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SUPERINTENDENT

JAN - 8 2021

**STATE OF HAWAI`I**
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI`I 96804

OFFICE OF FACILITIES AND OPERATIONS

December 22, 2020

TO: Keith E. Kawaoka
Acting Director, Office of Environmental Quality Control
Department of Health

FROM: Tracy Okumura
For Public Works Administrator
Facilities Development Branch

SUBJECT: **Chapter 343, Hawaii Revised Statutes, Draft Environmental Assessment and Anticipated Finding of No Significant Impact McKinley High School Athletic Complex Master Plan Amendment Honolulu, Island of Oahu, Hawaii Tax Map Key: (1) 2-3-009:001 (por.)**

The Hawaii State Department of Education hereby transmits the Draft Environmental Assessment and Anticipated Finding of No Significant Impact (DEA-AFONSI) for the McKinley High School Athletic Complex Master Plan Amendment Project, to be published on January 8, 2021 in *The Environmental Notice*.

A project location map (shapefile), and a PDF copy (searchable) of the DEA-AFONSI has been submitted via the Office of Environmental Quality Control online submittal form.

Should you have any questions, please contact Mitch Tamayori, Project Coordinator of the Facilities Development Branch, Project Management Section, at 784-5116 or via email, mitch.tamayori@k12.hi.us or feel free to contact Kawika McKeague, Consultant and Principal of G7O, at 523-5866 or via email kawikam@g70.design.

TO:mt

c: Facilities Development Branch



21-098

**From:** webmaster@hawaii.gov
**To:** HI Office of Environmental Quality Control
**Subject:** New online submission for The Environmental Notice
**Date:** Wednesday, December 30, 2020 10:28:36 PM

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**Action Name**

McKinley High School Athletic Complex Master Plan Amendment

**Type of Document/Determination**

Draft environmental assessment and anticipated finding of no significant impact (DEA-AFNSI)

**HRS §343-5(a) Trigger(s)**

- (1) Propose the use of state or county lands or the use of state or county funds

**Judicial district**

Honolulu, O‘ahu

**Tax Map Key(s) (TMK(s))**

(1) 2-3-009:001 (por.)

**Action type**

Agency

**Other required permits and approvals**

Numerous

**Proposing/determining agency**

State of Hawai‘i, Department of Education

**Agency contact name**

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Map It

**Was this submittal prepared by a consultant?**

Yes

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G70

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**Consultant address**

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United States
Map It

**Action summary**

The State of Hawai‘i, Department of Education is proposing to undertake the “McKinley High School (MHS) Athletic Complex Master Plan Amendment Project” (“Project”). MHS is located on TMK: (1) 2-3-009:001 (por.) in Honolulu, on the island of O‘ahu. The Project site is approximately 1.56 acres, located on the southwestern portion of the MHS campus. The Project improvements to the existing MHS athletic complex involve the following:
Construction
• Two-story Physical Education (P.E.) & Athletic Building (15,900 SF);
• North and south stadium bleachers (3,444 seats);
• Four to eight light poles at the track and football/soccer field;
• Plaza with gathering areas;
• Gravel parking area with space for 41 unmarked parking stalls; and
• Perimeter fence.
Demolition
• Existing maintenance/custodian cottage (complete demolition of approx. 1,700 SF); and
• Existing Boy’s P.E. locker room (partial demolition of approx. 1,900 SF).

**Reasons supporting determination**

See Chapter 6, Findings Supporting the Anticipated Determination of the Draft EA.

**Attached documents (signed agency letter & EA/EIS)**

- 201230_DEA-AFONSI_Appendices.pdf
- 201222_HRS343_DEA_AFONSI_MHS.PDF

**Action location map**

- MHS_Location_Map.zip

**Authorized individual**

Michele Leong

**Authorization**

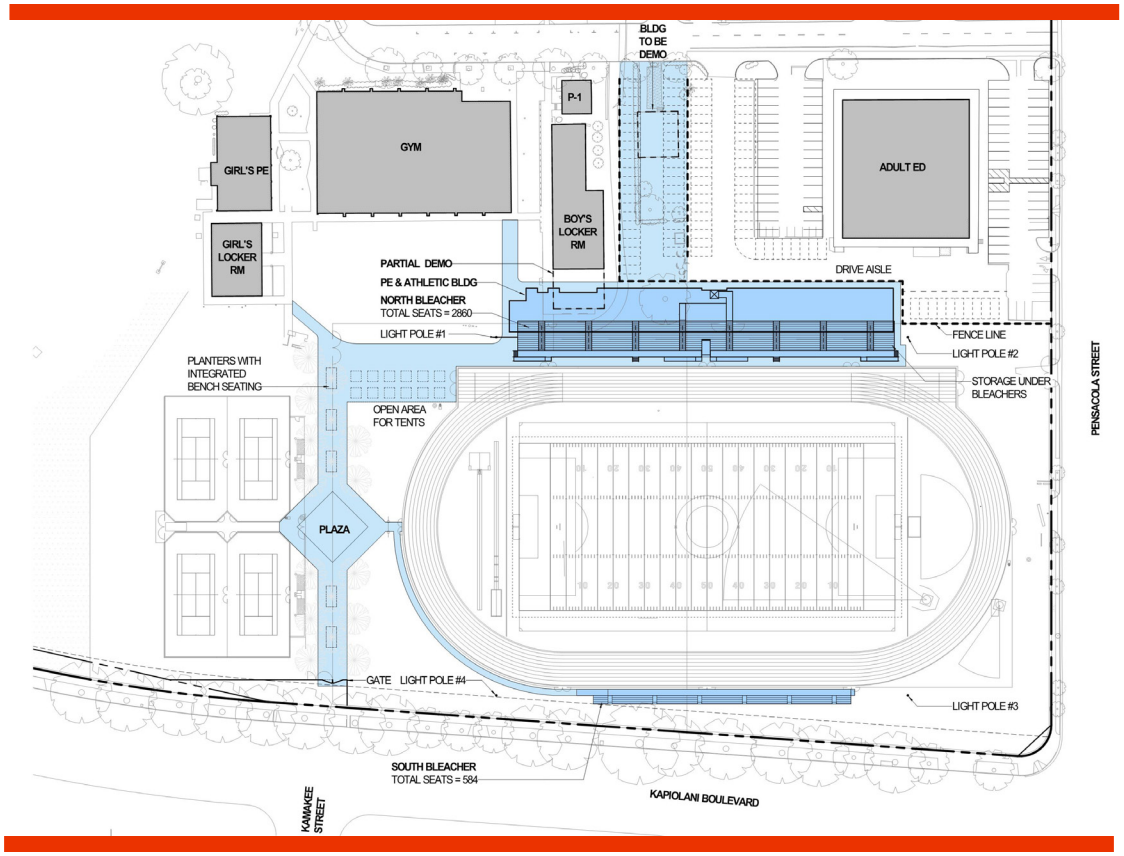
- The above named authorized individual hereby certifies that he/she has the authority to make this submission.

# McKinley High School

## Athletic Complex Master Plan Amendment

### DRAFT ENVIRONMENTAL ASSESSMENT/ ANTICIPATED FINDING OF NO SIGNIFICANT IMPACT

HONOLULU, ISLAND OF O'AHU




PROPOSING AGENCY:

PREPARED BY:

DEC. 2020

# McKinley High School

## Athletic Complex Master Plan Amendment

### DRAFT ENVIRONMENTAL ASSESSMENT/ ANTICIPATED FINDING OF NO SIGNIFICANT IMPACT

HONOLULU, ISLAND OF O'AHU

TMK (1) 2-3-009:001 (POR.)

PROPOSING AGENCY:

STATE OF HAWAI'I, DEPARTMENT OF EDUCATION
OFFICE OF FACILITIES AND OPERATIONS
FACILITIES DEVELOPMENT BRANCH
PROJECT MANAGEMENT SECTION
3633 WAIALAE AVENUE, RM. B-201
HONOLULU, HI 96816

ACCEPTING AUTHORTITY:

STATE OF HAWAI'I, DEPARTMENT OF EDUCATION

The document and all ancillary documents were prepared under my direction and in accordance with the content requirements of Chapter 343, Hawai'i Revised Statutes, and Title 11, Chapter 200, Hawai'i Administrative Rules.

PREPARED BY:

G70

111 S. KING STREET, SUITE 170
HONOLULU, HI 96813

DEC. 2020

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**Appendix B:** Noise Study – *Y. Ebisu & Associates, September 2020*

**Appendix C:** Preliminary Engineering Report – *Fukunaga & Associates, Inc., October 2020*

**Appendix D:** Transportation Impact Assessment Report Parking Management Plan - *AECOM, December 2020*

**Appendix E:** Literature Review and Field Inspection Report – *Cultural Surveys Hawai‘i, Inc., October 2020*

**Appendix F:** Early Consultation Package

**Appendix G:** Early Consultation Comments

# Acronyms and Abbreviations

| | |
|---|---|
| ACMP | Athletic Complex Master Plan |
| ADA | Americans with Disabilities Act |
| AM | Ante-meridiem |
| APE | Area of Potential Effect |
| Ave. | Avenue |
| Blvd. | Boulevard |
| BMPs | Best Management Practices |
| BWS | Honolulu Board of Water Supply, CCH |
| CAB | Clean Air Branch, DOH, State |
| CCC | Climate Change Commission |
| CCH | City and County of Honolulu |
| CCSR | Office of Climate Change, Sustainability and Resiliency, CCH |
| CDD | Community Development Districts |
| CFR | Code of Federal Regulations |
| cfs | Cubic Feet per Second |
| CIA | Cultural Impact Assessment |
| CSH | Cultural Surveys Hawai‘i, Inc. |
| CWB | Clean Water Branch |
| dBA | A-weighted decibels |
| DCAB | Disability and Communication Access Board, DOH |
| DLNR | Department of Land and Natural Resources |
| DNL | Day-Night Average Sound Level |
| DOE | Department of Education, State |
| DOH | Department of Health, State |
| DTS | Department of Transportation Services, CCH |
| EA | Environmental Assessment |
| EISB | Enterprise Infrastructure Services Branch |
| EMS | Honolulu Emergency Services Department, CCH |
| EPA | U.S. Environmental Protection Agency |
| F | Fahrenheit |
| FEA | Final Environmental Assessment |
| FEMA | Federal Emergency Management Agency |

| | |
|---|---|
| FIRM | Flood Insurance Rate Map |
| FL | Fill Land, mixed |
| FONSI | Finding of No Significant Impact |
| FT | Feet |
| gal/d | Gallons Per Day |
| gal/y | Gallons Per Year |
| HAR | Hawai‘i Administrative Rules |
| HCDA | Hawai‘i Community Development Authority |
| HECO | Hawaiian Electric Company |
| HFD | Honolulu Fire Department, CCH |
| HPD | Honolulu Police Department, CCH |
| HRS | Hawai‘i Revised Statutes |
| IBC | International Building Code |
| IRHB | Indoor and Radiological Health Branch, DOH, State |
| LID | Low-impact Development |
| LOS | Level of Service |
| LRFI | Literature Review and Field Inspection Report |
| LUC | Land Use Commission, State |
| M | Meter |
| MBTA | Migratory Bird Treaty Act |
| mg/kg | Milligram Per Kilogram |
| MHS | McKinley High School |
| MkA | Makiki Clay Loam |
| Mph | Miles per Hours |
| msl | Mean Sea Level |
| NBC | Neal S. Blaisdell Center |
| NPDES | National Pollutant Discharge Elimination System |
| NRHP | National Register of Historic Places |
| OIA | O‘ahu Interscholastic Association |
| PA | Public Address |
| PCBs | Polychlorinated Biphenyls |
| P.E. | Physical Education |
| PER | Preliminary Engineering Report |
| PGA | Peak Ground Acceleration |

| | |
|---|---|
| PM | Post-meridiem |
| PTWC | Pacific Tsunami Warning Center |
| PUC | Primary Urban Center |
| ROH | Revised Ordinances of Honolulu |
| SAAQS | State Ambient Air Quality Standards |
| SDC | Seismic Design Category |
| sec/veh | Seconds per Vehicle |
| SF | Square Feet |
| SHPD | State Historic Preservation Division, DLNR, State |
| SHWB | Solid and Hazardous Waste Branch |
| SIHP | State Inventory of Historic Places |
| SLU | State Land Use |
| SLR | Sea Level Rise |
| SMA | Special Management Area |
| St. | Street |
| State | State of Hawai‘i |
| TCLP | Toxic Characteristic Leaching Procedure |
| TCP | Traffic Control Plan |
| TIAR | Transportation Impact Analysis Report |
| TMK | Tax Map Key |
| U.S. | United States |
| USFWS | United States Fish and Wildlife Service |
| WWTP | Wastewater Treatment Plant |

Chapter 1

# Introduction

Chapter 1

# Introduction

## 1.1 Project Information Summary

| | |
|---|---|
| Type of Document: | Draft Environmental Assessment (EA)/Anticipated Finding of No Significant Impact |
| Project Name: | McKinley High School (MHS) Athletic Complex Master Plan Amendment |
| Proposing Agency and Accepting Authority: | State of Hawai‘i (State), Department of Education (DOE)<br>Office of Facilities and Operations<br>Facilities Development Branch<br>Project Management Section<br>3633 Wai‘alae Avenue (Ave.), Rm. B-201<br>Honolulu, Hawai‘i 96816 |
| Hawai‘i Revised Statutes (HRS) Chapter 343 Trigger: | HRS, §343-5(a)(1), use of State lands and funds |
| Project Location: | 1039 South King Street (St.)<br>Honolulu, Hawai‘i 96814<br>(*Figure 1-1, Project Location and Tax Map Key*) |
| Tax Map Key(s) (TMK) and Recorded Fee Owner(s): | TMK: (1) 2-3-009:001 (por.)<br>State, DOE |
| Project Site: | Approximately 1.56 acres (67,954 square feet [SF]) |
| State Land Use (SLU) District: | Urban |
| Kaka‘ako Community Development District Mauka Area Plan (2011) Neighborhood Zone: | Thomas Square (Educational Land Use) |
| Special Management Area (SMA): | Outside SMA |
| Flood Zones: | Zone X (area outside floodplain)<br>Zone AE (subject to 100-year flood) – abuts the Project site |
| Anticipated Determination: | Finding of No Significant Impact (FONSI) |

## 1.2 Project Overview

The State, DOE is proposing to undertake the "MHS Athletic Complex Master Plan Amendment Project" ("Project"). MHS is located on TMK: (1) 2-3-009:001 (por.) in Honolulu, on the island of O'ahu. See *Figure 1-1, Project Location and Tax Map Key*. The Project site is approximately 1.56 acres, located on the southwestern portion of the MHS campus. The Project improvements to the existing athletic complex involve the following:

*Construction*

- Two-story Physical Education (P.E.) & Athletic Building (15,900 SF);
  - Storage facility (1,800 SF);
  - Service corridor (2,400 SF);
- North and south stadium bleachers (3,444 seats);
  - North bleachers (2,860 seats);
  - South bleachers (584 seats);
- Four to eight light poles at the track and football/soccer field ("track and field");
- Plaza with gathering areas;
- Gravel parking area with space for 41 unmarked parking stalls; and
- Perimeter fence.

*Demolition*

- Existing maintenance/custodian cottage (complete demolition of ≈1,700 SF); and
- Existing Boy's P.E. locker room (partial demolition of ≈1,900 SF).

## 1.3 Basis for Environmental Review

This Draft EA has been prepared in accordance with the requirements of HRS, Chapter 343, and Hawai'i Administrative Rules (HAR), Chapter 11-200.1, which sets forth the requirements for the preparation of an EA. Under HRS, §343-5(a)(1), this Project triggers a need for an environmental review as it proposes the use of state lands and funds.

This Draft EA is presented in eight chapters and includes the following: a description of the Project; a list of necessary permits/approvals; a description of the existing environment; a discussion on potential impacts and proposed mitigation measures on identified natural, cultural, and socioeconomic resources as well as existing infrastructure; a description of alternatives; a discussion of the Project's relationship to State and County land use plans and policies; findings supporting the anticipated determination; a list of agencies, organizations, and individuals that participated in the pre-consultation phase of the EA; and a list of references used in developing the EA.

This Draft EA will be published in the Office of Environmental Quality Control's periodic bulletin, *The Environmental Notice*, which will commence a 30-day public comment period. After the 30-day comment period has concluded, comments received will be considered and addressed to the extent feasible within the Project scope and evaluation. A Final EA is prepared and revised based upon information received during the comment period. Upon acceptance of the Final EA, a FONSI is anticipated.

**Figure 1-1** **Project Location and Tax Map Key**

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Chapter 2

# Description of the Proposed Action

Chapter 2

# Description of the Proposed Action

## 2.1 Description of Existing Facilities and Uses

The existing athletic complex consists of a track and field (football/soccer), Boy's P.E. locker room, Girl's P.E. locker room, Girl's athletic locker room, gymnasium, and four tennis courts. The athletic complex facilities support the MHS P.E. and athletic programs. *Table 2-1, Regular Season Sports Events Schedule* below summarizes the existing regular sports season and associated events schedule at MHS.

**Table 2-1 Regular Season Sports Events Schedule**

| Sport | Number of Home Games/Season | Day(s)/Time of Games | Day(s)/Time of Practices |
|---|---|---|---|
| **Fall Season** | | | |
| Cross Country, Boys/Girls | 1 | Saturday, 9 AM-1 PM | Weekdays, 3 PM-5 PM |
| Football, Boys | 0 | N/A | Monday–Saturday, 9 AM-1 PM |
| Cheerleading, Coed | 0 | N/A | Weekdays, 3 PM-6 PM |
| Softball, Girls | 5 | Weekdays, 3 PM-6 PM<br>Saturday, 9 AM-12 PM | Monday–Saturday, 9 AM-12 PM |
| Volleyball, Girls | 6 | Monday–Thursday, 5 PM-9 PM | Weekdays, 3 PM-7 PM |
| Soft Tennis, Boys/Girls | 3 | Saturday, 9 AM-1 PM | Weekdays, 3 PM-6 PM |
| Bowling, Boys/Girls | 0 | N/A | N/A |
| **Winter Season** | | | |
| Basketball, Boys | 6 | Monday–Saturday,<br>5:30 PM -9:30 PM | Weekdays, 3 PM-7 PM<br>Saturday, 9 AM-12 PM |
| Basketball, Girls | 6 | Monday–Saturday,<br>5:30 PM-9:30 PM | Weekdays, 3 PM-7 PM<br>Saturday, 9 AM-12 PM |
| Soccer, Boys | 6 | Weekdays, 3 PM-6 PM<br>Saturday, 2 PM-5 PM | Weekdays, 9 AM-1 PM |
| Soccer, Girls | 6 | Weekdays, 3 PM-6 PM<br>Saturday, 2 PM-5 PM | Weekdays, 9 AM-1 PM |
| Swimming, Boys/Girls | 0 | N/A | N/A |
| Wrestling, Boys/Girls | 1 | Saturday, 10 AM-4 PM | Weekdays, 3 PM-6 PM |
| Canoe Paddling, Boys/Girls | 0 | N/A | N/A |
| Baseball, Coed | 5 | Weekdays, 3 PM-6 PM<br>Saturday, 10 AM-1 PM | Monday–Saturday, 9 AM-12 PM |

| Spring Season | | | |
|---|---|---|---|
| Baseball, Coed | 5 | Weekdays, 3 PM-6 PM<br>Saturday, 10 AM-1 PM | Monday–Saturday, 9 AM-12 PM |
| Softball, Girls | 5 | Weekdays, 3 PM-6 PM<br>Saturday, 10 AM-1 PM | Monday–Saturday, 9 AM-12 PM |
| Tennis, Boys/Girls | 6 | Weekdays, 2 PM-5 PM<br>Saturday 9 AM-12 PM | Weekdays, 3 PM-6 PM<br>Saturday, 9 AM-12 PM |
| Judo, Boys/Girls | 0 | N/A | Weekdays, 3 PM-6 PM |
| Track and Field, Boys/Girls | 0 | N/A | Weekdays, 3 PM-6 PM |
| Volleyball, Boys | 6 | Monday–Thursday, 5 PM-9 PM | Weekdays, 3 PM-7 PM |
| Water Polo, Girls | 0 | N/A | N/A |

*Table 2-2*, *Playoffs Sports Events Schedule* below summarizes the existing O‘ahu Interscholastic Association (OIA) final/playoff sports events at MHS and the associated season/schedule.

