

University Avenue/Maile Way

Although HCM analysis indicates that this intersection operates at LOS C(B) during the AM (PM) peak hours of traffic, existing operations have been observed to be worse, especially during the AM peak hour of traffic, where vehicles destined towards the Mid Pacific Institute and Saint Francis cause the downstream intersection (Kaala Street) to be overburdened. Currently, this intersection only provides a single lane at each approach, with no channelization (turning lanes). It is therefore recommended that a dialogue be initiated between community members and the City to assess the feasibility for widening the segment of University Avenue between Kaala Street and Maile Way to incorporate a second northbound lane. This lane would terminate at Kaala Street as an exclusive right-turn lane.

Figure 9 shows the traffic volumes and overall LOS. Table 2 compares the individual turning movement LOS for Base Year 2017 with/without mitigation with existing conditions.

Traffic Signal Coordination along University Avenue and Dole Street/Lower Campus Road

All of the signalized intersections along University Avenue between Dole Street and Maile Way, and the Dole Street/Lower Campus Road intersection are within approximately 1000 feet or less of each other. Therefore, in order to facilitate flow between these intersections, it is recommended that the following intersections be coordinated:

- University Avenue/Maile Way
- University Avenue/Metcalf Street
- University Avenue/Sinclair Library Parking Lot (New Signal)
- University Avenue/Dole Street
- Dole Street/Lower Campus Road

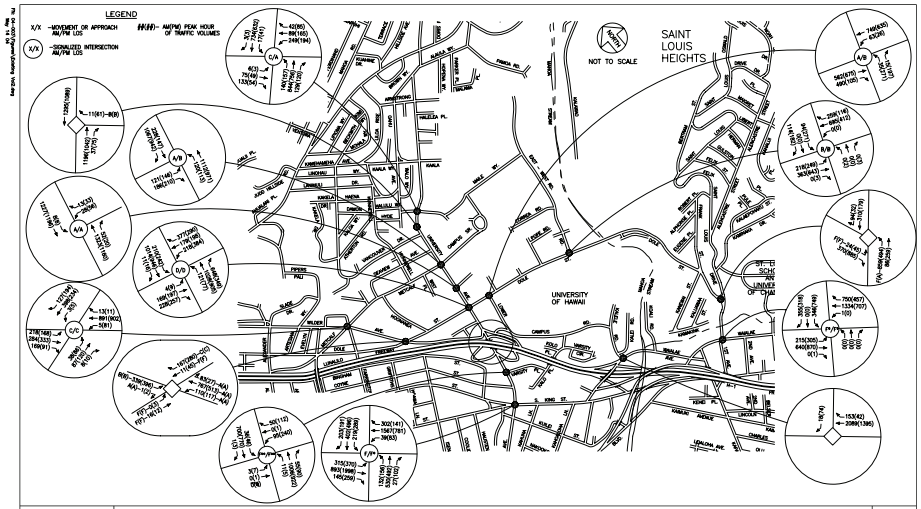


TABLE 2
Base Year 2017 Level of Service Summary

Intersection	Existing AM LOS	Existing PM LOS	Base 2017 (Timings Optimized) AM LOS	Base 2017 (Timings Optimized) PM LOS	Base 2017 with Mitigation AM LOS	Base 2017 with Mitigation PM LOS
South King Street/Beretania Street/University Avenue						
EB LT	F	E	F*	E		
EB TH	C	D	C	F*		
EB RT	B	C	B	C		
WB LT	F	F	F	F*		
WB TH/RT	F*	D	F	E		
NB LT	F	F*	F*	F*		
NB TH	F	F	F*	E		
NB RT	D	D	D	D		
SB LT	F*	F*	F*	F*		
SB TH	D	D	D	D		
SB RT	D	D	D	D		
OVERALL	*F*	*F**	*F**	*F**		
University Avenue/Varsity Place						
EB LT/TH/RT	C	C	C	C		
WB LT/TH	D	D	D	D		
WB RT	C	C	C	C		
NB LT	A	A	A	A		
NB TH	A	A	A	B		
NB RT	A	B	A	C		
SB LT	A	A	A	A		
SB TH	A	A	A	A		
OVERALL	*F***	*F***	*F***	*F***		
University Avenue/Dole Street						
EB LT/TH	D	E	E	E	E	E
EB RT	D	D	D	D	D	D
WB LT					D	D
WB LT/TH/RT	E	F	E	E		
WB LT/ TH					D	D
WB RT					D	B
NB LT	E	E	E	E	E	E
NB TH					D	D
NB TH/RT	F*	F*	F*	F*		
NB RT	B	B	B	B	B	B
SB LT	E	E	E	E	E	E
SB TH/RT	D	D	D	D	C	C
OVERALL	*E*	*F*	*E*	*E*	*D*	*D*
University Avenue/Sinclair Parking Lot						
WB LT	F**	F**	F**	F**	E	E
WB RT					E	E
NB TH/RT					A	A
SB LT	B	A	B	A	A	A
SB TH					A	A
OVERALL					A	A

* V/C ratio > 1.0
** Effective LOS F Due to Downstream Conditions

TABLE 2
Base Year 2017 Level of Service Summary

Intersection	Existing AM LOS	Existing PM LOS	Base 2017 (Timings Optimized) AM LOS	Base 2017 (Timings Optimized) PM LOS	Base 2017 with Mitigation AM LOS	Base 2017 with Mitigation PM LOS
University Avenue/Metcalf Street						
EB LT	C	B	C	B	E	E
EB RT	C	B	C	B	E	A
NB LT	A	B	A	B	B	A
NB TH	A	A	A	A	A	A
SB TH/RT	A	A	A	A	A	A
OVERALL	*A*	*A*	*A*	*A*	*A*	*B*
University Avenue/School of Architecture						
WB RT	B	B	B	B	B	B
University Avenue/Maile Way						
SEB LT/TH/RT	C	B	C	B	D	B
NWB LT	E	C	E	C	F	D
NWB TH	C	B	C	B	C	C
NWB RT	B	B	B	B	C	B
NEB LT	C	B	C	B	C	B
NEB TH	A	A	A	A	A	A
NEB RT	A	A	A	A	A	A
SWB LT	A	A	A	A	B	A
SWB TH/RT	B	A	B	A	C	B
OVERALL	*B*	*B*	*C*	*B*	*C*	*B*
Dole Street/Wilder Street						
EB LT/TH	F	F	F	F		
WB TH	F	F	F	F		
WB RT	C	C	C	C		
NB LT/TH	A	A	A	A		
SB LT	B	B	B	B		
Wilder Street/Metcalf Street						
EB LT/TH/RT	C	E	C	E		
WB TH/LT	D	C	D	D		
WB RT	B	B	B	B		
SEB LT	B	B	B	B		
SEB TH/RT	B	A	B	A		
NWB LT/TH/RT	C	C	C	C		
OVERALL	*C*	*C*	*C*	*C*		
Dole Street/Lower Campus Road						
EB TH	A	A	A	A	A	A
EB RT	A	A	A	B	A	A
WB LT/TH	A	A	A	A	A	A
NB LT	C	F**	C	F**	E	E
NB RT	C	B	C	D	E	D
OVERALL	*A*	*F***	*A*	*F***	*A*	*B*

* V/C ratio > 1.0
** Effective LOS F Due to Downstream Conditions

TABLE 2
Base Year 2017 Level of Service Summary

Intersection	Existing AM LOS	Existing PM LOS	Base 2017 (Timings Optimized) AM LOS	Base 2017 (Timings Optimized) PM LOS	Base 2017 with Mitigation AM LOS	Base 2017 with Mitigation PM LOS
Dole Street/East-West Road						
EB LT/TH	B	A	A	A		
WB TH/RT	B	C	B	C		
NB LT/TH/RT	A	B	A	B		
SB LT/TH	C	B	C	D		
SB RT	C	B	D	B		
OVERALL	*B*	*B*	*B*	*B*		
Dole Street/Saint Louis Heights Drive						
NB LT	F	A	C	A		
SEB LT	F	F	F	F		
Waialae/Saint Louis Heights Drive						
EB LT	D	**F***	D	D		
EB TH	A	A	A	B		
WB TH/RT	**F***	D	**F***	D		
SB LT	B	C	B	D		
SB TH	B	C	B	D		
SB RT	B	B	B	C		
OVERALL	*E*	*C*	*f***	*f***		

* V/C ratio > 1.0
** Effective LOS F Due to Downstream Conditions

IV. YEAR 2017 WITH PROJECT SCENARIO *(see section I.D. for definition)*

Year 2017 with Project = Base Year 2017 + LRDP Traffic

A. Discussion

While the LRDP includes new buildings and parking structures, during its 5-10 year horizon, number of students is not projected to increase as a result of these additions. Generally for traffic studies, vehicular trips are generated using empirical correlations between known independent variables that are based upon data compiled by the Institute of Transportation Engineers (ITE). The compiled data is reduced into average trip rates or formulae. In the case of Universities, the only studied independent variable is the number of students.

However, despite the construction of an additional 1200 parking stalls as a result of the LRDP, the student population is not projected to increase. Logically, the potential users of the additional parking will be drawn from the pool of existing campus commuters that are either currently unable or unwilling to utilize campus parking. This report assumed that the additional vehicles that will park on campus will relocate from existing off-campus parking.