**Table 2-2 Playoffs Sports Events Schedule**

| Sport | Month(s) | Game(s) per Playoff | Event Day(s)/Time |
|---|---|---|---|
| Basketball, Boys | February | 4-12 | Weekdays, 5 PM-10 PM |
| Basketball, Girls | February | 4-12 | Weekdays, 5 PM-10 PM |
| Volleyball, Boys | April | 6-12 | Weekdays, 5 PM-10 PM |
| Volleyball, Girls | October | 6-12 | Weekdays, 5 PM-10 PM |
| Baseball, Boys | May | 1-3 | Weekdays, 3 PM-6 PM<br>Saturday, 10 AM-1 PM |
| Softball, Girls | April-May | 4-16 | Weekdays, 5 PM-9 PM<br>Monday–Saturday, 9 AM-9 PM |
| Judo, Boys/Girls | April | 1 | Saturday, 10 AM-4 PM |
| Tennis, Boys/Girls | April-May | 2 | Weekdays, 2 PM-5 PM<br>Saturday, 9 AM-1 PM |
| Soft Tennis, Boys/Girls | September-October | 2 | Weekdays, 2 PM-5 PM<br>Saturday, 9 AM-1 PM |

*Table 2-3, Historic Sports Events Attendance* lists final/playoff sports events and the associated historic number of (paid) attendees.

**Table 2-3 Historic Sports Events Attendance**

| Event | Date | Paid Attendance |
|---|---|---|
| Basketball Finals, Girls | 1/24/18 | 752 |
| Basketball Finals, Boys | 2/12/20 | 667 |
| Volleyball Playoffs, Girls | 10/18/17 | 686 |
| Baseball Finals, Boys | 2/7/18 | 694 |
| Softball Finals, Girls | 4/28/18 | 579 |
| Judo-Eastern Conference Tournament | 4/20/19 | 242 |

## 2.2 Description of the Proposed Action

The Proposed Action (Project/Preferred Alternative) is an amendment to the 2011 MHS Athletic Complex Master Plan (ACMP) Final EA-FONSI ("2011 MHS ACMP Final Environmental Assessment [FEA]-FONSI") for the track and field area (see Section 2.3.3). The Proposed Action includes the construction of a new two-story P.E. & Athletic Building (15,900 SF) on the north side of an existing track and field. The first floor of the P.E. & Athletic Building will likely comprise of locker rooms, shower rooms, laundry rooms, restrooms, office space, fitness and weight training rooms, a physical therapy room, storage rooms, a janitor's closet, a ticket booth and a concession stand. The second floor of the P.E. & Athletic Building will likely comprise of a press box, accessible via an elevator. The P.E. & Athletic Building's floor plan configurations will be finalized during the design phase. Fronting and affixed to the P.E. & Athletic Building will be (north) stadium bleachers with 2,860 seats. Beneath the north bleachers will be a service corridor (2,400 SF), providing access to a storage facility (1,800 SF). South of the track and field will be (south) stadium bleachers with 584 seats. In total the north and south stadium bleachers will accommodate 3,444 seats, which will be used for student body assemblies and spectator seating for athletic games and practices.

On the west and east ends of the north and south bleachers will be a total of four to eight light poles for the track and field, which may reach up to approximately 90 feet (FT) in height. The number of light poles/field lights provided will determine the height of the light poles. Generally, less number of light poles will require higher poles to light the entire field. DOE will consider installing utility lights on the same poles that are mounted closer to the ground, to be used during clean up after the events are over. On the west side of the track and field will be an open plaza with bench seating, pre-function gathering spaces with tents for students and guests. Approximately 1,900 SF of the existing Boy's P.E. locker room will be partially demolished to accommodate the new P.E. & Athletic Building. The existing Boy's P.E. locker room will be sealed off and repurposed for a similar use, such as a multi-purpose teaching facility to hold specialty fitness or weight training classes. Additionally, the existing maintenance cottage (≈1,700 SF) will be demolished to accommodate a gravel parking area with space for 41 unmarked parking stalls. A perimeter fence will be installed on the north side of the Athletic P.E. complex building and alongside the gravel parking area. During construction, the open space fronting the existing gymnasium may be used for staging and storage. See *Figure 2-1, MHS Campus Site Plan* and *Figure 2-2, MHS Athletic Complex Site Plan* and *Appendix A*, *Conceptual Plans*.

The Project improvements will comply with Title IX of the Education Amendments of 1972 ("Title IX") and will be designed to accommodate MHS athletic programs for both sexes/genders who utilize the athletic complex throughout the year. The Project will be designed and constructed to conform with current building codes. For further discussion, see **Section 5.1, Title IX of the Education Amendments of 1972.**

*Table 2-4, Additional Sports Events Schedule* below summarizes the proposed additions/changes to the regular sports season events schedule at MHS once the Project improvements are completed. The athletic complex, including the track and field may also be used for other school events and professional and youth sport leagues with prior approval from MHS.

**Table 2-4 Additional Sports Events Schedule**

| Sport | Number of Home Games/Season | Day(s)/Time of Games | Day(s)/Time of Practices |
|---|---|---|---|
| **Fall Season** | | | |
| Cross Country, Boys/Girls | 1 | Saturday, 9 AM-1 PM | Weekdays, 3 PM-5 PM |
| Football, Boys | 4-5 | Saturday, 3 PM-10 PM | Monday–Saturday, 9 AM-1 PM |
| **Winter Season** | | | |
| Soccer, Boys | 7-8 | Weekdays, 5 PM-8 PM<br>Saturday, 5 PM-8 PM | Weekdays, 3 PM-7 PM<br>Saturday, 9 AM-3 PM |
| Soccer, Girls | 7-8 | Weekdays, 5 PM-8 PM<br>Saturday, 5 PM-8 PM | Weekdays, 3 PM-7 PM<br>Saturday, 9 AM-3 PM |
| **Spring Season** | | | |
| Track and Field, Boys/Girls | 3-7 | Saturday, 3 PM-10 PM | Weekdays, 3 PM-6 PM |

*Table 2-5, Additional Playoffs Sports Events Schedule* below summarizes the proposed additions/changes to the OIA final/playoff sports events at MHS once the Project improvements are completed.

**Table 2-5 Additional Playoffs Sports Events Schedule**

| Sport | Month(s) | Game(s) per Playoff | Event Day(s)/Time |
|---|---|---|---|
| Football, Boys | November | 1-2 | Saturday, 3 PM-10 PM |
| Soccer, Boys | January | 2-3 | Weekdays, 5 PM-8 PM<br>Saturday, 5 PM-8 PM |
| Soccer, Girls | January | 2-3 | Weekdays, 5 PM-8 PM<br>Saturday, 5 PM-8 PM |

## 2.3 Project Background

### 2.3.1 McKinley High School Vision and Mission

The MHS vision is to:

- "Inspire a passion for learning and a perseverance for excellence
- Prepare to meet the challenges of the world.
- Promote compassion, integrity, and responsibility" (MHS, 2020b).

The MHS mission is to:

- "President William McKinley High School is committed to enriching students' experiences through authentic education opportunities and maintaining a community of mutual respect. We empower students to embrace learning and become engaged citizens" (MHS, 2020b).

### 2.3.2 McKinley High School History

In 1865 the Fort Street English Day School was established by Maurice B. Beckwith. In November 1869, the Fort Street English Day School relocated from the basement of the old Fort Street church to a new stone building on the corner of Fort and School St. The Fort Street English Day School later moved to the Princess Ruth's Palace in 1895 and was renamed the Honolulu High School. In 1907, the Honolulu High School moved to the corner of Beretania and Victoria St. and was renamed to President William McKinley High School. In 1923, the MHS moved to its present location (G70, 2008). MHS is the only public high school serving the Ala Moana/Kaka'ako/Ward neighborhood.

### 2.3.3 McKinley High School Athletic Complex Master Plan

For more than two decades, MHS alumni and athletic department personnel have had a vision to redevelop the MHS athletic facilities to a higher standard of excellence. Over the years, they have investigated potential development options which resulted in the MHS ACMP (G70, 2008).

A Final EA was prepared for the MHS ACMP and a FONSI was issued on May 23, 2011. The 2011 MHS ACMP FEA-FONSI components consisted of the following:

- Relocation and replacement of the track and field and bleachers (approximately 2,500 seats);
- Relocation and replacement of three existing tennis courts and addition of three new tennis courts;
- Replacement Boy's P.E. locker/shower facility and Boy's athletic locker/shower facility;
- Relocation and replacement of the existing outdoor rifle range with a new semi-enclosed facility;
- A new 100-stall parking lot;
- A new 2-story YMCA wellness center with a 50-meter (M) swimming pool, bleachers, and a 3-story parking structure (340 stalls);
- A new gymnasium building;
- Renovation of the existing gymnasium;
- Relocation and replacement of the baseball field, bleachers (500-1,000 seats), and batting cages;
- An access road extension;
- An outdoor plaza and a pedestrian promenade;
- An open plaza at the replacement track and field;

- Modification of an existing driveway to include a right-turn in only access with a queuing lane;
- New 4-bus drop-off lane will be provided along Pensacola St. near the track and field facility

The 2011 MHS ACMP FEA-FONSI components that were implemented include the relocation/replacement of four tennis courts and the construction of the track and field (football/soccer). All other components of the 2011 MHS ACMP FEA-FONSI have not been implemented.

The DOE is proposing an amendment to the 2011 MHS ACMP FEA-FONSI to include the following Project improvements near the existing track and field:

- Two-story P.E. & Athletic Building (15,900 SF);
- North and south stadium bleachers (3,444 seats);
- Plaza with gathering areas;
- Four to eight light poles at the track and field;
- Gravel parking area with space for 41 unmarked parking stalls; and
- Perimeter fence.

A Boy's P.E. & Athletic locker facility, stadium bleachers, and plaza were previously identified in the 2011 MHS ACMP FEA-FONSI but differed in size and/or location from the proposed Project improvements. The Boy's P.E. & Athletic locker facility was previously planned in the same general location as the proposed P.E. & Athletic Building; however, it was smaller in size and was exclusively for boys. The stadium bleachers were previously planned near the softball and baseball fields with less seats proposed (2,500 seats) than what is currently being proposed (3,444 seats). Two smaller plazas were previously planned near the Girl's locker room and the mauka side of the track and field. Field lights, gravel parking area for 41 unmarked parking stalls; and a perimeter fence were not included in the 2011 MHS ACMP FEA-FONSI improvements.

## 2.4 Project Purpose and Need

The purpose of the Project is to provide MHS students, staff, alumni, and community members with an improved athletic complex and quality facilities. An improved athletic complex is primarily needed to support the existing MHS P.E. and athletic programs. Investment in MHS P.E. and athletic programs aligns with the MHS vision and mission statement; athletic programs are essential to student growth and have innumerable benefits, such as increased cognitive and academic achievement, improved physical health, and enhanced self-esteem and positive social relationships.

An improved athletic complex will further develop students' sports performance and bolster school pride. MHS athletic teams have participated as a member of the OIA for many decades, despite having inadequate athletic facilities. For example, the existing Boy's P.E. locker room has a history of maintenance and plumbing issues and there are no designated training rooms near the athletic complex. Additionally, the existing track and field is currently underutilized due to a lack of seating and field lights. As such, sports teams' practices are often cut short and nighttime sports events (e.g., football games, soccer games and track and field events) are held off campus at other DOE school campuses, thereby foregoing a home field advantage.

Improving athletic facilities at the only public high school in the Ala Moana/Kaka'ako/Ward neighborhood will allow MHS to better serve students and families within the community.

## 2.5 Project Site Location

The Project site is approximately 1.56 acres, located on the southwestern portion of the MHS campus. MHS is located on TMK: (1) 2-3-009:001 (por.) in Honolulu, on the island of O‘ahu. See *Figure 1-1, Project Location and Tax Map Key*. As the oldest public high school in Hawai‘i, MHS is in the heart of Honolulu and what is known as Kaka‘ako today. MHS is within walking distance of State and City and County of Honolulu (CCH) offices, Straub Medical Center, Neal S. Blaisdell Center (NBC), Ward Villages, Ala Moana Center, Thomas Square and the Honolulu Museum of Arts. MHS is bordered by South King St. to the north, Pensacola St. to the east, Kapi‘olani Boulevard (Blvd.) to the south, and NBC’s parking structure to the west. Surrounding the MHS campus are low- and mid-rise commercial buildings and low-, mid- and high-rise residential buildings.

## 2.6 Schedule and Costs

### 2.6.1 Schedule

The Project’s design and construction may be completed in phases. The first phase of the Project could be completed as early as 2025.

### 2.6.2 Cost

The planning and entitlement phase of the Project is funded by legislative line-item appropriations per Act 124/16 (G-52.02), Act 49/17 (G-69) and Act 53/18 (G-69). Future funding for design and construction of the Project will need to be approved by the legislature. The development budget for the Project is subject to funding availability and is estimated to cost approximately $15 million.

## 2.7 Required Permits and Approvals

The State and CCH permits and approvals that will likely be required for the Project are listed below in *Table 2-6*, *List of Required Government Permits and Approvals.*

**Table 2-6 List of Required Government Permits and Approvals**

| Permit or Approval | Approving Agency |
|---|---|
| National Pollutant Discharge Elimination System Permits | State, Department of Health |
| Noise Permit (Construction) | State, Department of Health |
| HRS, 6E-8 Compliance | State, Department of Land and Natural Resources, State Historic Preservation Division |
| Building Permits | CCH, Department of Planning and Permitting |
| Sewage Connection | CCH, Department of Planning and Permitting |
| Grubbing, Excavation, Grading, and Stockpiling | CCH, Department of Planning and Permitting |
| Water Use Permit | CCH, Honolulu Board of Water Supply |
| Street Usage Permit | CCH, Department of Transportation Services |

## 2.8 Agencies, Organizations, and Individuals Contacted for Early Consultation

Listed below are the agencies, elected officials, organizations, and neighbors who were contacted for early consultation, prior to the publication of the Draft EA. For more information regarding the comments received and associated responses, see **Chapter 7, Agencies, Organizations, and Individuals Consulted in the EA Process**.

*State of Hawai'i Agencies*
Department of Education, Facilities Development Branch
Department of Land and Natural Resources
Department of Transportation
Hawai‘i Community Development Authority
McKinley High School

*City and County of Honolulu Agencies*
Department of Environmental Services
Department of Planning and Permitting
Department of Transportation Services
Honolulu Board of Water Supply
Honolulu Fire Department
Honolulu Police Department

*Elected Officials*
Hawai‘i State Senator Sharon Y. Moriwaki, Senate District 12
House Representative Scott K. Saiki, 26th Representative District
Council Member Ann Kobayashi, Honolulu City Council District 5
Council Member Carol Fukunaga, Honolulu City Council District 6
Neighborhood Board No. 11 – Ala Moana/Kaka‘ako

*Organizations and Neighbors*
Hawaiian Electric Company
Hawai‘i High School Athletic Association
Kaka‘ako Improvement Association
Moana Pacific AOAO
Neal S. Blaisdell Center
Pacifica Honolulu
Symphony Honolulu
909 Kapiolani Condos

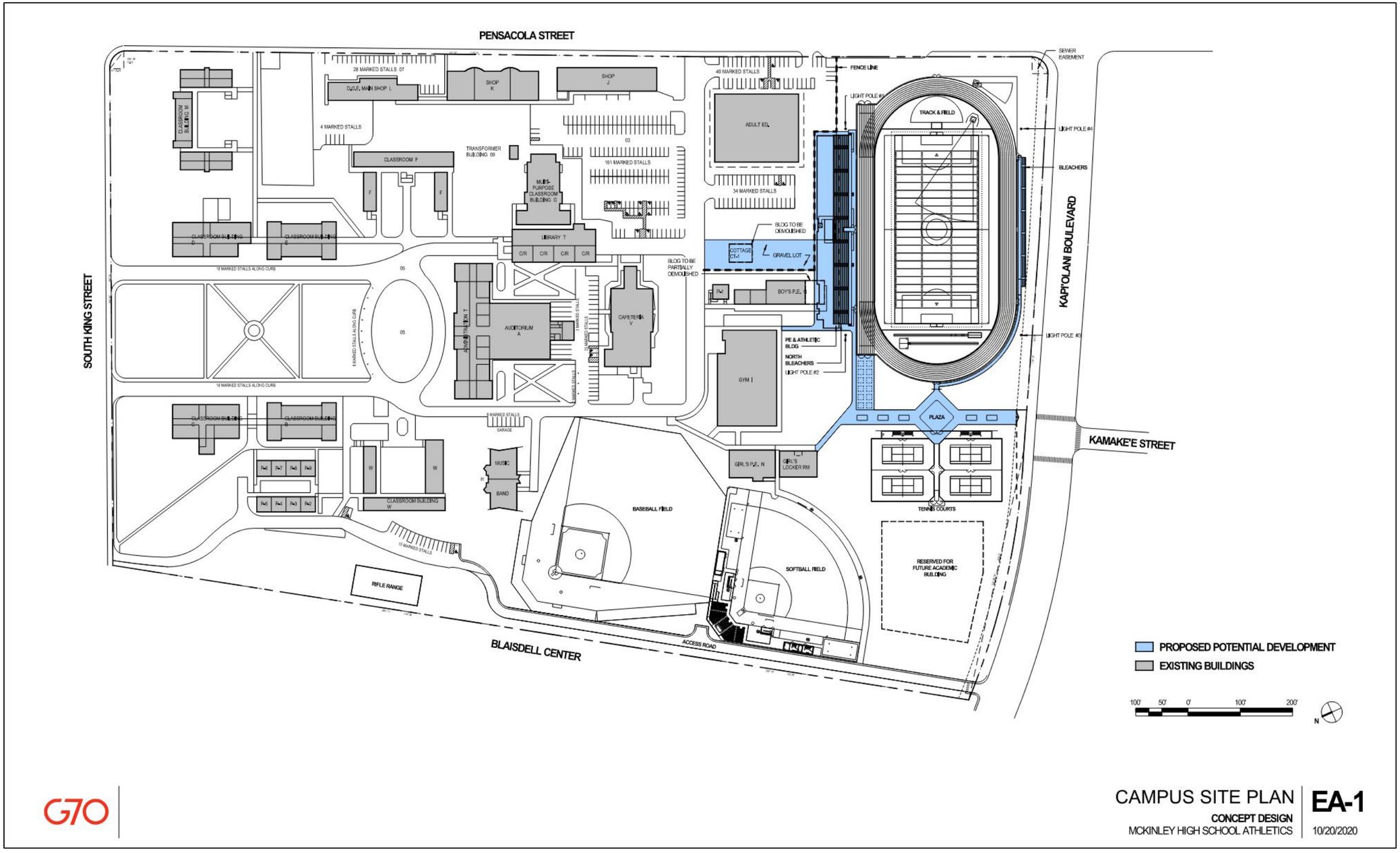


**Figure 2-1** **MHS Campus Site Plan**

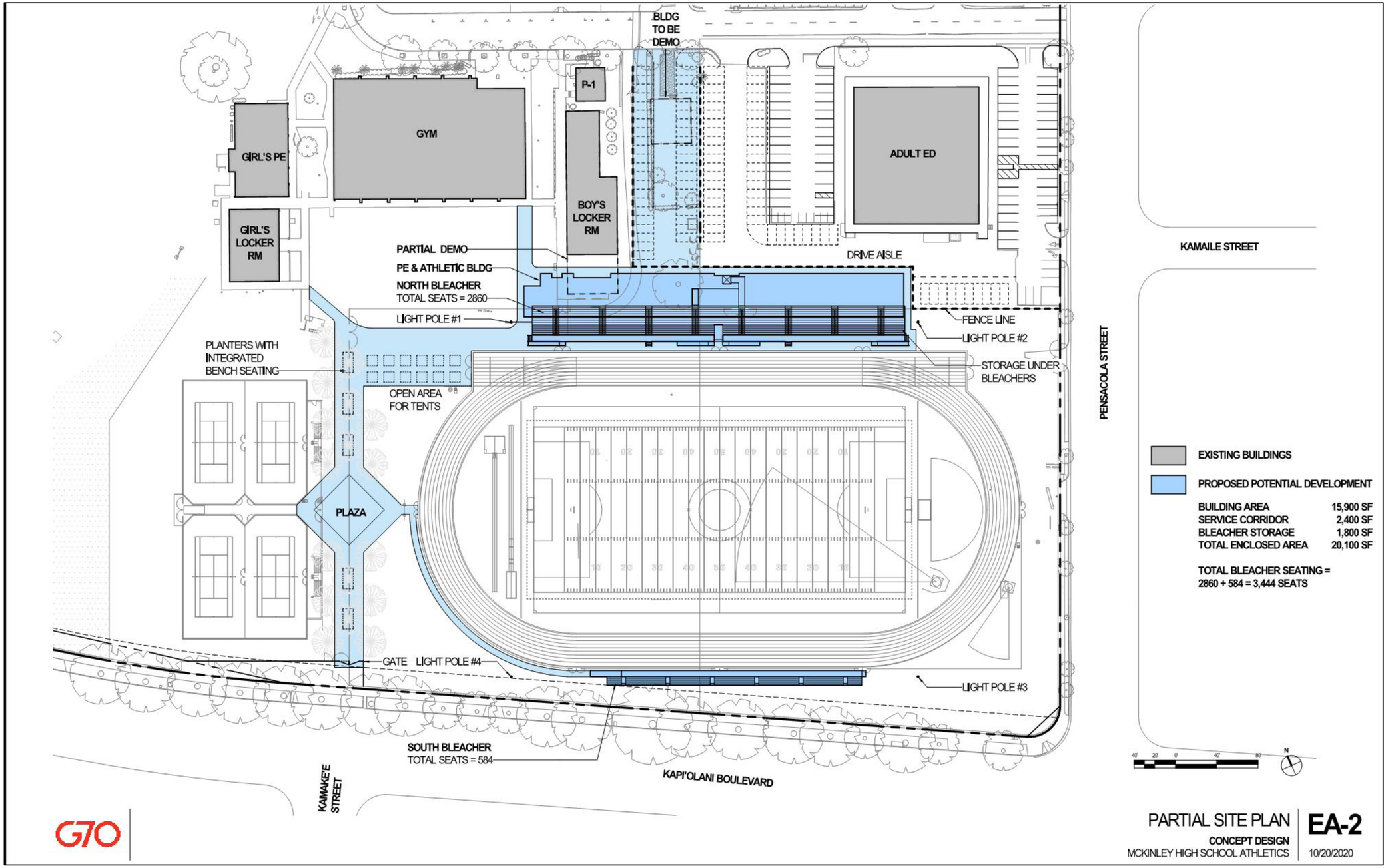


**Figure 2-2** **MHS Athletic Complex Site Plan**

Chapter 3

# Existing Conditions, Potential Impacts and Mitigation Measures

Chapter 3

# Existing Conditions, Potential Impacts and Mitigation Measures

This section describes the existing environmental setting and evaluates potential impacts and proposed mitigation measures. Strategies to mitigate potential impacts are also identified.

## 3.1 Geology, Topography, and Soils

***Existing Conditions***

The island of Oʻahu was created from two major shield volcano formations, Waiʻanae Volcano and Koʻolau Volcano. Both volcanos experienced massive submarine landslides, the Waiʻanae Slump to the southwest and the Nuʻuanu slide to the northeast. The remnants of these volcanoes and landslides formed two mountain ranges, which extend from the northwest to southeast and are joined by a central plateau. A rejuvenated period of volcanic activity produced numerous vent eruptions along the Koʻolau Range. Some of the best known vents include Diamond Head, Punchbowl Crater, Salt Lake Crater, Kaʻau Crater, and Koko Head.

The Kakaʻako geologic substratum consists of emerged fossil reef and sedimentary deposits that were formed 120,000 years ago. Much of the Kakaʻako Mauka area was reclaimed from soils composed of soft mixtures of sand, silt, and clay which extend from the top of the sub-surface coral layer to about sea level (Park, 2010 in G70, 2011).

The Project site slopes from north to south, from an elevation of 10 feet (FT) above mean sea level (msl) along South King St. down to approximately 2.5 FT above msl along Kapiʻolani Blvd. with an average slope of 0.5%. Two soil types are within the Project site; Fill Land, mixed (FL) underlies 80% of the Project site and Makiki Clay Loam (MkA) underlies 20% of the Project site. FL soils are typically dredged from the ocean or hauled from nearby areas and used for urban development. FL soils on the Project site are a result of past efforts to raise/fill the natural marshy ground surface close to the water table, as the Project site is approximately 500 M inland from the original south shore coastline and lies on the low reef limestone plain of Honolulu. Previous archaeological monitoring in the vicinity of the MHS campus have documented natural beach sand deposits and A horizon remnants buried beneath FL soils (CSH, 2020). MkA soils (0-2% slopes) have a dark-brown surface layer clay loam about 20 inches thick and a dark-brown subsoil clay loam about 10 inches thick containing cinders and rock fragments. The permeability of MkA soil is moderately rapid, runoff is slow, and the erosion hazard more than slight (USDA, 1972). See *Figure 3-1, Soils.*

***Potential Impacts and Mitigation Measures***

During construction, clearing and grubbing activities will temporarily disturb and expose soils. To minimize erosion, the Contractor will comply with all applicable federal, state and county regulations

for erosion control and will implement Best Management Practices (BMPs), which may include the following:

- Minimizing disturbed areas to reduce the fugitive dust;
- Centralizing on-site vehicular traffic routes, and locating potential dust-generating equipment in areas of the least impact;
- Retaining existing ground cover as long as possible;
- Providing a water truck on-site during the construction period to provide for immediate sprinkling when ground cover is removed;
- Watering graded areas when construction activity for each day has ceased; and
- Installing silt and dust fences and filter socks around active work areas and inlet protection devices near drainage outlets.

No substantial changes to the site's topography will be made, although some excavation and grading will be required to accommodate the proposed facilities. Additionally, the Project will require excavation for the construction of the athletic complex. Once construction is complete, soil within the Project site will be stabilized with pavement, gravel, or vegetative ground cover.

The Project is not anticipated to result in a significant impact on geology, topography or soils, as the proposed improvements do not involve the alteration of topographic conditions that adversely impact drainage patterns; or the excavation and/or disturbance of hazardous contaminants that compromise public health and safety. No additional mitigation is recommended.

**Figure 3-1** **Soils**

## 3.2 Climate, Climate Change, and Sea Level Rise

***Existing Conditions***

**Climate**

The National Weather Service defines climate as the expected frequency and states of the atmosphere, ocean, and land including variables such as temperature and wind speed and direction. Climate encompasses the weather over different periods of time (NWS, 2020a).

Hawai‘i's climate is typically characterized by mild temperatures throughout the year, moderate humidity, persistent northeasterly trade winds, significant differences in rainfall within short distances, and infrequent severe storms (NWS, 2020b). The Project site is located in Honolulu, on the island of O‘ahu, which has a climate similar to the leeward coastal lowlands in Hawai‘i.

The average annual temperature recorded at the Daniel K. Inouye International Airport is 77.5° F. Winds are primarily northeasterly trade winds. Occasionally, during the winter months, storms are accompanied by winds from the south. Average wind speeds for Honolulu range from approximately 10 to 15 miles per hour (mph). Relative humidity ranges between 56% and 72%. Average annual precipitation is approximately 24 inches, with rainfall occurring mostly between November and April.

**Climate Change and Sea Level Rise**

Climate change is considered a threat to O‘ahu. Planning for climate change and sea level rise (SLR) is challenging as there are multiple variables and unknown factors.

In 2016, the CCH, Office of Climate Change, Sustainability and Resiliency (CCSR) and the Climate Change Commission (CCC) were established. The CCSR is tasked with tracking climate change science and coordinating with CCH agencies to assess potential impacts on CCH facilities and develop resilient infrastructure in response to climate change. The CCC is tasked with providing advice and recommendations to the Mayor, City Council, and CCH departments.

In 2017, the CCC, Department of Land and Natural Resources (DLNR), Office of Conservation and Coastal Lands and Tetra Tech, Inc., prepared the *Hawai‘i Sea Level Rise Vulnerability and Adaptation Report* (“SLR Report”). The SLR Report produced a vulnerability model using the best available data and methods to determine the potential future exposure of each island to multiple coastal hazards because of SLR. Three chronic flooding hazards were modeled: passive “bathtub” flooding, annual high wave flooding, and coastal erosion. The three hazards were then combined to define the projected extent of chronic flooding due to SLR, called the SLR exposure area. The Hawai‘i Sea Level Rise Viewer is an online interactive map which illustrates the scale of potential flooding and erosion with SLR. The Intergovernmental Panel on Climate Change’s predicts up to 3.2 FT of global SLR by year 2100, based on a “business as usual” scenario where greenhouse gas (GHG) emissions continue at the current rate of increase; however, recent observations and projections suggest that SLR could occur as early as 2060 (Tetra Tech et. al., 2017).

The Project site and surrounding areas have a moderate risk of being impacted by a 3.2 FT SLR as illustrated in *Figure 3-2, Sea Level Rise Exposure Area*.

***Potential Impacts and Mitigation Measures***

Construction-related activities will result in the production of GHG emissions due to the generation of exhaust from construction vehicles and equipment. Construction-related activities include earthwork, grading, excavation, concrete work, stockpiling, and transport of building materials and construction spoils and debris. Construction-related impacts will be temporary and cease upon the completion of the Project.

The proposed P.E. & Athletic Building will involve similar energy consumption as the existing Boy's P.E. locker room. Energy efficient lighting will be used for interior and exterior lights at the P.E. & Athletic Building, and for the light poles at the track and field. Events at the MHS athletic complex, including the track and field are typically held during the hours of 7:00 AM to 10:00 PM due to noise regulation. Field lights will be dimmed once the event is over. The installation of landscaping such as shade trees within raised planters and grass near the plaza and bench seating will help to mitigate and absorb local GHG emissions. Shade trees are proposed in raised planters to avoid potential impacts from sea water; additionally, planting of salt-tolerant grass species will be considered. Installation of low-impact development (LID) designs such as use of bioswales and/or permeable pavement will be considered to mitigate potential impacts of flooding due to SLR. The increased number of bleachers will result in an increase in number of vehicles traveling to the Project site to attend sports events. The increased vehicle trips will contribute to GHG emissions. However, the impact is not anticipated to be significant. Sports spectators will be encouraged to carpool or use an alternative means of transportation such as mass transit, bicycle, or walking.

The impacts of GHG emissions are inherently indirect and cumulative. The Project is not anticipated to have a direct significant impact on the climate or significantly contribute to climate change, as proposed improvements will not lead to a substantial increase in GHG emissions, associated with the consumption of electricity, compared to baseline conditions. No additional mitigation is recommended.

**Figure 3-2** **Sea Level Rise Exposure Area**

# 3.3 Natural Hazards

## 3.3.1 Flooding

***Existing Conditions***

Flooding in Hawaiʻi primarily occurs as a result of stream overflow and surface runoff, following torrential rains that fall on steep slopes of mountain ranges. The most frequent and severe flooding on Oʻahu occurs where steep mountain ranges abruptly meet flat coastal plains, as found in Waimanālo, Kailua, Kāneʻohe, and Lāʻie. While floods are principally a natural event, most flood damage is a result of development on lands susceptible to flooding (Fletcher, et al., 2002).

The Federal Emergency Management Agency (FEMA) prepares Flood Insurance Rate Maps (FIRM) based on flood studies to identify flood hazard areas and associated base flood elevations (BFE), or the elevations at which water is anticipated to rise during the base flood. Based on the FEMA-FIRM panel 15003C0362G (dated 01/19/2011), the majority of the MHS campus and Project site is in Flood Zone X, an area of low-to-moderate flood hazard risk (determined to be outside the 0.2% annual chance floodplain). A small portion at the makai corner of the MHS campus, abutting the Project site is in Flood Zone AE with 5 FT BFE. Flood Zone AE is subject to inundation by the 1% annual chance flood (100-year). See *Figure 3-3, Flood Zones*.

***Potential Impacts and Mitigation Measures***

During construction, the Project site will be at minimal risk from the threat of natural hazards, such as flooding. However, the Project site is no more vulnerable to flood events than the surrounding area in Flood Zone X. If there is a flood event, construction activities will cease; equipment and materials will be secured; and all Federal, State and CCH requirements will be implemented to ensure the safety of staff, construction crews and community members near the Project site.

Project improvements will adhere to the Revised Ordinances of Honolulu (ROH), §21-9.10, *Flood Hazard Districts* and HAR §15-217-61, *Flood zone*. If there is a flood event, the MHS will implement its emergency response plan. The Project is not anticipated to result in a significant impact to the surrounding neighborhood during a flood event. No additional mitigation is recommended.

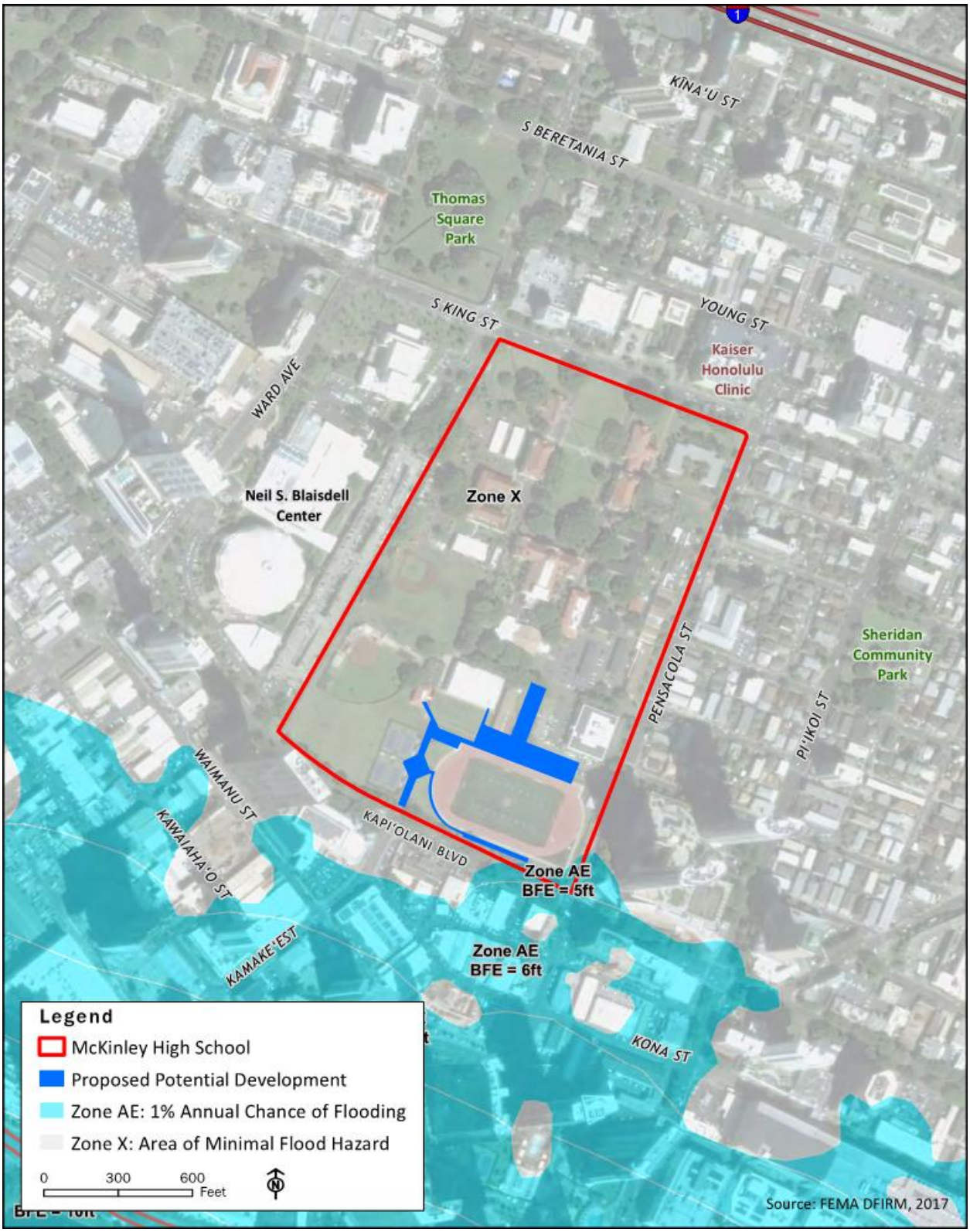


**Figure 3-3** **Flood Zones**

### 3.3.2 Tsunami

***Existing Conditions***

A tsunami involves the generation of destructive waves, created by sea floor movements triggered by earthquakes, landslides, or submarine faulting and volcanic eruptions. Tsunamis that impact Hawai‘i typically originate from distant, seismically active areas bordering the Pacific Ocean, or from local, undersea earthquakes, primarily near the island of Hawai‘i. Tsunamis are often difficult to predict, as there are several determining factors, including the slope, geology, and morphology of the offshore region and shoreline (Fletcher, et al., 2002). While tsunami inundation of low lying coastal areas is a rare phenomenon in Hawai‘i, it is prudent to assume that future events will occur.

The Pacific Tsunami Warning Center (PTWC) issues warnings when a potential tsunami with significant widespread inundation is imminent or expected. Tsunami warnings alert the public that tsunami coastal flooding is possible and alert emergency management officials to evacuate tsunami hazard zones. The CCH, Department of Emergency Management prepares Tsunami Evacuation Zone Maps for the island of O‘ahu. According to Map 19, Inset 2 (dated April 2015), the Project site is located within the “extreme tsunami evacuation zone,” which requires evacuation during an “extreme tsunami warning.” (CCH, 2015). The occurrence of an extreme tsunami event is extremely rare. See *Figure 3-4, Tsunami Zones*.

***Potential Impacts and Mitigation Measures***

During construction, the Project site will be at minimal risk from the threat of natural hazards, such as tsunamis. However, the Project site is no more vulnerable to tsunamis than the surrounding area, and in some cases the rest of O‘ahu. Depending on the type of tsunami warning issued by the PTWC, construction activities may have to come to a halt; equipment and materials will be secured; and all Federal, State and CCH requirements will be implemented to ensure the safety of staff, construction crews and community members near the Project site.

The Project does not involve improvements that increase the risk to the public’s safety during a tsunami event. In the event of a tsunami, the MHS will implement its emergency response plan. The Project is not anticipated to result in a significant impact to the surrounding neighborhood during a tsunami event. No additional mitigation is recommended.