Effectively, while within the segment of University Avenue between Dole Street and Maile Way, and the segment of Dole Street between Lower Campus Road and East-West Road may see an increased amount of traffic as a result of this redistribution, areas exogenous to these segments will likely notice a reduction. Such areas are identified in the Parking Study, and include:

- Manoa,
- Saint Louis Heights,
- Dole Street (Near Cultural Center), and
- Residential area west of Varsity

While the potential for trip reduction in these areas may occur, it would be overly presumptive to make assumptions to this point, especially since the future is unknown in regard to the possibility of permit parking for residents. Therefore, this report will conservatively assume that any areas outside of the aforementioned segments of University Avenue and Dole Street will experience no change as a result of the additional parking.

B. Trip Generation

Although standard methods for trip generation are not applicable in this case, the Lower Campus, with relatively few entrances and exits, offers a good indication as to the number of vehicular trips that are generated during the peak hours of traffic relative to the number of parking stalls.

The parking study concluded that there are currently 3,509 stalls in the lower campus area. The proposed Phase IIB quarry parking lot will increase this number by 900 to 4409. Therefore, it is reasonable to assume that the total number of trips entering and exiting each of the three primary entrance/exits will increase by a factor of (900/3509), or twenty-six percent. Note that this should be conservative, given that trips entering/exiting the Dole Street/Lower Campus Road intersection also include drop-off/pick-up's via the music building parking lot.

Likewise, the Kennedy Theatre parking lot, while creating an additional 480 stalls, will be partially tempered by the removal of 140 stalls within the 10 year horizon, effectively increasing the central campus parking by approximately 300 stalls. Currently, there are 1991 stalls in the central campus. This number will be increased by 300, or fifteen percent.

C. Trip Distribution/Assignment

The additional traffic generated by the new parking facilities were distributed based on existing travel patterns, within the aforementioned segments of Dole Street and University Avenue.

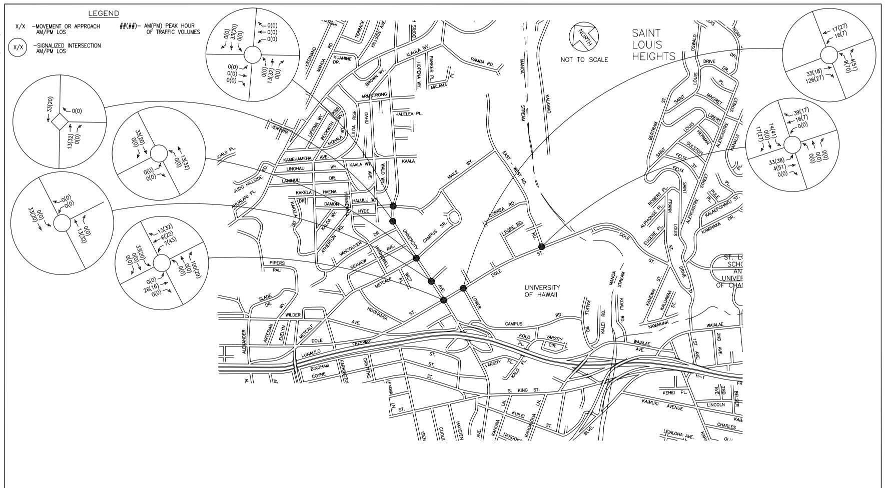
D. Year 2017 with Project Analysis

The following discussion considers incremental traffic impacts of the LRDP, and based on the preceding discussion, is limited to the segment of University Avenue between Dole Street and Maile Way, and the segment of Dole Street between University Avenue and west of Saint Louis Heights Drive. Hereinafter, these segments shall be collectively referred to as the "affected region."

Operations at all of these intersections within the affected region will continue to operate at LOS E or better, with the exception of the University

Avenue/Maile Way intersection, which will continue to experience LOS F in the westbound direction as a result of signal coordination. However, the delay at this intersection is projected to be 91 seconds, which is only slightly higher than the 80 second LOS F threshold.

HCM analysis indicates that the University Avenue/Dole Street and Dole Street/Lower Campus Road intersections will be able to accommodate the projected increase in traffic, while maintaining LOS E or better and under-capacity conditions at all approaches. However, as stated earlier, the effectiveness of the proposed mitigative measures at the University Avenue/Dole Street intersection will be tempered by conditions downstream of the intersection, particularly in the southbound direction toward the H-1 Freeway onramps and the South King Street/Beretania Street/University Avenue intersection, all of which experience prevailing regional congestion during the AM and PM peak hours of Traffic. See Figures 10 and 11 for project traffic and overall LOS. See Table 3 for individual turning movement LOS.



UH LRDP UPDATE

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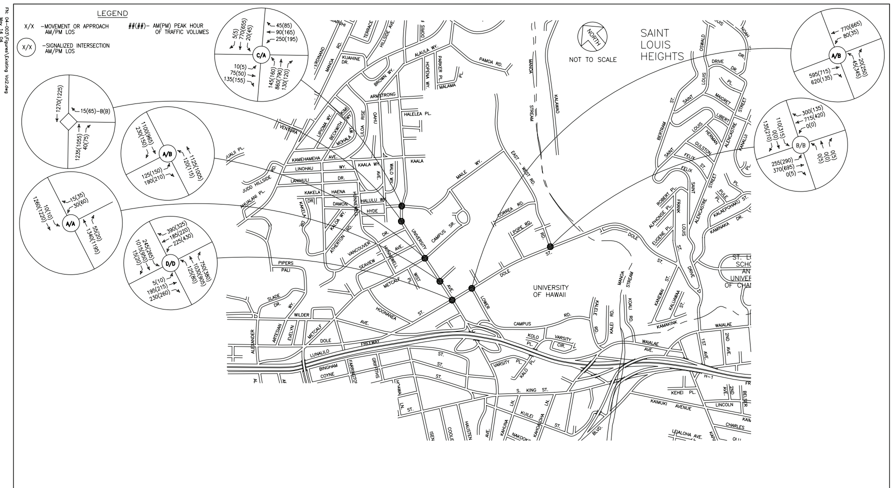
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

UH LRDP UPDATE PROJECT TRAFFIC VOLUMES AND LEVEL OF SERVICE

FIGURE 10



UNIVERSITY OF HAWAII AT MANOA LRDP UPDATE 2007

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YEAR 2017 WITH UH LRDP UPDATE TRAFFIC VOLUMES AND LEVEL OF SERVICE

FIGURE 11

TABLE 3
Year 2017 with LRDP Update (Category 1 - 5-10 Years)

Intersection	Base 2017 (Timings Optimized) AM LOS	Base 2017 (Timings Optimized) PM LOS	Base 2017 with Mitigation AM LOS	Base 2017 with Mitigation PM LOS	2017 with LRDP Update AM LOS	2017 with LRDP Update PM LOS
South King Street/Beretania Street/University Avenue						
EB LT	F*	E				
EB TH	C	F*				
EB RT	B	C				
WB LT	F	F*				
WB TH/RT	F	E				
NB LT	F*	F*				
NB TH	F*	E				
NB RT	D	D				
SB LT	F*	F*				
SB TH	D	D				
SB RT	D	D				
OVERALL	F*	F*				
University Avenue/Varsity Place						
EB LT/TH/RT	C	C				
WB LT/TH	D	D				
WB RT	C	C				
NB LT	A	A				
NB TH	A	B				
NB RT	A	C				
SB LT	A	A				
SB TH	A	A				
OVERALL	F**	F**				
University Avenue/Dole Street						
EB LT/TH	E	E	E	E	E	E
EB RT	D	D	D	D	D	D
WB LT			D	D	D	D
WB LT/TH/RT	E	E				
WB LT/ TH			D	D	D	D
WB RT			D	B	C	C
NB LT	E	E	E	E	E	E
NB TH			D	D	D	E
NB TH/RT	F*	F*				
NB RT	B	B	B	B	B	B
SB LT	E	E	E	E	E	E
SB TH/RT	D	D	C	C	C	C
OVERALL	*E*	*E*	*D*	*D*	*D*	*D*
University Avenue/Sinclair Parking Lot						
WB LT	F**	F**	E	E	E	E
WB RT			E	E	E	E
NB TH/RT			A	A	A	A
SB LT	B	A	A	A	A	A
SB TH			A	A	A	A
OVERALL			A	A	A	A

* V/C ratio > 1.0
** Effective LOS F Due to Downstream Conditions

TABLE 3
Year 2017 with LRDP Update (Category 1 - 5-10 Years)

Intersection	Base 2017 (Timings Optimized) AM LOS	Base 2017 (Timings Optimized) PM LOS	Base 2017 with Mitigation AM LOS	Base 2017 with Mitigation PM LOS	2017 with LRDP Update AM LOS	2017 with LRDP Update PM LOS
University Avenue/Metcalf Street						
EB LT	C	B	E	E	E	E
EB RT	C	B	E	A	E	E
NB LT	A	B	B	A	B	A
NB TH	A	A	A	A	A	A
SB TH/RT	A	A	A	A	A	A
OVERALL	*A*	*A*	*A*	*B*	*A*	*B*
University Avenue/School of Architecture						
WB RT	B	B	B	B		
University Avenue/Maile Way						
SEB LT/TH/RT	C	B	D	B	D	C
NWB LT	E	C	F	D	F	D
NWB TH	C	B	C	C	C	C
NWB RT	B	B	C	B	C	B
NEB LT	C	B	C	B	C	B
NEB TH	A	A	A	A	A	A
NEB RT	A	A	A	A	A	A
SWB LT	A	A	B	A	B	A
SWB TH/RT	B	A	C	B	C	B
OVERALL	*C*	*B*	*C*	*B*	*C*	*B*
Dole Street/Wilder Street						
EB LT/TH	F	F				
WB TH	F	F				
WB RT	C	C				
NB LT/TH	A	A				
SB LT	B	B				
Wilder Street/Metcalf Street						
EB LT/TH/RT	C	E				
WB TH/LT	D	D				
WB RT	B	B				
SEB LT	B	B				
SEB TH/RT	B	A				
NWB LT/TH/RT	C	C				
OVERALL	*C*	*C*				
Dole Street/Lower Campus Road						
EB TH	A	A	A	A	A	B
EB RT	A	B	A	A	A	C
WB LT/TH	A	A	A	A	A	A
NB LT	C	F**	E	E	E	D
NB RT	C	D	E	D	E	D
OVERALL	*A*	*F***	*A*	*B*	*A*	*C*