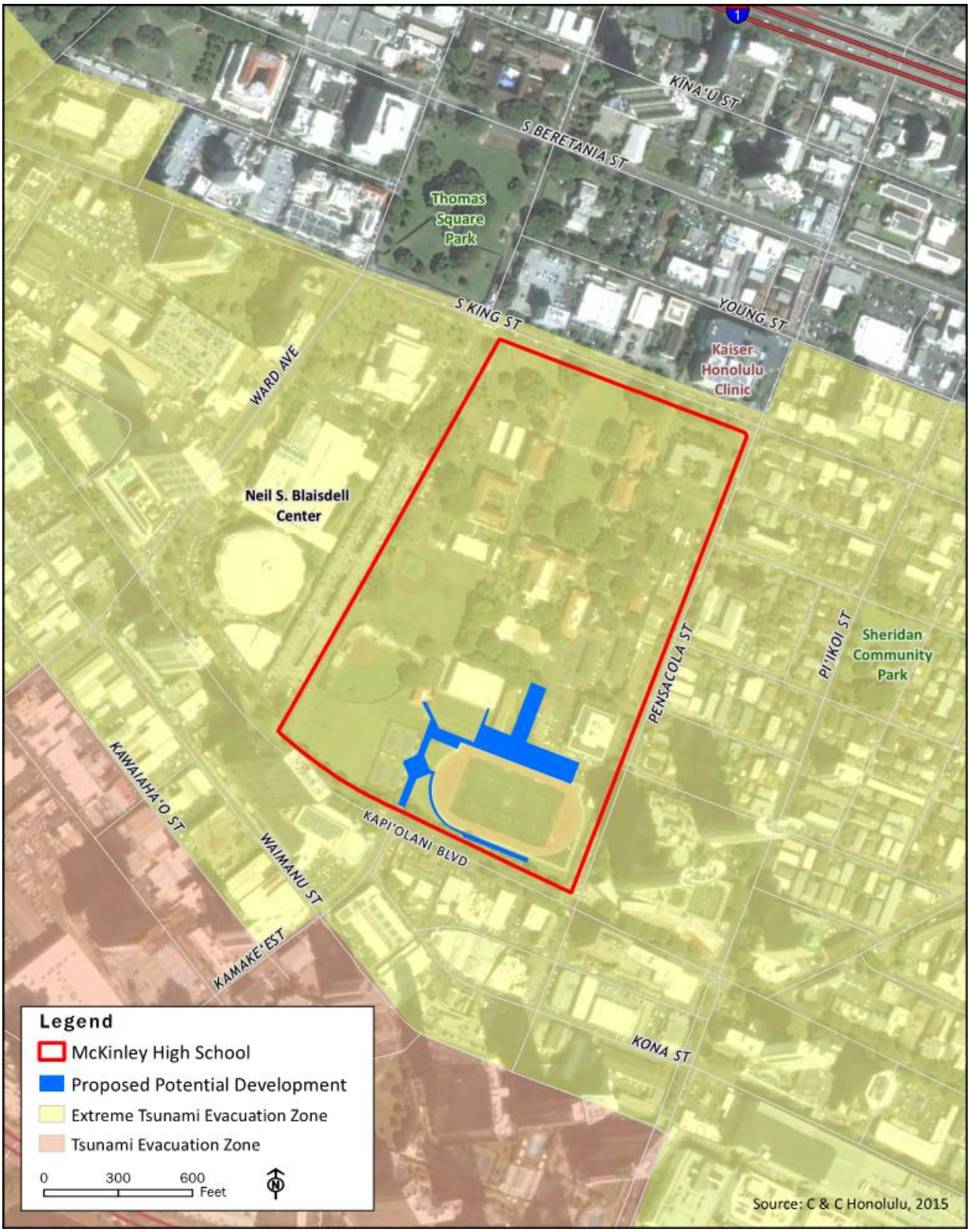


**Figure 3-4** **Tsunami Zones**

### 3.3.3 Seismic Activity

***Existing Conditions***

Most seismic hazards/earthquakes in Hawai‘i occur on Hawai‘i Island, where thousands of earthquakes occur each year; though most are insignificant, too small to be felt, and can only be detected by a seismograph. Approximately 95% of the earthquakes on Hawai‘i Island are related to volcanic activity or the movement of magma within Kilauea or Mauna Loa. The rare occurrence of earthquakes on O‘ahu is generally related to tectonic activity along seafloor fractures and faults, such as the Diamond Head Fault or volcanic activity on Hawai‘i Island. Earthquakes that reach O‘ahu are generally insignificant and cause little to no damage. However, the O‘ahu earthquake of 1948, was measured at a magnitude of 4.8-5.0 and “resulted in broken store windows, plaster cracks, fissures and ruptures to building walls and a broken underground water main” (Fletcher, et al., 2002).

The severity of an earthquake is classified by magnitude and intensity. Magnitude is a measure of the amount of energy released during an earthquake, while intensity is a measure of the severity of ground shaking (HI-EMA, 2018 in G70, 2020). Seismic hazards are often characterized by peak ground acceleration (PGA), which is defined as the greatest increase in velocity or ground shaking at a particular geographic point during an earthquake (measure in percentage of gravity). A seismic design category (SDC) is a classification assigned to buildings/structures based on occupancy and the severity of an earthquake, to ensure buildings/structures are earthquake resistant. *Figure 3-5, Seismic Hazards* illustrates the maximum PGA expected in the State over the next 50 years with a 2% chance of exceedance and corresponding SDCs. O‘ahu has the lowest expected ground acceleration (17% of gravity) and is in the “B” SDC, in which individuals “could experience shaking of moderate intensity” (USGS, n.d.).

***Potential Impacts and Mitigation Measures***

During construction, the Project site will be at minimal risk from the threat of natural hazards, such as seismic activity. However, the Project is no more vulnerable to seismic events than the entire island of O‘ahu. In the event of an earthquake, the United States (U.S.) Geological Survey, Central North Pacific office is the official source for earthquake information in Hawai‘i, and provides updates on seismic activity. In the event of an earthquake event, construction activities will cease; equipment and materials will be secured; and all Federal, State and CCH requirements will be implemented to ensure the safety of staff, construction crews and community members near the Project site.

The Project improvements will meet the current IBC and CCH seismic design standards. In the event of an earthquake, the MHS will implement its emergency response plan. The Project is not anticipated to result in a significant impact to the surrounding neighborhood during a seismic event. No additional mitigation is recommended.

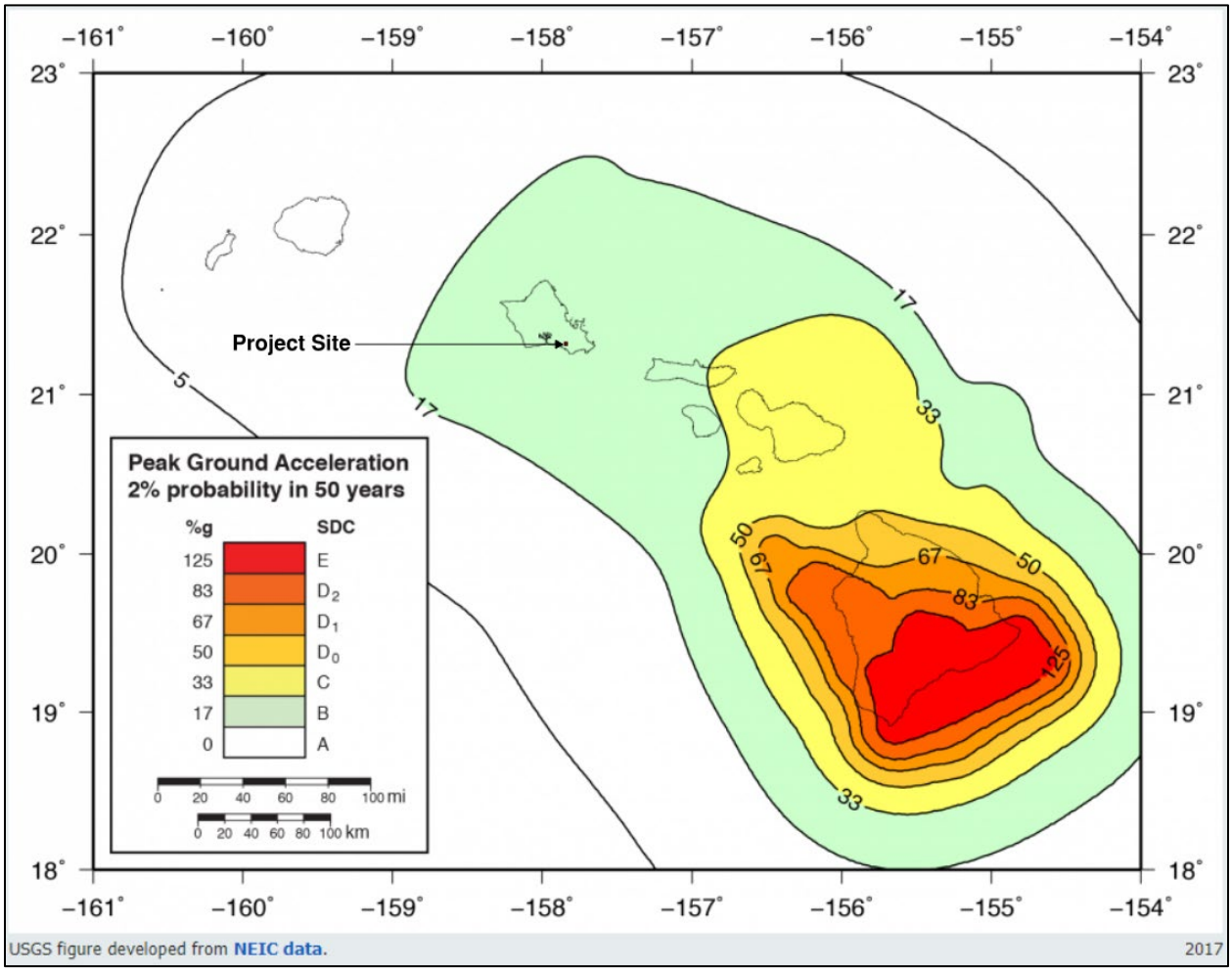


**Figure 3-5** **Seismic Hazards**

# 3.4 Water Resources

## 3.4.1 Groundwater

***Existing Conditions***

The Project site is located within the Honolulu Sector of the Southern Oʻahu Groundwater Area. The Honolulu Sector is one of six groundwater management areas defined by the DLNR, Commission on Water Resource Management, which is based on geologic and hydrologic variations. The Honolulu Sector is comprised of five subsectors: Pālolo, Nuʻuanu, Kalihi, Moanalua, and Waiʻalae. The Project site overlies the Nuʻuanu aquifer.

The Nuʻuanu aquifer is characterized by an unconfined sedimentary basal aquifer above a confined flank basal aquifer. The upper aquifer is classified as currently used, contains moderately brackish water that is not used for drinking and is ecologically insignificant. The flank aquifer is currently used for drinking, contains fresh water, is irreplaceable, and has a low vulnerability to contamination (Mink & Lau, 1990).

***Potential Impacts and Mitigation Measures***

During construction, groundwater may be encountered. The Contractor will shore up and seal excavated work areas during deep excavation, to minimize the potential of groundwater infiltrating active work areas and to prevent potential pollutants discharging into and arising from groundwater, as necessary. If construction dewatering is required, a National Pollutant Discharge Elimination System (NPDES) permit for construction dewatering will be obtained from the State Department of Health (DOH), Clean Water Branch (CWB).

The Project is not anticipated to have a significant impact on groundwater, as the proposed improvements do not involve the installation of an injection well or detention/infiltration basin, or a long-term release of pollutants. No additional mitigation is recommended.

### 3.4.2 Surface Water

***Existing Conditions***

There are no surface waters (e.g., streams, lakes, ponds, open bodies of water, or wetlands) on the Project site. The nearest surface waters to the Project site are two ponds connected via an open ditch at Ala Moana Beach Park, which is adjacent to the Pacific Ocean. See *Figure 3-6, Surface Waters*.

***Potential Impacts and Mitigation Measures***

During construction of the Project there is the potential for minor impacts to surface water quality, as surface waters are susceptible to point-source (i.e., from a discrete or distinct source) and non-point source (i.e., from a diffuse or widely spread, scattered unconcentrated source) pollution. As a result, the Contractor will install BMPs such as filter socks around active work areas and inlet protection devices near drainage outlets to handle the treatment of storm water runoff and mitigate potential construction-related pollutants (e.g., sediment, pollutants, petroleum products, and debris) from entering surface waters. The Project will comply with HAR, Chapters 11-54 and 11-55.

Since the Project involves the disturbance of more than one acre of land, a NPDES General Permit for discharges of storm water associated with construction activities will be required from the DOH, CWB. Separate NPDES General Permits for discharges of construction activity dewatering and hydrotesting waters may also be obtained from the from the DOH, CWB.

The Project is not anticipated to have a significant impact on surface waters, as the proposed improvements do not involve a long-term release of pollutants. No additional mitigation is recommended.

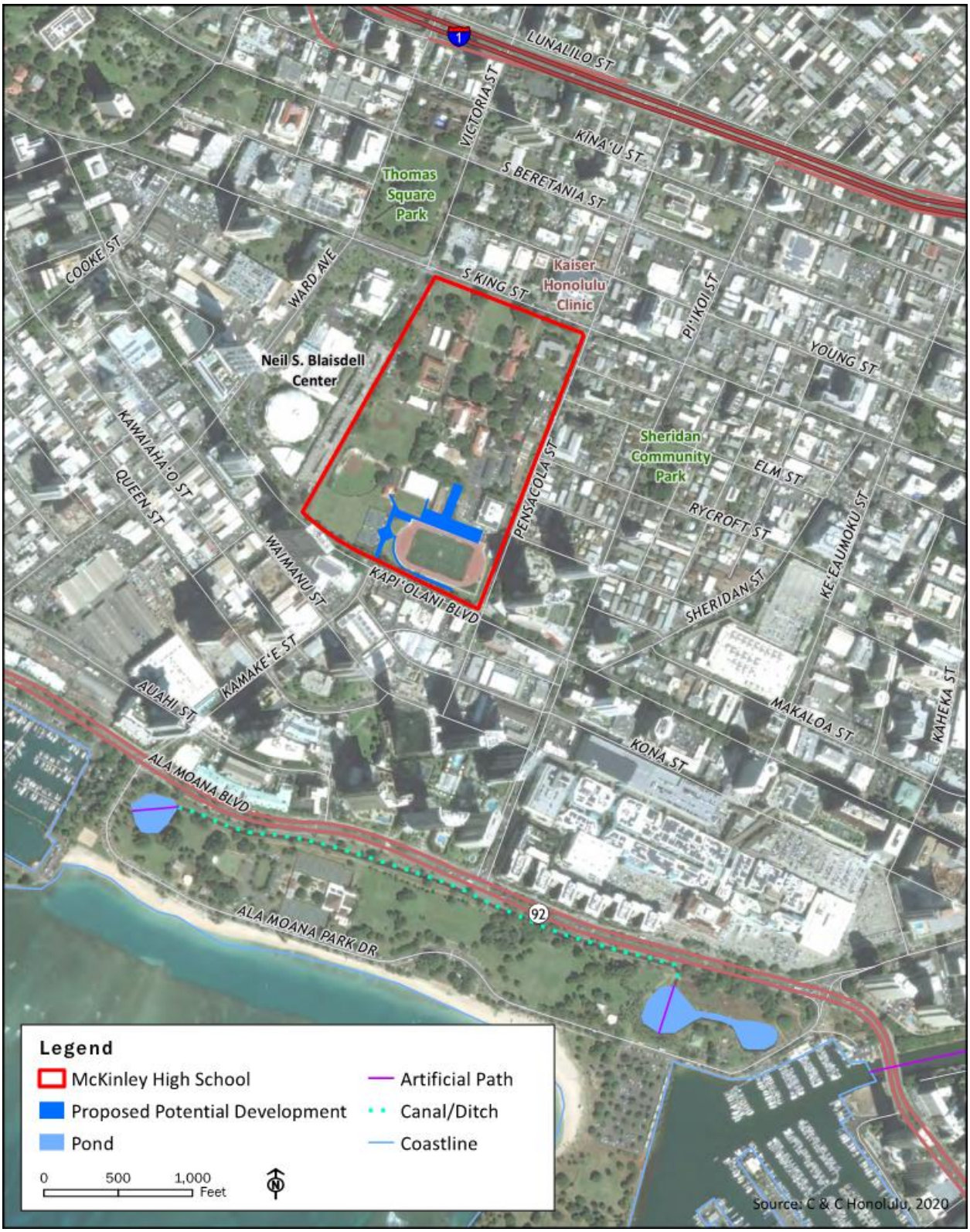


**Figure 3-6** **Surface Waters**

# 3.5 Flora and Fauna

## 3.5.1 Flora

***Existing Conditions***

Common Bermuda grass (*Cynodon dactylon*) is the predominant groundcover on the MHS campus. Monkey pod (*Samanea saman*) and silver trumpet (Tabebuia aurea) trees are also present on the MHS campus (Park, 2010 in G70, 2011). Other "weedy" species such as nut grass/purple nutsedge (*Cyperus rotundus*), dandelion (*Taraxacum officianale*), asthma-plant/pill-bearing spurge (*Euphorbia hirta*) and obscure morning glory (*Ipomea obscura*) typically found in the Honolulu urban area may also be present on the Project site (G70, 2019 in G70, 2020). Royal poinciana (*Delonix regia*) trees line Pensacola St. immediately east of the Project site and Monkey pod trees line Kapiolani Blvd. immediately south of the Project site (DLNR, DOFAW, n.d.).

***Potential Impacts and Mitigation Measures***

The Project involves the removal/relocation of approximately five trees, south of the existing maintenance/custodian cottage, to accommodate the new P.E. & Athletic Building and gravel parking area with unmarked parking stalls. These are not 'exceptional trees,' as defined by the CCH. A tree replacement/relocation plan will be developed in consultation with the DOE's arborist. Tree locations will consider avoiding possible root damage to buildings and dispersion of leaves on the track and field. The Project also involves the installation of landscaping such as new shade trees within raised planters and grass near the plaza and bench seating. Drought tolerant and native, non-invasive plants will be incorporated where possible. The Project will comply with HAR §15-217-56, *Landscape and recreation space*. The Project is not anticipated to have a significant impact on State or Federally listed, threatened, or endangered flora species, as the proposed improvements will not result in a take of a protected species or substantial damage of a designated critical habitat. No additional mitigation is recommended.

## 3.5.2 Fauna

***Existing Conditions***

There are no known federally-, State-listed, threatened or endangered fauna species, or designated critical habitats on the MHS campus (USFWS, 2010 in G70, 2011). Terrestrial and avifauna species such as the common myna bird (*Acridotheres tristis*), cat (*Felis catus*), domestic dog (*Canis familaris*), rat (*Rattus spp.*), mouse (*Mus domesticus*), small Asian mongoose (*Herpestes auropunctatus*), and other fauna species that have adapted to the Honolulu urban environment may be present on the Project site (G70, 2019 in G70, 2020).

According to the United States Fish and Wildlife Service (USFWS), the federally- and State-listed endangered, endemic 'Ōpe'ape'a or Hawaiian hoary bat (*Lasiurus cinereus semotus*) – Hawai'i's only native terrestrial mammal – is known to roost in trees near forests, though occasionally flies within the Honolulu urban environment (USFWS, n.d. in G70, 2020).

Additionally, seabird species that are protected under the Migratory Bird Treaty Act (MBTA), such as the wedge-tailed shearwater (*Puffinus pacificus*) may fly over the Project site (USFWS, 2010 in G70, 2011). The MBTA-protected, Hawaiian seabird – manu-o-Kū or white (fairy) tern (*Gygis alba rothschildi*) is known to fly over and lay eggs in the Honolulu urban environment (Pyle, 2017 in G70, 2020).

According to the Hui Manu-o-Kū, a fledged manu-o-Kū was sited in a Shower tree within the northern portion of the MHS campus on June 24, 2019, approximately 0.25 miles from the Project site. More recently, a manu-o-Kū chick and a fledgling were sited in two separate Monkeypod trees on Kapiolani Blvd. on March 12, 2020, approximately 0.1 mile from the Project site (Hui, 2020).

***Potential Impacts and Mitigation Measures***

It is possible that species such as the Hawaiian hoary bat, wedge-tailed shearwater, and manu-o-Kū may fly over the Project site. Seabirds often fly at night and are attracted to artificially lighted areas, which can result in disorientation and fallout due to exhaustion or collision with objects, and/or predation by feral dogs and cats if downed (USFWS, 2010 in G70, 2011). During construction, the following mitigation measures will be implemented to avoid impacts to the Hawaiian hoary bat and seabirds.

- Hawaiian Hoary
  - Woody plants greater than 15 FT tall will not be disturbed, removed, or trimmed during the bat birthing and pup rearing season (June 1 through September 15). Additionally, barbed wire will not be used for fencing (G70, 2020).
- Seabirds
  - Nighttime construction will be avoided during the seabird fledging period (September 15 through December 15) to prevent injury to seabirds such as the wedge-tailed shearwater, and manu-o-Kū. Outdoor construction lights will be shielded to the maximum extent possible, so the bulb can only be seen from below and as much as possible the lowest wattage bulbs will be used. The Contractor will provide construction crews with information about seabird fallout prior to the initiation of work. If a downed seabird is found, the Contractor will contact USFWS immediately (USFWS, 2010 in G70, 2011).
  - Manu-o-Kū: Prior to the removal/relocation of trees, all trees will be examined to determine if any manu-o-Kū are nesting, especially during the breeding season (January through June, with a peak in March). Trees will not be removed/relocated with nesting manu-o-Kū. Nesting trees or branches will be left alone for at least 80 days from when the egg is laid. If a previously undiscovered nest is found after work begins, work will cease within a minimum radius of 100 FT of the nest and the USFWS will be contacted (G70, 2020).