* V/C ratio > 1.0
** Effective LOS F Due to Downstream Conditions

TABLE 3
Year 2017 with LRDP Update (Category 1 - 5-10 Years)

Intersection	Base 2017 (Timings Optimized) AM LOS	Base 2017 (Timings Optimized) PM LOS	Base 2017 with Mitigation AM LOS	Base 2017 with Mitigation PM LOS	2017 with LRDP Update AM LOS	2017 with LRDP Update PM LOS
Dole Street/East-West Road						
EB LT/TH	A	A			A	A
WB TH/RT	B	C			B	C
NB LT/TH/RT	A	B			A	B
SB LT/TH	C	D			D	D
SB RT	D	B			D	B
OVERALL	*B*	*B*			*B*	*C*
Dole Street/Saint Louis Heights Drive						
NB LT	C	A				
SEB LT	F	F				
Waialae/Saint Louis Heights Drive						
EB LT	D	D				
EB TH	A	B				
WB TH/RT	**F***	D				
SB LT	B	D				
SB TH	B	D				
SB RT	B	C				
OVERALL	*f***	*f***				

* V/C ratio > 1.0
** Effective LOS F Due to Downstream Conditions

E. Year 2017 with Project Recommended Improvements

No improvements are recommended beyond those outlined in Section IIIC. Operations at the affected intersections will remain relatively constant without any substantial increase in delay.

While the potential for improving the Old Waialae Road and Varsity Place Exits was considered, these improvements are generally not recommended. Discussion follows:

Old Waialae Road Entrance/Exit

As an entrance, this access point services vehicles originating in Waikiki, Kaimuki, or Kapahulu Areas. Any vehicles from areas further east will likely utilize the Freeway exit to access the Makai Campus. Currently, incoming flow does not experience significant difficulty entering the Entrance/Exit.

As an exit, this access point services vehicles either destined for the H-1 freeway (westbound), South King Street (westbound), or the Kapahulu Area/H-1 Freeway (Eastbound – Indirect connection). The limited number of vehicles that utilize this exit during the PM peak hour of traffic immediately experience difficulty making this maneuver during the PM peak hour of traffic (when vehicles are more likely to exit), due to the following conditions:

- When accessing the H-1 Freeway Onramp (westbound), the queue from the H-1 Freeway spills back to beyond the Old Waialae Road Entrance/Exit.
- When accessing South King Street (westbound), there is difficulty finding an acceptable gap in the prevailing flow along Old Waialae Road to immediately cross the two (2) lanes necessary to make this movement.
- The H-1 Freeway onramp (westbound) has a very short acceleration lane, which makes it difficult to enter the freeway at this location.

Improvement of this vehicular gateway would require the installation of a traffic signal at the Old Waialae Road/Kalele Road intersection. This is not recommended, due to a lack of sight distance along Old Waialae Road.

Figure 12: Old Waialae Road

Varsity Place Entrance/Exit

Access to this entrance/exit is relatively limited due to the limitation on ingress/egress. Currently, Lower Campus Road intersects with Varsity Circle, and Ultimately Varsity Place. Varsity Place connects with University Avenue, where congestion is currently a problem. While roadside parking could be cleared, and the road widened to facilitate vehicular flow along Varsity Place to incorporate two lanes in the westbound direction towards University Avenue, these vehicles the benefits of such a change would only be realized during the PM peak hour of traffic, and could potentially decrease the capacity of University Avenue during the PM peak hour of traffic.

True improvement of this entrance/exit would necessitate the acquisition of Rights-of-Way (ROW) from a variety of owners of property that front South King Street, in order to provide a direct connection between Lower Campus Road and King Street. Such a modification would also require sufficient lane

channelization be provided, as not to further impede vehicular flow along South King Street. It is likely that eastbound double left-turn lanes, an exclusive westbound right-turn lane, and dedicated southbound left and right-turn lanes would be necessary. In conjunction with this, a traffic signal would have to be installed at the new intersection. See Figure 13 below for an aerial photograph of the area surrounding the Varsity Place Entrance Exit.

Figure 13: Varsity Area

V. CONCLUSIONS AND RECOMMENDATIONS

The University of Hawaii at Manoa Long Range Development Plan, 2007 Update, Category I (LRDP) (5-10 year horizon) will work towards creating a livable campus community with useable green space and a more pedestrian friendly central campus. Pursuant to this ideal, new buildings, pedestrian malls, and parking lots will be constructed throughout the campus.

Existing Conditions

The University of Hawaii at Manoa (UHM) campus, as a result of being situated at the gateway to the mature residential community of Manoa, near the H-1 Freeway, and Major Arterials South King Street, Beretania Street, and Waialae Avenue, experiences its fair share of traffic (both regional and local in origin).

With Level-of-Service (LOS) used as the Measure of Effectiveness (MOE) at intersections of interest within the vicinity of UHM, the following key study intersections were identified as problematic:

- South King Street/Beretania Street/University Avenue – King Street and Beretania Street belong to a greater east-west corridor, which also includes the H-1 Freeway, Kapiolani Boulevard, and Ala Moana Boulevard. Therefore, these major arterials experience a significant regional traffic component. Furthermore, this intersections' adjacency to numerous H-1 Freeway On-ramps and Off-ramps, UHM traffic, and Manoa Traffic, generates a significant turning movement demand in a location which is not capable of further roadway widening. The efficiency and capacity of this intersection is also negatively impacted by the permitted left-turn movements into driveways, despite the absence of dedicated left-turn lanes.
- University Avenue/Dole Street – the busiest intersection along UHM's perimeter, vehicular queues in the northbound (mauka) direction extend southward towards South King Street and onto the H-1 Freeway Off-ramps, during the AM peak hour of traffic. During the PM peak hour of traffic, vehicular queues in the westbound direction queues beyond the Lower Campus Road intersection, and into Lower Campus Road itself.

- University Avenue/Sinclair Parking Lot – While HCM analysis indicates that this intersection currently operates smoothly, the express bus traffic that utilize this exit often have difficulty making the westbound left-turn out of the driveway. This is in part due to the wide turning angles required, and the prevailing queue in the southbound direction at the University Avenue/Dole Street intersection, which should be improved as a result of the mitigative measures at that intersection.
- University Avenue/Maile Way – According to HCM analysis, this intersection operates smoothly at an overall LOS C or better during the AM and PM peak hours of traffic for both existing and future conditions. However, HCM analysis does not account for the congestion downstream in the northbound direction along University Avenue. During the AM peak hour of traffic especially, conditions at the signalized intersection of Kaala Street, which provides access to the Mid Pacific Institute are extremely congested during the AM peak hour of traffic. To exacerbate problems, immediately north of the University Avenue/Maile Way intersection, the two (2) northbound lanes merge into one (1). Therefore, this intersection likely operates at LOS E or F during its worst peak periods.
- Wilder Avenue/Dole Street – The northbound approach to this intersection is formed by the H-1 Freeway Wilder Street Off-Ramp, which provides access to the Makiki Area, which includes residential land uses, Punahou School, and Maryknoll Schools. This off-ramp is given the right-of way, in order to maintain conditions along the H-1 Freeway. However, this is done at the expense of Dole Street traffic, which has a relatively low demand.
- Dole Street/Lower Campus Road – The majority of the vehicles entering/exiting the Makai Campus utilizes this vehicular gateway, due to the fact that it offers the greatest accessibility. During the PM peak hour of traffic, many of the commuters, dorm residents, and faculty that utilize the existing 3509 Makai Campus parking stalls exit through Lower Campus Road and turn Left onto Dole Street, where they immediately encounter the queue generated by the University Avenue/Dole Street

intersection. This causes vehicles to queue back to the parking guard shack and beyond at times.

- Dole Street/Saint Louis Heights Drive – This intersection operates relatively well during the peak hours of traffic. Although HCM analysis indicates that the southeastbound left-turn operates at LOS F during the AM and PM peak hours of traffic, this turning movement volume is relatively low, and would therefore not warrant a traffic signal.
- Waialae Avenue/Saint Louis Heights Drive – During the AM peak hour of traffic, congestion was observed to occur in the westbound direction, where queues were observed to extend as far as 10th Avenue during the AM peak hour of traffic, primarily in the right and center lanes. During the PM peak hour of traffic, similar congestion occurs in the westbound direction along Waialae Avenue. Although there is a brief reprieve west of Saint Louis Drive, congested conditions resume along Old Waialae Road, the H-1 Freeway and King Street further westward.