The Project involves the permanent installation of four to eight light poles at the track and field, reaching up to approximately 90 FT in height. The exterior of the new P.E. & Athletic Building will have security lights. MHS is in urban area where night lights are prevalent. The brightness of exterior building lights will be equivalent to existing lights on other MHS buildings and will not result in light spillage. Events at the MHS athletic complex, including the track and field are typically held during the hours of 7:00 AM to 10:00 PM due to noise regulation. Field lights will be dimmed once the event is over. To avoid impacts to seabirds, permanent outdoor lights will be shielded to the maximum extent possible, and BMPs will be implemented. Staff and students will be provided with information about seabird fallout. If a downed seabird is found, USFWS will be contacted immediately (USFWS, 2010 in G70, 2011).

The Project is not anticipated to have a significant impact on fauna species, as the proposed improvements will not result in a substantial decline or take of a protected, threatened, or endangered species, a substantial damage of a designated critical habitat or a substantial interference with seasonal movements of seabirds or migratory avifauna. No additional mitigation is recommended.

## 3.6 Air Quality

***Existing Conditions***

Hawai‘i lies within the Northern Hemisphere Hadley Cell, which is responsible for persistent northeast trade winds. Consequently, air quality is relatively good on the island of O‘ahu.

The DOH, Clean Air Branch (CAB) has established State Ambient Air Quality Standards (SAAQS) for criteria pollutants in in the HAR, §11-59, *Ambient Air Quality Standards* and §11-60, *Air Pollution Control*. The DOH, CAB, Air Surveillance and Analysis Section, collects measurements of ambient level pollutants in the air through a statewide monitoring network. The closest ambient air quality monitoring station to the Project site is the Honolulu Station (“Honolulu Sta.”) located downtown Honolulu. Air quality on O‘ahu consistently meets SAAQS for all monitored parameters, although occasional exceedances of the more stringent SAAQS for carbon monoxide may occur near congested roadway intersections.

Existing air quality in the vicinity of the Project site is mostly impacted by emissions from vehicular sources which emit carbon monoxide, nitrogen oxides, hydrocarbons, and other air pollutants. Air quality data from the Honolulu Sta. suggests that all State and national air quality standards are currently being met in the downtown Honolulu area (B.D. Neal, 2010 in G70, 2011).

***Potential Impacts and Mitigation Measures***

Construction-related activities will result in the generation of fugitive dust from grubbing, grading, excavation, aggregate processing, vehicle and equipment exhaust and emissions, and the transport of building materials and spoils/debris. Additionally, indirect short-term air quality impacts may include vehicle emissions due to short-term constructed-related traffic delays on nearby roadways. The Contractor will comply with HAR, Chapter 60.1, *Air Pollution Control* and may implement BMPs such as phasing/limiting disturbed areas, watering active work areas, installing dust screens, keeping adjacent paved roads clean, washing of tires/adjacent roadways, covering open-bodied trucks when in motion when transporting materials, moving of heavy construction equipment and scheduling construction workers to commute on off-peak hours (B.D. Neal, 2010 in G70, 2011).

Potential long-term impacts on air quality will primarily be associated with carbon monoxide emissions from vehicles at nearby traffic-congested intersections as a result of major sports events (B.D. Neal, 2010 in G70, 2011). A Transportation Impact Analysis Report (TIAR) and Parking Management Plan was prepared for the Project by AECOM in 2020 (*Appendix D*). When secondary driveways on South King St. and on Kapi‘olani Blvd. are opened to provide access to the MHS campus, the TIAR found that a major sport event at the MHS track and field will result in minor increases (0.1 seconds per vehicle [sec/veh] to 1.0 sec/veh) in vehicle delays at nearby intersections. This delay is not anticipated to change the level of service (LOS) at these intersections (AECOM, 2020). Typically, an increase in traffic volume less than 5%, or less than 100 vehicles per hour and traffic approach volumes of less than 1,000 vehicles per hour does not cause significant impacts to air quality if adequate LOS is provided (B.D. Neal, 2010 in G70, 2011). Considering the relatively minor Project-related traffic impacts, traffic should have negligible adverse long-term impacts on air quality levels in the vicinity of the Project site.

The Project is not anticipated to have a significant impact on air quality, as the proposed improvements do not involve permanent air-polluting activities that will impair the State’s ability to meet Federal or State air quality standards. No additional mitigation is recommended.

# 3.7 Noise Conditions

***Existing Conditions***

Noise is defined as any unwanted or unpleasant sound that causes a disturbance or interferes with normal activities. It may be intermittent or continuous, steady, or impulsive, and stationary or temporary. Existing ambient noise in the Project vicinity is attributable to both the natural environment and human activity, from sources that are typical of urban environments.

Noise is regulated by the DOH, Indoor and Radiological Health Branch (IRHB), in accordance with HAR, §11-46, *Community Noise Control*. HAR, §11-46-3 defines maximum permissible sound levels for three classifications of land use (by zoning district) and provides for the abatement and control of excessive noise sources, including stationary and temporary construction and industrial generated noise sources. "Class A" zoning districts include all residential, conservation, preservation, public space, open space or similar types of zoning districts; "Class B" zoning districts include all multi-family dwelling, apartment, business, commercial, hotel, resort or similar types of zoning districts; and "Class C" zoning districts include all agriculture, country, industrial or similar types of zoning districts. The Project site is in the Class A zoning district; however, this will be confirmed by DOH, IRHB. The maximum permissible sound levels in the Class A zoning district are 55 A-weighted decibels (dBA) between 7:00 AM and 10:00 PM and 45 dBA between 10:00 PM and 7:00 AM. To illustrate, leaves rustling, soft music, or whisper is approximately 30 dBA; normal conversation or background music is approximately 60 dBA; and a vacuum cleaner is approximately 75 dBA.

Per HAR, §11-46, noise levels are not permitted to exceed the maximum permissible sound levels for more than 10% of the time within any 20-minute period, except by permit or variance from DOH, IRHB. A noise permit is required for construction activities (during 7:00 AM to 6:00 PM Monday through Friday and 9:00 to 6:00 PM on Saturday) that exceed 78 dBA or have a total cost of more than $250,000 (based on the value of the building permit). Per HAR §11-46-5, school activities that are approved by school authorities and occur between 7:00 AM to 10:00 PM do not need to adhere to maximum sound level constraints or obtain a noise permit.

The Day-Night Average Sound Level (DNL) method developed by the U.S. Environmental Protection Agency (EPA) is widely used to measure and describe noise. Determining noise levels using the DNL metric requires definition of an average sound level, typical duration, and frequency of occurrence. Noise which occurs at night (10:00 PM to 7:00 AM) is penalized by an additional 10 dB when calculating annual average DNL value, based on the assumption that nighttime noise is more disturbing and less desirable. A 65 DNL is often used as a noise impact threshold for a broad range of noise sources by the federal government (Ebisu, 2020). There are no fines or violations associated with exceeding the 65 DNL impact threshold; it is primarily used to determine the need for noise mitigation on federal projects. The equivalent to State maximum permissible sound levels expressed in DNL is approximately 55 DNL for single-family residential districts and approximately 60 DNL for multi-family residential, commercial, and resort districts.

***Potential Impacts and Mitigation Measures***

Y. Ebisu & Associates conducted a Noise Study for the Project in September 2020. See *Appendix B, Noise Study*. The Noise Study compared existing noise levels (base year of 2017) and future noise levels (with and without the Project) based on potential short-term and long-term noise impacts (Ebisu, 2020).

During construction, short-term noise impacts will be most prominent throughout the site work and earthwork phases (e.g., excavation and filling). Construction-related noise may range from 75 to 85 dBA at distances of 100 FT from the Project site. The Project site will be located approximately 150 FT from the cafeteria and most classroom buildings (Ebisu, 2020). Construction noise will gradually diminish as the exterior structure of the new P.E. & Athletic Building is built and roofed. Construction activities within the new building and exterior walls will attenuate the noise.

Construction-related noise will be temporary. The Contractor will obtain a noise permit from DOH, IRHB and will employ the following mitigation measures to minimize noise impacts:

- Construction equipment and vehicles will be appropriately muffled and maintained to reduce backfires. All generators will be housed in baffle boxes (a sound-resistant box placed over or around a generator), be equipped with an attached muffler, or use other noise-abatement methods in accordance with industry standards.
- The use of certain construction equipment, including pile drivers, hydraulic hammers, and jackhammers, will be limited to 9:00 AM to 5:30 PAM, Monday through Friday.
- Use of broadband back up alarms rather than high frequency beeper backup alarms on operating equipment.
- Equipment staging and material storage areas will be distanced from classroom buildings and noise sensitive neighbors. Noisy construction activities will be scheduled after school hours or on Saturdays.
- If construction-related noise exceeds the DOH's "maximum permissible" noise levels at the MHS campus property line, the Contractor will obtain a noise permit or variance.

The Noise Study assessed the potential long-term noise impacts from the Project, based on non-traffic noise generated during a sport event with maximum spectator capacity at the MHS track and field (3,444 occupied bleacher seats). Predicted noise levels were evaluated from three nearby residential receptor locations – the Moana Pacific condominium on Pensacola St., Pacifica Honolulu condominium on Kapiolani Blvd. and residences along Kamaile St. From these three residential receptors, crowd noise is estimated to range from 61.0 to 69.4 dBA; a public address (PA) system mounted on light poles near the north/south bleachers is estimated to range from 65.1 to 73.1 dBA; and three marching bands playing simultaneously at both ends of the football field and mid-field are estimated to range from 51.8 to 60.0 dBA. These three residential receptors either have convex or flat surfaces and will not reflect higher sound levels back toward the MHS or towards residences located further away. An extreme hypothetical scenario was used to illustrate the potential for non-traffic noise impacts expressed in DNL– if a sport event with maximum spectator capacity occurred twice a week for 52 weeks of the year and extended from 5:00 PM to 11:00 PM (past the 10:00 PM curfew), the upper DNL value of non-traffic noise heard from the Kamaile St. residences would increase to 65.2 DNL, which slightly exceeds the 65 DNL federal noise impact threshold. However, 104 sports events with maximum spectator capacity will not occur at MHS past 10:00 PM throughout the year (Ebisu, 2020).

The Noise Study estimated potential long-term traffic-related noise impacts for the base year (2017), future year without the Project, and future year during a sport event with maximum spectator capacity during the PM peak traffic hour. Traffic-related noise was evaluated from distances of 50, 100, and 150 FT from the centerlines of Kapiolani Blvd., South King St. and Pensacola St. Traffic-related noise at Kapiolani Blvd. and South King St. currently exceeds the 66 Leq(h) (or hourly equivalent sound level) threshold that is used by the State, Department of Transportation, Highways Division for identifying traffic-related noise impacts. Future traffic-related noise levels (without the Project) near Kamaile St. residences are estimated to be approximately 64 to 65 DNL. Increases in future traffic-related noise

associated with the Project are relatively small (1.1 dBA), with the largest increase occurring along Pensacola St.; however, any increase in traffic-related noise will be difficult to measure or perceive. Overall, the Noise Study concluded that the Project is not anticipated to result in traffic-related or non-traffic related noise impacts. Traffic-related noises sources are expected to be the dominant source of noise in the vicinity with or without the Project (Ebisu, 2020).

The DOE will consider designing a PA system with High-Q (25+) speakers which are pointed toward the track and field and bleachers, to minimize noise impacts (Ebisu, 2020). Events at the MHS athletic complex, including the track and field are typically held during the hours of 7:00 AM to 10:00 PM due to noise regulation. Per HAR §11-46-5, school activities that are approved by school authorities which occur between 7:00 AM to 10:00 PM do not need to adhere to maximum sound level constraints or obtain a noise permit. On a rare occasion that an event goes past 10:00 pm, a noise permit will be obtained from the DOH, IRHB. Clean-up after events may extend past 10:00 pm; however, noise levels will substantially decrease. The MHS will provide advance notice to surrounding neighbors if an event will go past 10:00 pm. The Project is not anticipated to result in a significant impact to existing noise conditions. No additional mitigation is recommended.

## 3.8 Utilities and Infrastructure

A Preliminary Engineering Report (PER) was prepared for the Project by Fukunaga & Associates, Inc. in October 2020. The PER evaluated the existing and proposed capacity for potable water, sewer and drainage utilities and infrastructure for the Project. See *Appendix C, Preliminary Engineering Report*.

### 3.8.1 Potable Water

***Existing Conditions***

The CCH, Honolulu Board of Water Supply (BWS) constructs, operates and maintains O‘ahu’s municipal potable water system, which comprises of an interconnected distribution network of reservoirs, wells, shafts, water tunnels, booster and pumping stations and water mains.

The BWS operates and maintains the potable water system serving the MHS campus. The existing water distribution system loops through the MHS campus and consists of a 6-, 8- and 12-inch water lines, that connect to 12-inch water lines in Pensacola St. and King St. Individual laterals tap off this loop and connect to the buildings. The existing average water demand of MHS (based on 221,257 SF of building area and 34.42 acres of irrigated landscape) is estimated at 164,231 gallons per day (gal/d) or 59,944,257 gallons per year (gal/y). The BWS calculates the average water demand based on a combination of BWS standards for student population, campus acreage and/or building square footage (Fukunaga, 2020). See *Appendix C.*

***Potential Impacts and Mitigation Measures***

Construction activities will require use of water for dust control, vehicle wash down, concrete mixing, general housekeeping activities, and for pipe pressure testing. These uses will be intermittent and of short duration and will cease upon project completion. Quantities of water required for these uses are relatively minor. The existing water system has sufficient capacity to accommodate the temporary demands from construction-related activities, and thus will not disrupt or otherwise adversely impact the potable water system.

The Project involves the demolition of approximately 60 FT of an existing 6-inch water line to accommodate the construction of the new P.E. & Athletic Building, which will connect back to the existing 6-inch water line.

Average daily water demand can be estimated based on BWS Water System Standards (dated 2002), using campus acreage, student population, and/or building area as a metric. The Project does not involve an increase in campus acreage or a change in student population; therefore, water demand calculations were based on building area. The Project involves an increase of 22,160 SF in building area. Based on the increased building area, it is projected that the Project will result in an increased average water demand of 2,660 gal/d or 970,900 gal/y, which is a 1.6% increase over the existing annual consumption of 59,944,257 gal/y. The water demand calculations are a conservative estimate as the activities in the new P.E. & Athletic Building will be transferred from the existing Boy's P.E. locker room, and the irrigation area will be decreased (Fukunaga, 2020).

The Project involves the installation of shade trees in raised planters and grass. The DOE will implement water conservation measures such as the planting of drought-tolerant species to reduce irrigation demands. The DOE will also investigate the feasibility of sourcing non-potable water for irrigation, such as harvesting rainwater in catchments or storm water in holding tanks. Based on an early consultation letter from the BWS (dated May 7, 2020), the existing water system is adequate to accommodate the proposed Project. However, the availability of water will be confirmed when the building permit application is submitted. The DOE will be required to pay a Water System Facilities Charges for resource development, transmission, and daily storage.

The Project is not anticipated to result in a significant impact on the potable water system, as proposed improvements do not involve the creation of point-source pollution that leads to permanent damage to O'ahu's potable water supply; a substantial alteration to any portion of the existing potable water system; or a substantial consumption of potable water. No additional mitigation is recommended.

### 3.8.2 Wastewater

***Existing Conditions***

The CCH, Department of Environmental Services constructs, operates and maintains O'ahu's wastewater infrastructure, including wastewater treatment pump stations and wastewater treatment plants (WWTPs). Wastewater is screened to remove debris, settled to remove organic solids, and treated at the WWTPs.

Wastewater at the MHS is primarily generated from domestic use and groundwater infiltration. Based on the existing population of 2,200 students, the existing sewer system can handle an average daily wastewater flow of 55,000 (gal/d), and a maximum daily rate of wastewater flow of 137,500 gal/d. The existing sewer system's design peak flow is estimated at 323,135 gallons (Fukunaga, 2020).

The existing sewer system on the MHS campus consists of sewer lines ranging in size from 6 to 12-inches in diameter, which connect to two existing CCH-owned sewer mains; a 48-inch sewer main under Pensacola St. and a 36-inch sewer main under Kapi'olani Blvd. Wastewater flows to the Ala Moana Sewer Pump Station and is pumped to the Sand Island Wastewater Treatment Plant, where it is treated and disposed (Fukunaga, 2020). See *Appendix C.*

***Potential Impacts and Mitigation Measures***

During construction, the Contractor will provide portable toilets for use by the construction workers. Wastewater from the portable toilets will be collected and discharged into a sewer manhole designated for septage receiving. The Contractor will adhere to strict BMPs to minimize and control the generation of construction-related wastewater and pollutants that could be discharged in storm water runoff.

The Project's average daily wastewater flow is estimated at 47,525 gal/d, and the maximum daily rate of wastewater flow is estimated at 118,813 gal/d (based on a student population of 1,901). The Project's design peak flow is estimated at 293,973 gallons. Based on the design peak flow calculations, the existing sewer system is sufficient, and the Project will not require an increase in sewer capacity (Fukunaga, 2020). The P.E. & Athletic Building will connect to the existing sewer system through the installation of approximately 400 FT of new 8-inch sewer line and a new manhole. The new sewer line and alignment will be designed in accordance with the *City and County of Honolulu Wastewater System Design Standards*, Volume 1, dated July 2017 (Fukunaga, 2020).

The Project is not anticipated to result in a significant impact on the existing wastewater system, as the proposed improvements will not result in a substantial increase in generation of wastewater on the Project site. No additional mitigation is recommended.

### 3.8.3 Drainage

***Existing Conditions***

The CCH, Department of Facility Maintenance, Storm Water Quality Branch, is responsible for maintaining the drainage system on O'ahu and aims to improve the quality of runoff that enters the CCH drainage system and eventually discharges into the Pacific Ocean.

The existing drainage system at MHS consists of underground 4 to 18-inch diameter drain lines. Runoff from the MHS flows off-campus into existing CCH-owned drainage infrastructure (e.g., concrete box culverts) on Pensacola St. and Kapi'olani Blvd. Box culverts connect to a concrete rock masonry-lined ditch that runs mauka to makai (ocean side) and borders the western property line between the MHS and the NBC. Flows are conveyed and eventually discharge into the channel and lagoon system in Ala Moana Park (Fukunaga, 2020). See *Appendix C.*

***Potential Impacts and Mitigation Measures***

During construction, there is the potential for pollution associated with storm water runoff to discharge into CCH drainage infrastructure and nearby surface waters. The Contractor will install BMPs such as filter socks around active work areas and inlet protection devices near drainage outlets to handle the treatment of storm water runoff and mitigate potential construction-related pollutants from entering drainage infrastructure and surface waters. The Project will comply with HAR, Chapters 11-54 and 11-55. Since the Project involves the disturbance of more than one acre of land, a NPDES General Permit for discharges of storm water associated with construction activities will be required from the DOH, CWB. Separate NPDES General Permits for potential discharges of construction activity dewatering and hydrotesting waters may also be obtained from the from the DOH, CWB.

The Project will result in a total runoff of 2.64 cubic FT per second (cfs), based on a 10-year recurrence interval and a 1-hour rainfall duration. This is an increase of 1.06 cfs due to approximately 35,000 SF of additional impervious area. To accommodate the increase in stormwater runoff, the installation of new drain lines ranging from 8- to 24-inches and an underground stormwater detention system are

proposed near the new P.E. & Athletic Building. The new drain lines and stormwater detention system will have approximately 2 FT of cover with an invert of approximately 2 FT below. The new drainage infrastructure is proposed to be installed in accessible open spaces (e.g. roadways and grassy areas) to facilitate an ease in maintenance. The new drainage infrastructure would replace the existing subdrain pipe system between the tennis courts and football/soccer field where the open plaza is proposed (Fukunaga, 2020). The DOE will consider installing LID designs such as use of bioswales and/or permeable pavement to mitigate increased runoff and potential impacts of flooding due to SLR. The DOE will also consider water conservation measures such as stormwater harvesting to provide a non-potable water source for irrigation use.