Base Year 2017

Based on data obtained from the State DOT, regional traffic is projected to increase by approximately 1% annually along the Regional Arterials. Traffic growth within the vicinity of UHM is not projected to occur, due to the fact that most of the area has already been built out, and that the UHM student population is not projected to increase. Furthermore, vehicular traffic decreased during the PM peak hour of traffic and remained constant during the AM peak hour of traffic between 2004 and 2007 at the University/Dole Street intersection based on field counts conducted by ATA.

LOS F conditions will continue to occur during Base Year 2017 at the following locations:

- South King Street/Beretania Street/University Avenue*
- University Avenue/Varsity Place*
- University Avenue/Dole Street*
- University Avenue/Sinclair Parking Lot*

- Dole Street/Wilder Avenue – Mitigation would result in the reduction of traffic flowing from the H-1 Freeway On-Ramp, which is not recommended. Furthermore, the Dole Street traffic that experiences LOS F exhibits a relatively low demand due to further downstream obstructions and better alternative routes. Therefore, mitigation is not recommended.
- Dole Street/Lower Campus Road*
- Dole Street/Saint Louis Heights Drive – While the southeast-bound left-turn currently experiences and will continue to experience LOS F during the AM and PM peak hours of traffic, the demand for this movement is relatively low, and would not warrant a Traffic Signal. Mitigation is not recommended.
- Waialae Avenue/Saint Louis Heights Drive – Due to limited right-of-way, no geometric improvements can be made at this intersection.

* Indicates that mitigative measures are recommended and discussed in the next section.

Base Year 2017 Mitigative Measures

University Avenue/Dole Street Intersection

Phase I

Reconfigure the westbound approach to the University Avenue/Dole Street intersection to incorporate an exclusive left-turn lane, a shared left-turn/through lane, and an exclusive right-turn lane, with storage extending approximately 100 feet east of the University Avenue/Lower Campus Road intersection. This mitigative measure could potentially necessitate the relocation of the historic Gateway structures located along University Avenue.

The effect of Phase I would be to eliminate over-capacity conditions. However, the southbound left-turn movement would still expericnce LOS F during the PM peak hour of traffic.

Phase II

Reconfigure the northbound approach to the University Avenue/Dole Street intersection to incorporate three (3) exclusive through lanes and two exclusive right-turn lanes, the rightmost of which would directly connect with the H-1 Freeway Westbound Off-Ramp. In conjunction with this, modify the Dole Street/Lower Campus Road intersection to incorporate one (1) Eastbound through lane, an eastbound shared through/right-turn lane, and an exclusive right-turn lane. Note that these modifications could potentially necessitate the relocation of the existing monkeypod trees along University Avenue, and reduce the available parking within the Music Building Complex.

Phase II, when implemented without Phase I, would produce a similar result as phase I, in that over-capacity conditions would be eliminated, and that the southbound left-turn movement would continue to experience LOS F, while the eastbound and westbound approaches would experience LOS E during the PM peak hour of traffic.

Phase I & II

HCM analysis indicates that the effect of implementing phases I and II in combination would improve the overall delay of the intersection from 73.1 (56.6) seconds during the AM (PM) peak hours of traffic to 38.8 (39.9) seconds, with all movements at the intersection operating at LOS E or better during both periods. It should be noted that at the Dole Street/Lower Campus Road intersection, the lane modification will reduce the number of lanes that drivers need to cross to enter the Lower Campus Road, thereby reducing capacity reductions caused by weaving movements.

It is recommended that Phases I and II be implemented as a mitigative measure, while recognizing that the intent of this geometric augmentation would be to improve conditions for vehicles traveling northbound along University Avenue. Although vehicular flow will also improve in the westbound direction during the PM peak hour of traffic,

such benefits would generally be realized locally, given that existing bottlenecks occur downstream at the following locations:

- University Avenue/H-1 Freeway Eastbound On-ramp
- University Avenue/H-1 Freeway Westbound On-ramp
- South King Street/Beretania Street/University Avenue
- Dole Street/Wilder Street
- University Avenue, south of Maile Way

Mitigation of these problems would require costly modifications, including improving congestion along the entire corridor. The H-1 Freeway, Beretania Street, and South King Street would all have to be widened to accomplish this. However, the implementation of the Rapid Transit System will ultimately reduce future vehicular traffic demand.

Figure 14: Existing Lane Configuration at University Avenue Intersections with Dole Street and Lower Campus Road

Figure 15: Phases I and II Modifications

Turning Movement Restriction

During field observations, it was noted that along South King Street, east of University Avenue, and University Avenue in the Varsity Area, vehicular flow was hampered by the allowing of left-turns into driveways and small side streets.