The Project is not anticipated to have a significant impact on existing drainage infrastructure. The Project will result in an increase in impervious surfaces and related storm water runoff; however, the increases in storm water runoff will be negligible and retained and treated on-site. No additional mitigation is recommended.

### 3.8.4 Solid and Hazardous Waste

***Existing Conditions***

Solid waste on O‘ahu is collected by the CCH, ENV, Refuse Division as well as private vendors. The ENV, Refuse Division is responsible for the collection, transport and disposal of most of O‘ahu’s solid waste. The ENV, Refuse Division currently collects solid waste from the MHS. Solid waste is primarily disposed of at H-POWER (CCH’s waste-to-energy plant) located at Campbell Industrial Park or the Waimānalo Gulch Sanitary Landfill. The PVT Land Company Limited (PVT) owns and operates the PVT Landfill, which accepts non-combustible construction and demolition materials and recyclable materials from contractors on a pre-arranged basis. PVT is Hawaii’s largest recycler by volume of material; approximately 7 million tons of wood, glass, metal, plastic, roofing materials, carpet, and concrete are recycled at PVT every year.

***Potential Impacts and Mitigation Measures***

Prior to the partial demolition of the existing Boy’s P.E. locker room and full demolition of the maintenance/custodian cottage, the below standard procedures for hazardous material sampling will be followed by a qualified inspector. Building materials should use destructive sampling protocols to collect representative samples for analysis.

- Asbestos – Sampling and testing of asbestos shall follow EPA and DOH guidelines. Building materials with an asbestos concentration of greater than 1% shall be considered asbestos containing materials (Enpro, 2010 in G70, 2011). Asbestos containing materials will be disposed of at the PVT Landfill, or another landfill permitted by the DOH, Solid and Hazardous Waste Branch (SHWB). The inspector will consult with the DOH, IRHB, Asbestos Program as necessary and adhere to the requirements in HAR, Chapter 11-501 through 11-504.
- Lead Paint – One sample for each structure to be demolished shall be collected. Structures with less than 5.0 milligram per kilogram (mg/kg) Toxic Characteristic Leaching Procedure (TCLP) lead may be demolished and disposed of in a local, municipal landfill. Structures (or segregated lead paint containing components) with greater than 5.0 mg/kg TCLP lead shall be disposed at the PVT Landfill, or another landfill permitted by the DOH, SHWB. The inspector will consult with the DOH, IRHB, Lead-based Paint Program as necessary and adhere to the requirements in HAR, Chapter 11-41.

- Universal Wastes – Prior to demolition, existing buildings should be inventoried for Polychlorinated Biphenyls (PCBs) containing light ballasts and mercury containing lamps. PCB containing light ballasts and mercury containing lamps shall be handled per Universal Waste regulations (Enpro, 2010 in G70, 2011).

During construction, green waste and demolition waste will be generated from grubbing, grading and partial demolition of the existing Boy's P.E. locker room and full demolition of the maintenance/custodian cottage. Green waste will be disposed of at a composting facility such as Hawaiian Earth Recycling, or another approved facility. Non-combustible construction and demolition materials, such as wood, glass, metal, plastic, roofing materials, carpet, and concrete, will be recycled or disposed of at the PVT Landfill or another approved facility. Hazardous wastes will be disposed at the PVT Landfill, or another landfill permitted by the DOH, SHWB. After construction, solid waste generated by MHS activities will continue to be collected by the ENV, Refuse Division and disposed of at approved solid waste disposal facilities.

The Project is not anticipated to result in a significant impact on the existing solid waste disposal system, as the proposed improvements will not lead to a substantial increase in the generation of solid waste during and/or post-construction or a delay or disruption in the collection of solid waste for the surrounding community. No additional mitigation is recommended.

### 3.8.5 Electrical System

***Existing Conditions***

Electrical power to the campus is provided by Hawaiian Electric Company (HECO).

The electrical vault is located within a stand-alone building between Buildings G (Hirata Hall) and P-10 (Graphic Arts). From the Main Switch Board, electrical power at 480/277 volts is distributed to various buildings on campus via a system of handholes and underground ducts. Transformers within the individual buildings convert the 480/227 volts down to 208/120 volts where required for general power utilization.

***Potential Impacts and Mitigation Measures***

Construction of the Project will not adversely impact the provision of electrical power at the MHS or the surrounding community. The existing HECO system has adequate capacity to meet the power requirements during construction activities. In the event of a utility power outage, the Contractor should be prepared with a backup power generator on-site.

The Project is not anticipated to have a significant impact, as the HECO facilities will be able to provide adequate power without causing delays or disruptions to the provision of electrical power to the surrounding community. No additional mitigation is recommended.

### 3.8.6 Telecommunications

***Existing Conditions***

Spectrum and Hawaiian Telcom, Inc. provide cable, internet, and telecommunications services, and operate overhead and underground coax and fiber systems in the Project vicinity.

The main telephone room and main data (computer) room is in the Administration Building at MHS. Telephone cabling is distributed to various buildings on campus via a system of handholes and underground ducts. Data cabling is distributed to various buildings on campus via a system of handholes and underground ducts. The data system is maintained by the DOE's Enterprise Infrastructure Services Branch (EISB). The main media room is in Building T (Audio/Visual Center). Television cabling is distributed to various buildings on campus via a system of handholes and underground ducts. The television distribution system is maintained by the DOE, EISB.

***Potential Impacts and Mitigation Measures***

During construction, coordination with communications vendors will be undertaken to review as-built plans and properly locate service lines, to avoid impacts to underground telecommunication infrastructure.

The Project will not result in significant increase in telecommunication system demand. Telecommunications system handholes are sufficiently distributed throughout the campus and will be able to support telecommunications requirements of the new athletic complex.

The Project is not anticipated to have a significant impact, as the existing telecommunication system is adequate without causing delays or disruptions to the provision of telecommunication services to the surrounding community. No additional mitigation is recommended.

# 3.9 Transportation System

## 3.9.1 Roadways, Traffic and Access

***Existing Conditions***

Roadways

The MHS is bounded by South King St. to the north, Kapiʻolani Blvd. to the south, Pensacola St. to the east, and NBC to the west. Key streets within the vicinity of MHS are described below:

- South King St. is a one-way arterial roadway oriented in the Koko Head-bound direction. Near MHS, it has four travel lanes, one parking lane, and a two-way cycle track. MHS's main entrance is located on South King St. The posted speed limit in the vicinity of MHS is 25 mph. South King St. is under the jurisdiction of the CCH.
- Ward Ave. is a mauka-makai-oriented major collector roadway connecting the upper and lower Makiki areas and providing key access to the H1 Freeway for the lower Makiki area. It is primarily a four-lane roadway with on-street parallel parking lanes on both sides of the roadway. The posted speed limit in the vicinity of MHS is 25 mph. Ward Ave. is under the jurisdiction of the CCH.
- Victoria St. is a mauka-makai oriented collector roadway between South King St. and the H1 Freeway. It provides circulation between the ʻEwa-Koko Head roadways of South King St., South Beretania St., and Kinau St. It is a two-lane, undivided roadway with on-street parallel parking on both sides of the roadway. Its posted speed limit is 25 mph. Victoria St. is under the jurisdiction of the CCH.
- Kapiʻolani Blvd. is an arterial roadway that provides ʻEwa-Koko Head mobility within the central Honolulu area. It is a six-lane, undivided roadway. During peak commute hours, Kapiʻolani Blvd. is contra-flowed providing additional directional capacity in the peak direction (ʻEwa-bound

during the AM peak, Koko Head-bound during the PM peak). The posted speed limit in the vicinity of MHS is 25 mph. Kapiʻolani Blvd. is under the jurisdiction of the CCH.

- **Pensacola St.** is a one-way major collector oriented in the makai-bound direction. It forms a couplet with Piʻikoi St. to provide mauka-makai circulation in the Makiki area. Near MHS, there are three travel lanes with on-street parallel parking lanes on both sides of the roadway. There is also a two-way cycle track located along the Koko Head curb of Pensacola St. The posted speed limit in the vicinity of MHS is 25 mph. Pensacola St is under the jurisdiction of the CCH (AECOM, 2020).

### Access

The main driveway (right-in/right-out) which provides the most direct access to MHS athletic facilities and parking areas is off of Pensacola St., approximately 700 FT mauka of Kapiʻolani Blvd. There are four other ancillary driveways on Pensacola St. Two of the ancillary driveways are located between South King St. and the main driveway, and only serves the maintenance facility. The third ancillary driveway is located makai of the main driveway and serves as supplemental access to the Community School for Adults parking lot and is often gated. The fourth ancillary driveway provides access to the football and track field and is usually gated.

There are three access driveways to the MHS campus on South King St. Two of them are connected to the main driveway and consist of a one-way entrance and a one-way exit located approximately halfway between Victoria St. and Pensacola St. The third driveway is used for special events and is otherwise gated; however, it can also be used as a secondary entrance/exit to MHS. There is a driveway located on Kapiʻolani Blvd. near the NBC's driveway, which is used for special events and can provide supplemental access to MHS; otherwise it is gated (AECOM, 2020).

### Traffic

A TIAR and Parking Management Plan was prepared for the Project by AECOM in December 2020. See *Appendix D*, *Transportation Impact Assessment Report Parking Management Plan*. The TIAR assessed the potential short and long-term traffic impacts from the Project. The current COVID-19 situation has resulted in atypical traffic conditions; therefore, data from previous traffic studies near the Project site was utilized in the TIAR: *Complete Street Mobility Assessment Study* conducted by Fehr & Peers (December 2017) and the *TIAR for the Neal S. Blaisdell Center Redevelopment Project* conducted by AECOM (September 2018). Table 1 in the TIAR, illustrate existing conditions such as LOS and vehicular delay (sec/veh, for the major intersections adjacent to MHS campus during AM and PM peak commuter periods (AECOM, 2020).

### ***Potential Impacts and Mitigation Measures***

Prior to the start of construction, a Traffic Control Plan (TCP) will be prepared. The Contractor will implement the TCP to minimize construction-related traffic from impacting the surrounding area. Construction-related traffic will be temporarily noticeable but will not significantly increase traffic on surrounding streets. The following mitigation measures are recommended, for optimal traffic conditions:

- Trucks delivering construction material and disposing of construction waste should be scheduled on weekdays during times of non-peak commuter periods (9:00 AM to 3:00 PM).
- All construction vehicles will be kept in proper operating condition to prevent impacts on public roadways.

The MHS campus already accommodates sports events; however, the proposed construction of the north and south stadium bleachers (3,444 seats) will potentially draw a larger attendance at these sports events. Most vehicles accessing the MHS athletic complex facilities enter via the Pensacola St. driveway, which concentrates traffic through the South King St./Pensacola St. intersection (AECOM, 2020).

Based on an interpolation of historic data of attendance at MHS sports events, it was estimated that a major sport event could generate 1,041 additional vehicle trips. To mitigate vehicular traffic during a major sport event (3,444 occupied bleacher seats), it is recommended that the secondary driveways on South King St. and on Kapiʻolani Blvd. be opened to allow entry into the MHS campus. As shown in the below *Table 3-1, MHS Event Peak Hour Intersection Operations*, when secondary driveways are utilized, a major sport event is anticipated to result in minor increases (0.1 sec/veh to 1.0 sec/veh) in vehicle delay at nearby intersections; and the overall LOS remains the same (AECOM, 2020).

This assumes that South King St. and Kapiʻolani Blvd. driveways are utilized. These major sports events will be infrequent, typically occur toward the end of the football/track season and are not anticipated to change the daily peak and off-peak traffic operations on/near the MHS campus (AECOM, 2020).

**Table 3-1 MHS Event Peak Hour Intersection Operations**

| Intersection | No Event | | Major Event | |
|---|---|---|---|---|
| | Delay (sec/veh) | LOS | Delay (sec/veh) | LOS |
| South King St./Pensacola St. | 27.3 | C | 28.3 | C |
| Kapiʻolani Blvd./Pensacola St. | 23.0 | C | 23.7 | C |
| Kapiʻolani Blvd./Kamakeʻe St. | 0.4 | A | 0.5 | A |
| Kapiʻolani Blvd./Ward Ave. | 46.7 | D | 46.7 | D |
| South King St/Ward Ave | 23.3 | C | 23.7 | C |
| South King St/Victoria St | 20.1 | C | 21.6 | C |

*Notes: Sourced from Table 6 in AECOM, 2020. Results assume that secondary MHS driveways are used.*

The Project is not anticipated to result in a significant impact on the existing roadways, access driveways, or traffic and circulation. The proposed improvements will not involve a substantial alteration or degradation of the existing roadway network that would cause traffic delays, or a substantial increase in traffic, which would cause a substantial decrease in the LOS. No additional mitigation is recommended.

### 3.9.2 Parking

***Existing Conditions***

The existing main parking lot on the MHS campus has 157 marked stalls; additionally, there are 26 marked stalls adjacent to the cafeteria, which totals to 183 marked stalls. Figure 8 and Figure 9 in the TIAR include photos of the main parking lot (AECOM, 2020).

***Potential Impacts and Mitigation Measures***

During construction, existing parking stalls will remain accessible to students, faculty, and staff at the MHS. The Contractor will implement the TCP to minimize construction-related traffic from impacting the surrounding area. Per an early consultation letter from the Honolulu Police Department (HPD) (dated May 13, 2020), the Contractor will reserve a parking area for first responders that is accessible to the main entrance of the construction area.

The Parking Management Plan assessed potential increased demand for parking and identified space on the MHS campus to accommodate this demand. It is estimated that a maximum capacity/major sport event (occupies 3,444 bleacher seats) would generate approximately 1,295 vehicle trips to the MHS campus. After considering the parking stalls (183) in the main parking lot and cafeteria, a total of 1,112 parking stalls will be needed to accommodate the estimated increase in vehicle traffic. Figures 10 through 14 in the TIAR illustrate the location and number (1,117) of marked parking stalls and non-paved parking areas on the MHS campus that could serve as overflow parking. These areas include marked parking stalls at the McKinley Community School for Adults building; the softball field; and non-paved areas adjacent to the NBC (AECOM, 2020), as well as the gravel parking area with space for 41 unmarked parking stalls, as proposed by the Project. Therefore, the MHS campus has sufficient space to accommodate a major sport event, with a surplus of 5 parking stalls. This information is summarized in the below *Table 3-2, Total Available Parking for MHS Athletic Events*. The NBC parking lot/structure may also be used as supplemental overflow parking when there are no conflicting events (AECOM, 2020). The Project will comply with HAR §15-217-63, *Parking and loading.*

**Table 3-2 Total Available Parking for MHS Athletic Events**

| Parking Area | Number of Parking Stalls |
|---|---|
| Main Parking Lot and Cafeteria Area Marked Parking Stalls | 183 |
| Overflow Marked and Unmarked Parking Areas | 1,117 |
| Total Parking Available on Campus for Major Athletic Event at Football/Track Field | 1,300 |
| Total Projected Vehicular Parking Demand Estimated for Major Athletic Event at Football/Track Field | 1,295 |

*Notes: Sourced from Table 7 in AECOM, 2020.*

### 3.9.3 Mass Transit

***Existing Conditions***

The CCH, Department of Transportation Services (DTS) funds a municipal bus services – TheBus, which is operated by O‘ahu Transit Services (OTS). The MHS campus can be conveniently accessed from multiple TheBus routes on South King St. and Kapi‘olani Blvd. that provide substantial service during peak traffic periods. South King St. is serviced by Routes 1, 1L, 2, and 2L, while Kapi‘olani Blvd. is serviced by Routes 3, 9, 13, 40, 52, 53, 62, CityExpress A, and CountryExpress C. Route 15 provides service along Ward Ave. and Routes 17 and 18 provide service on Pensacola St. There are two bus stops along South King St. that provide proximate access to the MHS campus, one adjacent to the NBC and the other on the ‘Ewa-makai corner of the South King St./Pensacola St. intersection. Additionally, there are multiple bus stops on Kapi‘olani Blvd. and Pensacola St. that provide convenient access to the MHS campus (AECOM, 2020).

The Honolulu Authority for Rapid Transportation is currently undertaking the Honolulu Rail Transit project. The nearest rail transit stop is proposed at Ward/Halekauwila St., which is less than 10-minute walk to MHS. The second phase of the rail transit project will cross urban Honolulu to Ala Moana Center and is anticipated to start service in December 2025.

***Potential Impacts and Mitigation Measures***

During construction, public transit provided by TheBus and the future rail transit will remain accessible. The Contractor will implement the TCP to minimize construction-related traffic from impacting the surrounding area.

Based on an interpolation of historic data of attendance at MHS sports events, it was estimated that a major sport event could result in approximately 141 additional transit trips. However, existing TheBus routes that service on South King St., Kapiʻolani Blvd., Ward Ave., and Pensacola St. are sufficient to accommodate the estimated transit demand (AECOM, 2020). Moreover, after the rail transit starts service in December 2025, there will be added municipal transit services available to event attendees.

The Project is not anticipated to result in a significant impact on municipal mass transit services. The proposed improvements do not involve the obstruction or removal of a transit stop that would limit the public's use of mass transit, nor does the Project result in a substantial increase in the use of municipal mass transit which taxes services. No additional mitigation is recommended.

### 3.9.4 Pedestrian and Bicycle Facilities

***Existing Conditions***

South King St., Pensacola St., Kapiʻolani Blvd., and Ward Ave. have sidewalks on both sides of the roadway. There are crosswalks at the major signalized intersections in the Project vicinity. There is a signalized crosswalk located on South King St. near the MHS main driveway entrance (AECOM, 2020).

There are buffered two-way bicycle tracks on South King St. and on Pensacola St., while bicycles on Kapiʻolani Blvd. and Ward Ave. share the road with vehicles (AECOM, 2020). Per the 2019 *Oʻahu Bike Plan Update*, issued by DTS, protected bike lanes are proposed for Kapiʻolani Blvd. and Ward Ave. (DTS, 2019). The MHS campus has 11 bicycle parking spaces (G70, 2011).

***Potential Impacts and Mitigation Measures***

During construction, sidewalks and bicycle infrastructure will remain available to bicyclists and pedestrians. The Contractor will implement the TCP to minimize construction-related traffic from impacting the surrounding area.

Based on an interpolation of historic data of attendance at MHS sports events, it was estimated that a major sport event could result in approximately 33 additional bicyclist trips and 33 additional (external) pedestrian trips. The DOE, MHS, will consider providing additional bicycle parking facilities as bicycle use to the MHS campus increases (G70, 2011).

The Project is not anticipated to result in a significant impact on pedestrians, as the proposed improvements do not involve the obstruction or removal of pedestrian infrastructure that would limit the public's use of sidewalks or crosswalks. The Project is not anticipated to result in a significant impact on bicyclists, as the proposed improvements do not involve the obstruction or removal of bicycle infrastructure that would limit the public's use of bicycle lanes or paths. No additional mitigation is recommended.

# 3.10 Public Facilities and Services

## 3.10.1 Recreational Facilities

***Existing Conditions***

The MHS campus contains the largest publicly-owned outdoor recreation facilities, mauka of the Ala Moana/Kaka‘ako/Ward neighborhood, which are available to community members. Community members are currently allowed to use the track only during sports teams' practices throughout the year, provided that the use does not interfere with the practices. Community members may use the track without prior notification or reservation; however, members are required to leave once practice ends. The MHS prefers that community members utilize the outer lane of the track whenever possible. The use of other athletic facilities requires prior reservation and submission of a DOE 'Request & Agreement for Use of School Buildings, Facilities, or Grounds' form. The public is welcomed to call MHS to inquire about potential facility use.

Additional recreational facilities in the Project vicinity include the following:

- Neal S. Blaisdell Center, located approximately 0.1 miles west of the Project site;
- Thomas Square, located approximately 0.3 miles northwest of the Project site;
- Sheridan Community Park and Pi‘ikoi-Rycroft Mini Park, located approximately 0.2 miles east of the Project site; and
- Ala Moana Beach Park (State Recreation Area) located approximately 0.3 miles south of the Project site.

***Potential Impacts and Mitigation Measures***

During construction, traffic congestion and temporary detours may have a minimal impact on the public's access to the NBC and potentially other recreational facilities in the Project vicinity. However, the Contractor will conduct construction activities in accordance with a TCP.

The Project involves the development of an athletic complex, including bleachers, an open-air plaza and gravel parking area, which will provide MHS students, staff, and the public with quality athletic facilities for P.E. classes, team practices, games, and recreation.

The Project is not anticipated to have a significant impact on existing recreational resources/facilities in the Project vicinity, as the proposed improvements will not involve a long-term loss of access to, or use of recreational park space or shoreline areas; a permanent change to a recreational area; or a long-term conflict with existing recreational uses. No additional mitigation is recommended.

## 3.10.2 Police

***Existing Conditions***

The HPD provides police protection services on O‘ahu. The HPD's mission is to serve and protect O‘ahu with aloha. HPD has eight patrol districts on O‘ahu. The MHS is within District 1, Sector 3. The main HPD station is on South Beretania St., approximately 0.5 miles northwest of MHS, and provides police protection to the campus.

***Potential Impacts and Mitigation Measures***

During construction, there may be Project-related traffic and noise. Per an early consultation letter from the HPD (dated May 13, 2020), the Contractor will implement a TCP to facilitate the flow of traffic during construction and minimize traffic impacts to the surrounding area. The Contractor will also communicate with the NBC to avoid disruptions during scheduled events. Lastly, a parking area that is accessible to the main entrance of the construction area will be reserved for first responders.

During major athletic events there may be a need to utilize off-duty police to facilitate the flow of traffic entering and existing the MHS campus, as well as for safety with large crowds. This will not impact police services within District 1, Sector 3.

The MHS Athletic Department will adhere to their emergency procedures should an emergency occur within the athletic facilities complex during a practice or game. The Project is not anticipated to result in a significant impact on HPD's operations, as the proposed improvements will not result in an appreciable increase on the long-term demand for such services; or lead to an obstruction or reduction of such services, which would endanger the health and safety of individuals on the Project site or surrounding community. No additional mitigation is recommended.

### 3.10.3 Fire

***Existing Conditions***

The CCH, Honolulu Fire Department (HFD) provides fire protection services on Oʻahu. HFD responds to emergencies including, but not limited to fires, emergency medical calls, hazardous materials incidents, motor vehicle accidents, natural disasters, and technical rescues. HFD works with the CCH, Emergency Services Department (ESD), Emergency Medical Services Division (EMS), who dispatches the closest available unit.

The Kakaʻako Fire Station on Queen St. (Station 9), Makiki Fire Station at Piʻikoi St./Wilder Ave. (Station 3), and the Pāwaʻa Fire Station at Kehaka St./Makaloa St. (Station 2) are all approximately within 1.0 mile of the MHS campus.

Existing fire protection lines thread through the MHS campus with fire hydrants located adjacent to the interior roadways. There are two existing fire hydrants within 40 FT of the Project site. There are also existing fire hydrants along frontages of Kapiʻolani Blvd., South King St. and Pensacola St. There is an existing 8-inch detector check meter on Pensacola St. providing fire flow, which would provide service to the new P.E. & Athletic Building.

***Potential Impacts and Mitigation Measures***

During construction, there may be a minimal increase in the demand on fire services, should worker safety emergency situations arise. Coordination with the HPD will be necessary to mitigate traffic congestion and ensure public safety. Fire vehicle access to the Project site will be maintained during construction.

All Project improvements will be designed and constructed in compliance with ROH, Chapter 20, *Fire Code of the City and County of Honolulu* and relevant provisions of the Uniform Fire Code, 2006 Edition. The proposed P.E. & Athletic Building will be installed with a sprinkler system. BWS standards mandate that the potable water distribution system deliver the maximum daily demand of potable water, while simultaneously accommodating the required fire flow and a residual pressure of 20

pounds per square inch. The actual required fire flow will be determined based on the sprinkler system layout. Per an early consultation letter from the HFD (dated May 4, 2020), fire department access roads will be within 150 FT of any portion of the P.E. & Athletic Building and within 50 FT of an exterior door that provides access to the interior of the building. A water supply capable of delivering the required fire flow for fire protection shall be provided. Fire department access roads will have unobstructed width and vertical clearance to meet CCH requirements. Construction drawings will be submitted to the HFD for review and approval.

The MHS Athletic Department will adhere to their emergency procedures should an emergency occur within the athletic facilities complex during a practice or game. The Project is not anticipated to result in a significant impact on HFD's operations, as the proposed improvements will not result in an appreciable increase on the demand for such services; or lead to an obstruction or reduction of HFD's ability to provide fire protection services to the Project site or surrounding community. No additional mitigation is recommended.

### 3.10.4 Emergency Medical

***Existing Conditions***

The CCH, EMS provides emergency medical services on Oʻahu. The EMS has three districts and 21 ambulance units on Oʻahu. The MHS campus is located within District 2. The HESD, EMS dispatches paramedic crews to respond to medical emergencies and transports patients to the nearest emergency room. The nearest hospital to the MHS campus is Straub Medical Center, located approximately 0.35 miles northwest of the Project site.

***Potential Impacts and Mitigation Measures***

During construction, there may be a minimal increase in the demand for medical services, should worker safety emergency situations arise. Emergency vehicle access to the Project site will be maintained for the duration of construction.

The MHS Athletic Department will adhere to their emergency procedures should a medical emergency occur within the athletic facilities complex during a practice or game. The Project is not anticipated to result in a significant impact on emergency medical services, as the proposed improvements will not result in an appreciable increase on the demand for such services; or lead to an obstruction or reduction of such services, which would endanger the health and safety of individuals on the Project site or surrounding community. No additional mitigation is recommended.

## 3.11 Historic, Archaeological, and Cultural Resources

### 3.11.1 Historic and Archaeological Resources

***Existing Conditions***

Cultural Surveys Hawaiʻi, Inc. (CSH) prepared an Archaeological Literature Review and Field Inspection Report (LRFI) for the Project in October 2020. The LRFI was prepared in accordance with HRS, §6E-8 and HAR, §13-275. Field inspections of the Project site were conducted on March 17, 2020 and April 3, 2020 by CSH archaeologists (CSH, 2020). See *Appendix E, Literature Review and Field Inspection Report.*

The Project site is in the Kewalo area of the central Honolulu Ahupuaʻa, Honolulu (Kona) District. The Project site is approximately 500 M inland from the original south shore coastline and lies on the low, raised reef limestone plain of Honolulu. Ancient streambeds ran on either side of the present MHS campus; these streams were disrupted by the Pūowaina (Punchbowl) eruption. FL soils on the Project site are a result of past efforts to raise/fill the natural marshy ground surface close to the water table. Previous archaeological monitoring in the vicinity of the MHS campus have documented natural beach sand deposits and A horizon remnants buried beneath FL soils (CSH, 2020).

The LRFI verified two previously identified historic properties within the Project site. First, the entire 45.6-acre MHS campus is designated as a Historic District (State Inventory of Historic Places (SIHP) # 50-80-14-9926) and is on the National Register of Historic Places (NRHP). Contributing components of SIHP # -9926 include seven buildings within the MHS plaza and a statue of President McKinley. The remaining 33 buildings and one structure were considered noncontributing due to their modern architecture (less than 50 years old in 1993). Many of these buildings have since been demolished. The Project area and its existing buildings/facilities did not contribute to the SIHP # -9926 designation.

Second, the MHS campus is also within the boundaries of the Kewalo wetlands (SIHP #50-80-14-6636), a natural buried wetland that encompasses a large portion of the traditional ʻili of Kewalo (now part Kakaʻako). Previous archaeological studies and a review of historical maps have documented modifications to the natural Kewalo wetlands (e.g., constructed ponds, a modified edge, a coral wall, and associated fence post). The Kewalo wetlands (SIHP # -6636) have been encountered during previous drilling work within the MHS campus, at approximately 1-2 M (3.2 - 6.5 FT) below the surface (CSH, 2020).

Within the Project area, two existing buildings, a maintenance/custodian cottage and the Boy's P.E. locker room (Building Q) are now older than 50 years of age (constructed circa 1959 and 1963). On the northwestern exterior wall of Building Q is a bronze plaque dedicated to a MHS alumnus, Leroy A. Mendonca, who perished in the Korean War. While these buildings are not contributing elements to SIHP # -9926, they meet the definition of a "historic property." In the open space west of the track and field is a free-standing bronze plaque affixed to a concrete foundation dedicated to a previous school coach and educator, William S. Wise. The plaque may be a potential contributing element to the designated SIHP # -9926 historic property (CSH, 2020).

Lastly, two historic properties were identified in a 2015 archaeological monitoring report, northwest of the Project site on the MHS campus. A stone and mortar (ditch) wall running at a northeast and southwest direction (SIHP # -7754), and a subsurface historical trash layer which included alcohol, milk, glass and medical bottles, and ceramic and metal fragments in a subsurface layer about 25- to 30-centimeter-thick overlying silty clay (SIHP # -7755). While not currently identified within the Project site, SIHP # -7755 could potentially be present in other areas of the MHS campus, including the Project site (CSH, 2020).

***<u>Potential Impacts and Mitigation Measures</u>***

The new P.E. & Athletic Building will be constructed on concrete slab. Utilities (e.g. water, sewer, drainage) will require excavation at depths below 3.2 FT from the surface. Excavation for the elevator shaft is expected to reach depths 4 FT below the surface, and excavation for the light pole foundations are expected to reach depths 6 FT below the surface. Based on early consultation with the DLNR, State Historic Preservation Division (SHPD), Archaeology Branch, Project-related excavations may affect the Kewalo wetlands (SIHP # -6636), which are presumed to be at an approximate depth of 1-2 M (3.2 - 6.5 FT) below the surface (CSH, 2020). An archaeological inventory survey (AIS) does not appear

warranted. Instead, an archaeological monitoring program consisting of a combination of on-site and on-call monitoring is recommended.

The Project involves the partial/full demolition of two existing buildings. The Boy's P.E. locker room (Building Q) will be partially demolished, and the maintenance/custodian cottage will be fully demolished. While these buildings are not contributing elements to SIHP # -9926, they are over 50 years old and meet the definition of a "historic property." Per early consultation with the SHPD, Architecture Branch, the demolition of the maintenance/custodian cottage has been sufficiently documented in a *Thematic Historic Context Study* prepared in 2018 by Mason Architects. Proposed recommended mitigation for the partial demolition of Building Q, includes the submittal of Reconnaissance Survey Level documentation in a transmittal letter from DOE to SHPD.

The bronze dedicatory plaque to MHS alumnus, Leroy A. Mendonca (affixed to Building Q) will not be affected during the partial demolition. Additionally, the Project is not anticipated to impact the free-standing William S. Wise plaque; the plaque will be integrated into the plaza design. The Project will comply with HAR §15-217-62, *Historical and cultural sites*.

The Project is not anticipated to result in a significant impact to historic or archaeological properties. If human skeletal remains are inadvertently discovered during construction activities, all work shall cease immediately and an archaeologist from the SHPD, Archaeology Branch and/or History/Cultural Branch and the HPD shall be notified to determine jurisdictional authority. All work in the area will be suspended until further recommendations are made for the appropriate treatment of archaeological and/or cultural materials. No additional mitigation is recommended.

### 3.11.2 Cultural Resources

***Existing Conditions***

A Cultural Impact Assessment (CIA) was completed by CSH in 2010 for the 2011 MHS ACMP FEA-FONSI, which encompassed a larger Area of Potential Effect (APE) of 22.1 acres than the proposed Project. The findings from the CIA are summarized below:

**Traditional Cultural Landscape**

The Project site is located within the ʻili (small land division within an ahupuaʻa) of Kewalo, east of Kakaʻako ʻIli and mauka of Kukuluāeʻo ʻIli. Land Commission Award and other historic-era documents identify Kewalo as the area between Cooke St. and Sheridan St., mauka of Queen St. Kewalo literally means "the calling (as an echo)" (CSH, 2010 in G70, 2011).

From the legendary accounts, it appears that Kewalo, Kukuluāeʻo, and Kakaʻako were traditionally noted for their fishponds and salt pans, for marsh lands where pili grass and other plants were collected, for ceremonial sites such as Puʻukea Heiau, Kewalo Spring, and Kawailumalumai Pond, and for the trails that allowed transport between the more populated areas of Waikīkī and Honolulu. Important chiefs were born in the area and conducted religious rites there. Commoners traveled to the area to procure food and other resources. Makaʻāinana also lived in the area, possibly adjacent to the ponds and the trails (CSH, 2010 in G70, 2011).

Kewalo is located between two major precontact population centers, Kou (the area of downtown Honolulu surrounding the harbor) and Waikīkī. In Waikīkī, a system of loʻi (irrigated fields) taro fed by streams descending from Makiki, Mānoa, and Pālolo valleys blanketed the plain, and networks of fish ponds dotted the shoreline. Similarly, Kou possessed shoreward fishponds and irrigated fields watered

by ample streams descending from Nuʻuanu and Pauoa Valleys. The pre-contact population and land use patterns of Kewalo may have been derived from its relationship to these two densely populated areas and likely participated in some of the activities associated with them (CSH, 2010 in G70, 2011).

**Community Consultation**

In August 2010, CSH contacted 20 Hawaiian cultural organizations, government agencies, and individuals who might have knowledge of and/or concerns about traditional cultural practices within the APE and/or related to the MHS campus and its surroundings. A total of 10 consulted parties responded and 5 participated in formal semi-structured interviews, which occurred from November to December 2010.

The DLNR, SHPD and Office of Hawaiian Affairs sent response letters. In the response letter (dated August 31, 2010) DLNR, SHPD indicated the possibility of finding cultural resources below ground due to historic building practices of building primarily above ground while leaving underground layers less disturbed. Some pre-contact and historic burials have been disturbed and later re-interred in nearby areas. SHPD noted that there were historic water sources, loʻi kalo, and trails used for gathering, settlement, and access to the shoreline within the vicinity (CSH, 2010 in G70, 2011).

Interviewees included State Senator Suzanne Chun Oakland, Ms. Piʻilani Kaopuiki, Mr. Lopaka Kapanui, Charles Kapua, and an Unnamed Participant. The comprehensive list of consulted parties is shown in Table 3, *Results of Community Consultation* of the CIA. Results of community consultation are included in Section 8.2, *Results of Community Consultation* of the CIA. A summary of the themes/issues resulting from community consultation interviews are stated below:

- The diversity of the MHS was celebrated by Senator Chun Oakland and Ms. Piʻilani Kaopuiki (MHS alumni).
- Plants and agriculture of Kewalo were once an important part of the school curriculum and the culture. Senator Chun Oakland recalled MHS having a robust agricultural program before she became a student. One interviewee gathered medicinal plants for lāʻau lapaʻau on MHS campus, such as ʻuhaloa, and laukahi.
- Net fishing and pole fishing near Ala Moana and the Kewalo Basin from the shoreline and in boats were common.
- The importance of a sense of place was mentioned by all interviewees.
- The controversial role of President McKinley in the history of Hawaiʻi and the inaccuracy of the McKinley statue on the MHS campus was mentioned by some interviewees (CSH, 2010 in G70, 2011).

***Potential Impacts and Mitigation Measures***

During construction, there is the potential for inadvertent cultural finds. It is recommended that a cultural and archaeological monitor be present during all phases of construction (CSH, 2010 in G70, 2011). Project construction workers and all other personnel involved in construction and facility operations will be informed of the possibility of inadvertent cultural finds, including iwi kūpuna (ancestral human skeletal remains). In the event, cultural materials and/or iwi kūpuna are discovered, all work shall cease immediately and an archaeologist from SHPD shall be notified pursuant to HAR §13-280-3. All work in the area will be suspended until further recommendations are made for the appropriate treatment of archaeological and/or cultural materials. If iwi kūpuna (ancestral remains) are identified, all earth moving activities in the area will stop, the area will be cordoned off, and the SHPD and the HPD will be notified pursuant to HAR §13-300-40.

The CIA recommends that improvements to the athletic complex be contextually-sensitive and align with Hawai'i's unique environment. Proposed buildings/structures should match the architectural style of existing buildings on the MHS campus. The Project will also comply with HAR §15-217-55, *Architectural design.* Similarly, proposed landscaping should include the use of native plants. While outside of the Project area, the CIA recommends that DOE consult the Hawaiian community to determine an amicable means to resolve the controversy surrounding the McKinley statue. A potential mitigation measure may be erecting a plaque in front of the McKinley statue to state/remediate the inaccurate depiction of history.

The Project is not anticipated to result in a significant impact on existing cultural resources as the proposed improvements will not result in a permanent loss of access to areas customarily used by native Hawaiians or others for resource gathering or traditional cultural practices; a permanent degradation of plants, animals, and other resources customarily used by native Hawaiians for subsistence or traditional cultural practices; and is not anticipated to disturb to traditional sacred sites or traditional cultural objects. No additional mitigation is recommended.

## 3.12 Socio-Economic Characteristics

***Existing Conditions***

The estimated population of Honolulu County (as of July 1, 2019) is 974,563. The median household income in Honolulu County, during 2014-2018 was $82,906 (in 2018 dollars). Approximately 61% of Honolulu County's population 16 years+ was in the civilian labor force, during 2014-2018. Approximately 91% of Honolulu County's population 25 years+ graduated from high school during 2014-2018 (USCB, 2019).

***Potential Impacts and Mitigation Measures***

During construction, the Project will generate short-term economic benefits through the employment of design and construction firms. Additionally, construction material suppliers and surrounding retail businesses can also be expected to benefit indirectly from the Project.

No long-term jobs are anticipated due to the Project. No induced population growth is anticipated in association with the Project. Once construction is complete, the Project is anticipated to have a positive impact on MHS students, staff and the public, which may have a positive indirect impact on the percentage of individuals within the Honolulu County who attain a high school degree.

The Project is not anticipated to result in a significant impact on the existing socio-economic conditions in the area, as the proposed improvements will not result in a substantial decrease in employment, earnings and/or tax revenue during and/or post-construction; and will not result in a substantial population or demographic change in the surrounding community. In contrast, the Project will have a positive short-term direct, indirect, and cumulative impacts on jobs, earnings, and tax revenues. No additional mitigation is recommended.

## 3.13 Visual and Scenic Resources

***Existing Conditions***

Visual and scenic resources include panoramic views and vistas, landmarks, and landscape features such as significant trees and open space areas.

The Project site is in an urban residential and commercial mixed-used area within the Ala Moana/Kakaʻako/Ward neighborhood. Existing makai views at the ground-level of the Project site consist of low-rise commercial buildings and high-rise residential buildings. Existing mauka views at the ground-level of the Project site consist of the north portion of the MHS campus, mid- and high-rise residential buildings and the Koʻolau Range in the background. Immediately to the west of the Project site is a view of the NBC and immediately to the east is the Moana Pacific high-rise condominium complex. Views into the Project site principally consist of the existing track and field and P.E. & Athletic Building, with high-rise residential buildings in the background.

The Project site is subject to Hawaiʻi Community Development Authority (HCDA)'s *Kakaʻako Community Development District Mauka Area Plan* ("Mauka Area Plan") and HAR, §15-217, *The Mauka Area Rules*. The Mauka Area Plan recognizes panoramic mauka views of the Koʻolau Range from the Kakaʻako Waterfront Park and the Kewalo Peninsula, which are also identified in the CCH, Primary Urban Center (PUC) Development Plan. The view cone (of the panoramic mauka views) associated with the Kewalo Peninsula vantage point, encompasses the western portion of the MHS campus, but excludes the Project site. The Mauka Area Plan also designates a view corridor along Kamakeʻe St. to preserve mauka-makai views and to ensure light and air is provided at the street level. The view corridor along Kamakeʻe St. terminates at Kapiʻolani Blvd. near the Project site. *Figures 3-7* to *3-10* below identify views into and beyond the Project site from various viewpoints.

***Potential Impacts and Mitigation Measures***

Construction activities will be visible from neighboring areas surrounding the Project site, and occasionally construction equipment may obstruct scenic mauka-makai views. However, construction-related impacts to visual and scenic resources are temporary and will end upon completion of the Project. Additionally, dust screens (12 to 16 FT tall) will be installed around active work areas. Dust screens have a dual function and screen views into construction areas, thereby mitigating the visual distraction and contrast of an active construction area from surrounding uses.