Varsity Area

Vehicles turning left from the southbound direction cause other vehicles to switch lanes to maneuver around them. Due to the lack of an acceptable gap in northbound traffic, these vehicles often cause those behind them to arrive at the South King Street/Beretania Street/University Avenue intersection after the signal indication has turned red. The resulting flow interruptions have major implications along University Avenue in this area, due to the fact that the current cycle length at that intersection is 170

seconds. Effectively, all of the vehicles impacted by this problem will be delayed by a additional two minutes, fifty seconds as the traffic signal cycles through all of its phases again. Operations at the University Avenue/Varsity Place intersection are also affected by this problem.

Similarly, in the northbound direction left-turns impede the flow of the approximately 1,000 vehicles (for both AM and PM peak hours of traffic) traveling in the northbound direction, sometimes reducing the upstream capacity of the South King Street/Beretania Street/University Avenue intersection.

South King Street – University Avenue to Humane Society

South King Street, east of University Avenue has become a bottleneck for eastbound traffic during the PM peak hour of traffic. It has been observed that vehicles traveling eastbound along South King Street are affected by vehicles making left-turns into driveways, and at the signalized intersection near the Seven Eleven/Aloha Gas station.

Based on the conditions described above, it is recommended that a dialogue be initiated between community members and the City to assess the potential for left-turn prohibitions during the PM peak hour of traffic for:

- Northbound and southbound University Avenue traffic, south of Varsity Place, and north of King Street
- Eastbound South King Street traffic, East of University Avenue and west of the Humane Society.

It is recognized that the merit of this mitigative measure will have to be balanced with the needs of the local community and businesses.

It should be noted that should these prohibitions be implemented, they would not eliminate LOS F at the South King Street/Beretania Street/University Avenue intersection. However, they would improve the

efficiency of the intersection and the capacity of University Avenue and South King Street in the area.

University Avenue/Sinclair Library Driveway

While this intersection experiences a relatively low turning movement volume and operates at LOS B, the bus traffic that passes through the turnaround often have difficulty making the westbound left-turn out of the driveway. Therefore, it is recommended that a traffic signal be installed to facilitate this movement. In conjunction with this, it is recommended that the bus stop located along University Avenue, just north of Dole Street be relocated to the existing bus turnaround at this intersection.

University Avenue/Maile Way

Although HCM analysis indicates that this intersection operates at LOS C(B) during the AM (PM) peak hours of traffic, existing operations have been observed to be worse, especially during the AM peak hour of traffic, where vehicles destined towards the Mid Pacific Institute and Saint Francis cause the downstream intersection (Kaala Street) to be overburdened. Currently, this intersection only provides a single lane at each approach, with no channelization (turning lanes). It is therefore recommended that a dialogue be initiated between community members and the City to assess the feasibility for widening the segment of University Avenue between Kaala Street and Maile Way to incorporate a second northbound lane. This lane would terminate at Kaala Street as an exclusive right-turn lane.

Traffic Signal Coordination along University Avenue and Dole Street/Lower Campus Road

All of the signalized intersections along University Avenue between Dole Street and Maile Way, and the Dole Street/Lower Campus Road intersection are within approximately 1000 feet or less of each other. Therefore, in order to facilitate flow between these intersections, it is recommended that the following intersections be coordinated:

- University Avenue/Maile Way

- University Avenue/Metcalf Street
- University Avenue/Sinclair Library Parking Lot (New Signal)
- University Avenue/Dole Street
- Dole Street/Lower Campus Road

Year 2017 with LRDP

While the LRDP includes new parking structures, the number of students is not projected to increase as a result of these additions. Ultimately, as based on standard methods for generating trips for Universities, this would mean that the number of vehicular trips generated by the LRDP will remain the same. However, a redistribution of the existing trips will occur, in this case more heavily concentrating traffic at the University Avenue/Dole Street, Dole Street/Lower Campus Road, and Dole Street/East-West Road intersections. However, given the improvements recommended in Base Year 2017 Mitigation Measures, these intersections will continue to operate at LOS E or better and under capacity.

As stated earlier, one caveat to this statement is that downstream conditions along University Avenue and subsequently the H-1 Freeway, Beretania Street, and South King Street will continue to experience congestion, and may therefore limit the incoming/outgoing capacity in the area.

Year 2017 with Project Recommended Improvements

No improvements beyond those recommended in Base Year 2017 Mitigative Measures are recommended.

Improvements at the Old Waialae Road Entrance/Exit and at the Varsity Place were investigated, and are generally not recommended. See discussion in Section IV.E.

VI. REFERENCES

1. Federal Highway Administration, Manual on Uniform Traffic Control Devices for Streets and Highways, including Revision 1, 2004.

2. Institute of Transportation Engineers, Trip Generation, 7th Edition, 1997.

3. Institute of Transportation Engineers, Trip Generation Handbook, and ITE Recommended Practice, 2001

4. Transportation Research Board, Highway Capacity Manual, 2000.