The architectural design of the proposed P.E. & Athletic Building, and associated facilities will reflect MHS's unique architectural character and that of the surrounding neighborhood. The Project will also adhere to the building heights and development standards for the Thomas Square neighborhood zone, as indicated in the HCDA's Mauka Area Plan and HAR, §15-217. The proposed building height of the two-story P.E. & Athletic Building (30 FT) and the four to eight light poles at the track and field (up to approximately 90 FT) will be insignificant in contrast to the surrounding high-rise condominiums.

The Project is not anticipated to result in a significant impact to visual resources, as the proposed improvements will not result in a significant alteration of the visual character of the MHS campus or surrounding area. The Project will not permanently obstruct panoramic mauka views within the Kewalo Peninsula vantage point view cone or the mauka-makai view corridor along Kamakeʻe St. No additional mitigation is recommended.

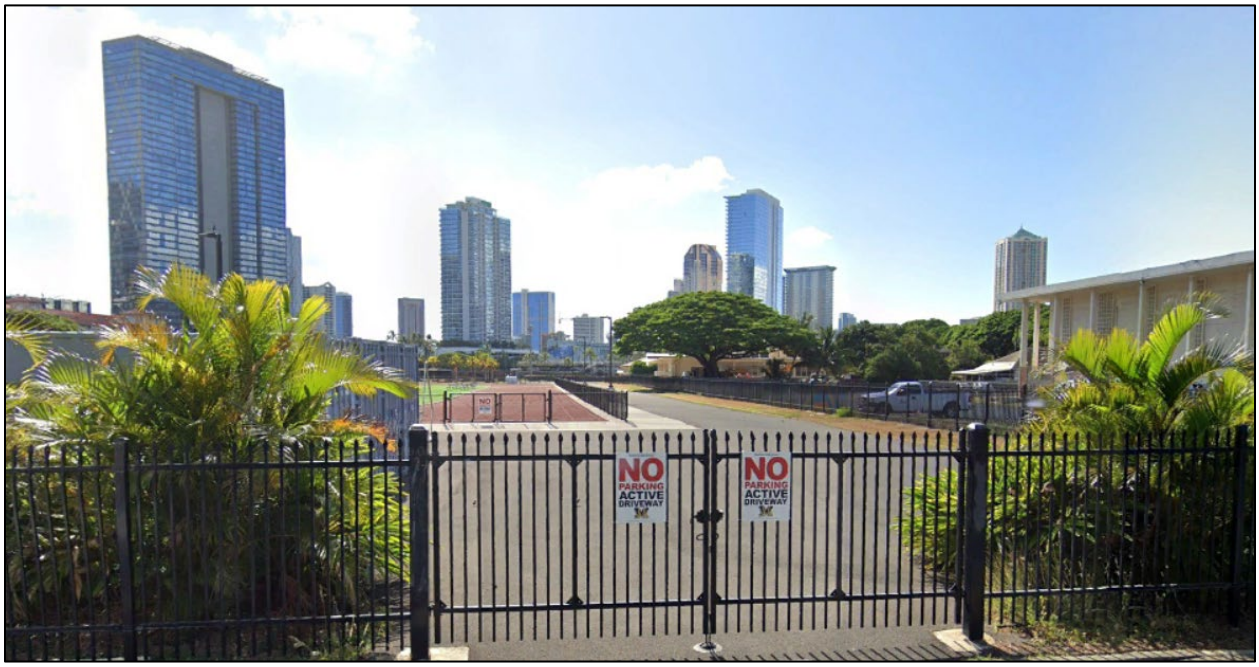


**Figure 3-7** **View of Project Site from Pensacola St. Looking West**

**Figure 3-8** **View of Project Site from Pensacola St./Kapiʻolani Blvd. Looking North East**

**Figure 3-9** **View of Project Site from Kamakeʻe St./Kapiʻolani Blvd. Looking North**

**Figure 3-10** **View (Elevated) of Project Site from MHS Campus Looking South**

## 3.14 Potential Cumulative and Indirect/Secondary Impacts

Cumulative impacts result from the incremental effects of an activity when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertake such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period. Indirect/secondary impacts are associated with, but do not result directly from, an activity. The environmental analysis of the proposed Project addresses development in the context of known planned or approved land uses in the vicinity.

The Project is anticipated to have a beneficial cumulative impact on MHS students, staff, and community members with the development of an improved athletic complex and quality athletic facilities. The positive impacts that health, wellbeing and a sense of fulfillment and achievement that physical exercise and team sports can have on an individual and community are innumerable and unquantifiable. The Project will also have beneficial short-term, indirect impact on employment, earnings, and tax revenue during construction.

The impacts of climate change are inherently indirect and cumulative. The Project's individual contribution to the cumulative impact of global GHG emissions will be relatively negligible.

Chapter 4

# Alternatives to the Proposed Action

Chapter 4

# Alternatives to the Proposed Action

## 4.1 Alternative A – No Action

The "No Action" alternative refers to the future site conditions that would result should the Project not proceed and instead maintain the status quo of the Project site. Under the No Action alternative, components of the 2011 MHS ACMP FEA-FONSI that have not been implemented could still be developed. However, the No Action alternative would not provide MHS students and the community with all the improved athletic facilities proposed by this Project (e.g., 3,444 stadium bleachers seats and field lights); therefore, it would not meet the purpose and need of the Proposed Action. For this reason, the No Action alternative was not considered a viable alternative. The No Action alternative would preclude the short and long-term impacts described in this Draft EA.

## 4.2 Alternative B – Delayed Action

The "Delayed Action" alternative would involve postponing the construction of the proposed Project until a future date. As a result, the MHS would continue to operate with the existing P.E. and athletic complex facilities. Therefore, the Delayed Action alternative would not meet the purpose and need of the Proposed Action. For this reason, the No Action alternative was not considered a viable alternative. Additionally, delaying construction to a future date would likely result in higher planning, entitling, design and construction costs due to inflation.

## 4.3 Alternative C – Different Location

The DOE considered siting the proposed improvements at a different location on the MHS campus. However, the primary purpose of the improvements is to support existing P.E. and athletic activities at the track and field (football/soccer). The secondary purpose of the proposed improvements is to support athletic activities in the gymnasium, baseball field, softball field and tennis courts. Therefore, siting the proposed improvements adjacent to the existing track and field is the most reasonable location. For this reason, the "Different Location" alternative was not considered a viable alternative.

## 4.4 Alternative D – Different Design

The DOE investigated different design configurations for the proposed improvements. One such configuration involved the development of two separate athletic buildings. However, it was determined that this alternative would not provide the most efficient operations; would result in additional adverse environmental impacts from those associated with the preferred alternative; and would not be as cost effective. For this reason, the "Different Design" alternative was not considered a viable alternative.

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Chapter 5

# Relationship to Plans and Policies

Chapter 5

# Relationship to Plans and Policies

## 5.1 Title IX of the Education Amendments of 1972

The U.S. DOE's Office for Civil Rights enforces Title IX. Title IX prohibits sex discrimination in any education program or activity that receives federal funding, including state and local educational agencies. Title IX addresses many issues within educational programs, including recruitment, admissions, and counseling; financial assistance; harassment; treatment of pregnant and parenting students; discipline; employment; and athletics programs (DOE, n.d.).

Title 34, Code of Federal Regulations (CFR), §106.41, *Athletics*, states that "No person shall, on the basis of sex, be excluded from participation in, be denied the benefits of, be treated differently from another person or otherwise be discriminated against in any interscholastic, intercollegiate, club or intramural athletics offered by a recipient, and no recipient shall provide any such athletics separately on such basis." Furthermore, per 34 CFR § 106.41(c), equal athletic opportunities for members of both sexes extend to the provision of equipment and supplies, locker rooms, practice, and competitive facilities.

Discussion: The Project will comply with provisions and intent of Title IX. The new P.E. & Athletic Building will be designed to accommodate MHS athletic programs for both sexes/genders who utilize the athletic complex throughout the year. The DOE is consulting the DOE, Civil Rights Compliance Branch to ensure the Project improvements comply with Title IX.

## 5.2 Americans with Disabilities Act of 1991

The Americans with Disabilities Act (ADA) of 1991 was enacted to ensure that people with disabilities have the same rights and opportunities as everyone else. The ADA prohibits discrimination against individuals with disabilities in all areas of public life, including jobs, schools, transportation, and all public and private places that are open to the public (DOJ, n.d.a). The U.S. Department of Justice revised regulations for Titles II and III of the ADA on September 15, 2010, which resulted in the revised *2010 ADA Standards for Accessible Design* ("2010 Standards"). These 2010 Standards sets minimum accessibility and design requirements for newly constructed or altered State and local government facilities, public accommodations, and commercial facilities (DOJ, n.d.b).

The DOH, Disability and Communication Access Board (DCAB) implements the ADA and enforces guidelines for the design of buildings and facilities per HRS, Chapter 103-50. HRS, §103-50(a) states, "…all plans and specifications for the construction of public buildings, facilities, and sites shall be prepared so that the buildings, facilities, and sites are accessible to and usable by persons with disabilities."

Discussion: The Project will comply with provisions and intent of the ADA and HRS, §103-50. The DOE will consult with DOH, DCAB as necessary to ensure that the proposed improvements meet accessibility and design requirements.

## 5.3 Hawai‘i State Plan

The Hawai‘i State Planning Act, adopted in 1978, and promulgated in HRS, Chapter 226, resulted in the *Hawai‘i State Plan*, recently revised in 1991. The *Hawai‘i State Plan* provides goals, objectives, policies, and priority guidelines for growth, development and the allocation of resources throughout the state in various areas of State interest. The purpose of the *Hawai‘i State Plan* is to improve the planning process in the State; increase the effectiveness of government and private actions; improve coordination among different agencies and levels of government; provide for wise use of Hawai‘i's resources and to guide the future development of the State.

State goals under the Hawai‘i State Planning Act are set to guarantee, for present and future generations, those elements of choice and mobility that insure individuals and groups may approach their desired levels of self-reliance and self-determination:

- A strong, viable economy, characterized by stability, diversity, and growth, that enables the fulfillment of the needs and expectations of Hawai‘i present and future generations.
- 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.
- Physical, social, and economic well-being, for individuals and families in Hawai‘i, that nourishes a sense of community responsibility, of caring, and of participation in community life.

Objectives and policies of the *Hawai‘i State Plan* are presented and discussed based on their relevance to the proposed Project in the below *Table 5.1, Hawai‘i State Plan*.

| **Table 5-1: Hawai‘i State Plan<br>Part 1. Overall Theme, Goals, Objectives, and Policies<br>S = Supportive, N/S = Not Supportive, N/A = Not Applicable** | **S** | **N/S** | **N/A** |
|---|---|---|---|
| **§226-1: Findings and Purpose** | | | |
| **§226-2: Definitions** | | | |
| **§226-3: Overall Theme** | | | |
| §226-4: State Goals. In order to guarantee, for the present and future generations, those elements of choice and mobility that insure that individuals and groups may approach their desired levels of self-reliance and self-determination, it shall be the goal of the State to achieve: | | | |
| (1) A strong, viable economy, characterized by stability, diversity, and growth, that enables the fulfillment of the needs and expectations of Hawai‘i's present and future generations | | | x |
| (2) 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. | | | X |
| (3) Physical, social and economic well-being, for individuals and families in Hawai‘i, that nourishes a sense of community responsibility, of caring, and of participation in community life. | X | | |
| Discussion: While the Project will contribute to the physical and social well-being for MHS students, staff, and the community. The goals specified in HRS, §226-4(1-2) are not directly applicable to the Project. | | | |
| **§226-5: Objective and policies for population**<br>(a) It shall be the objective in planning for the State's population to guide population growth to be consistent with the achievement of physical, economic, and social objectives contained in this chapter;<br>(b) To achieve the population objective, it shall be the policy of this State to: | | | |

| Table 5-1: Hawai‘i State Plan<br>Part 1. Overall Theme, Goals, Objectives, and Policies<br>S = Supportive, N/S = Not Supportive, N/A = Not Applicable | S | N/S | N/A |
|---|---|---|---|
| (1) Manage population growth statewide in a manner that provides increased opportunities for Hawai‘i’s people to pursue their physical, social and economic aspirations while recognizing the unique needs of each county. | | | X |
| (2) Encourage an increase in economic activities and employment opportunities on the neighbor islands consistent with community needs-and desires. | | | X |
| (3) Promote increased opportunities for Hawai‘i's people to pursue their socioeconomic aspirations throughout the islands. | | | X |
| (4) Encourage research activities and public awareness programs to foster and understanding of Hawai‘i's limited capacity to accommodate population needs and to address concerns resulting from an increase in Hawai‘i's population. | | | X |
| (5) Encourage federal actions and coordination among major governmental agencies to promote a more balanced distribution of immigrants among states, provided that such actions do not prevent the reunion of immediate family members. | | | X |
| (6) Pursue an increase in federal assistance for states with a greater proportion of foreign immigrants relative to their state’s population | | | X |
| (7) Plan the development and availability of land and water resources in a coordinated manner so as to provide for the desired levels of growth in each geographic area | | | X |
| Discussion: The objectives and policies specified in HRS, §226-5 are not directly applicable to the Project. | | | |
| §226-6 Objectives and policies for the economy in general.<br>(a) Planning for the State’s economy in general shall be directed toward achievement of the following objectives: | | | |
| (1) Increased and diversified employment opportunities to achieve full employment, increased income and job choice, and improved living standards for Hawai‘i's people. | | | X |
| (2) A steadily growing and diversified economic base that is not overly dependent on a few industries and includes the development and expansion of industries on the neighbor islands. | | | X |
| (b) To achieve the general economic objectives, it shall be the policy of this State to: | | | |
| (1) Promote and encourage entrepreneurship within Hawai‘i by residents and nonresidents of the State. | | | X |
| (2) Expand Hawai‘i's national and international marketing, communication, and organizational ties, to increase the State's capacity to adjust to and capitalize upon economic changes and opportunities occurring outside the State. | | | X |
| (3) Promote Hawai‘i as an attractive market for environmentally and socially sound investment activities that benefit Hawai‘i's people. | | | X |
| (4) Transform and maintain Hawai‘i as a place that welcomes and facilitates innovative activity that may lead to commercial opportunities. | | | X |
| (5) Promote innovative activity that may pose initial risks, but ultimately contribute to the economy of Hawai‘i. | | | X |
| (6) Seek broader outlets for new or expanded Hawai‘i business investments. | | | X |
| (7) Expand existing markets and penetrate new markets for Hawai‘i's products and services. | | | X |
| (8) Assure that the basic economic needs of Hawai‘i's people are maintained in the event of disruptions in overseas transportation. | | | X |
| (9) Strive to achieve a level of construction activity responsive to, and consistent with, state growth objectives. | | | X |
| (10) Encourage the formation of cooperatives and other favorable marketing arrangements at the local or regional level to assist Hawai‘i's small-scale producers, manufacturers, and distributors. | | | X |

| Table 5-1: Hawai‘i State Plan<br>Part 1. Overall Theme, Goals, Objectives, and Policies<br>S = Supportive, N/S = Not Supportive, N/A = Not Applicable | S | N/S | N/A |
|---|---|---|---|
| (11) Encourage labor-intensive activities that are economically satisfying, and which offer opportunities for upward mobility. | | | X |
| (12) Encourage innovative activities that may not be labor-intensive, but may otherwise contribute to the economy of Hawai‘i. | | | X |
| (13) Foster greater cooperation and coordination between the government and private sectors in developing Hawai‘i's employment and economic growth opportunities. | | | X |
| (14) Stimulate the development and expansion of economic activities which will benefit areas with substantial or expected employment problems. | | | X |
| (15) Maintain acceptable working conditions and standards for Hawai‘i's workers. | | | X |
| (16) Provide equal employment opportunities for all segments of Hawai‘i's population through affirmative action and nondiscrimination measures. | | | X |
| (17) Stimulate the development and expansion of economic activities capitalizing on defense, dual-use, and science and technology assets, particularly on the neighbor islands where employment opportunities may be limited. | | | X |
| (18) Encourage businesses that have favorable financial multiplier effects within Hawai‘i's economy. | | | X |
| (19) Promote and protect intangible resources in Hawai‘i, such as scenic beauty and the aloha spirit, which are vital to a healthy economy. | | | X |
| (20) Increase effective communication between the educational community and the private sector to develop relevant curricula and training programs to meet future employment needs in general, and requirements of new, potential growth industries in particular. | | | X |
| (21) Foster a business climate in Hawai‘i--including attitudes, tax and regulatory policies, and financial and technical assistance programs--that is conducive to the expansion of existing enterprises and the creation and attraction of new business and industry. | | | X |
| Discussion: The objectives and policies specified in HRS, §226-6 are not directly applicable to the Project. | | | |
| §226-7 Objectives and policies for the economy - agriculture. | | | |
| (a) Planning for the State's economy with regard to agriculture shall be directed towards achievement of the following objectives: | | | |
| (1) Viability of Hawai‘i's sugar and pineapple industries. | | | X |
| (2) Growth and development of diversified agriculture throughout the State. | | | X |
| (3) An agriculture industry that continues to constitute a dynamic and essential component of Hawai‘i's strategic, economic, and social well-being. | | | X |
| (b) To achieve the agriculture objectives, it shall be the policy of this State to: | | | |
| (1) Establish a clear direction for Hawai‘i's agriculture through stakeholder commitment and advocacy. | | | X |
| (2) Encourage agriculture by making best use of natural resources. | | | X |
| (3) Provide the governor and the legislature with information and options needed for prudent decision making for the development of agriculture. | | | X |
| (4) Establish strong relationships between the agricultural and visitor industries for mutual marketing benefits. | | | X |
| (5) Foster increased public awareness and understanding of the contributions and benefits of agriculture as a major sector of Hawai‘i's economy. | | | X |
| (6) Seek the enactment and retention of federal and state legislation that benefits Hawai‘i's agricultural industries. | | | X |

| Table 5-1: Hawai‘i State Plan<br>Part 1. Overall Theme, Goals, Objectives, and Policies<br>S = Supportive, N/S = Not Supportive, N/A = Not Applicable | S | N/S | N/A |
|---|---|---|---|
| (7) Strengthen diversified agriculture by developing an effective promotion, marketing, and distribution system between Hawai‘i's producers and consumer markets locally, on the continental United States, and internationally. | | | X |
| (8) Support research and development activities that provide greater efficiency and economic productivity in agriculture. | | | X |
| (9) Enhance agricultural growth by providing public incentives and encouraging private initiatives. | | | X |
| (10) Assure the availability of agriculturally suitable lands with adequate water to accommodate present and future needs. | | | X |
| (11) Increase the attractiveness and opportunities for an agricultural education and livelihood. | | | X |
| (12) Expand Hawai‘i's agricultural base by promoting growth and development of flowers, tropical fruits and plants, livestock, feed grains, forestry, food crops, aquaculture, and other potential enterprises. | | | X |
| (13) Promote economically competitive activities that increase Hawai‘i's agricultural self-sufficiency. | | | X |
| (14) Promote and assist in the establishment of sound financial programs for diversified agriculture. | | | X |
| (15) Institute and support programs and activities to assist the entry of displaced agricultural workers into alternative agricultural or other employment. | | | X |
| (16) Facilitate the transition of agricultural lands in economically non-feasible agricultural production to economically viable agricultural uses. | | | X |
| (17) Perpetuate, promote, and increase use of traditional Hawaiian farming systems, such as the use of loko i‘a, māla, and irrigated lo‘i, and growth of traditional Hawaiian crops, such as kalo, ‘uala, and ‘ulu. | | | X |
| (18) Increase and develop small-scale farms. | | | X |
| Discussion: The objectives and policies specified in HRS, §226-7 are not directly applicable to the Project. | | | |
| §226-8 Objective and policies for the economy--visitor industry.<br>(a) Planning for the State's economy with regard to the visitor industry shall be directed towards the achievement of the objective of a visitor industry that constitutes a major component of steady growth for Hawai‘i's economy.<br>(b) To achieve the visitor industry objective, it shall be the policy of this State to: | | | |
| (1) Support and assist in the promotion of Hawai‘i's visitor attractions and facilities. | | | X |
| (2) Ensure that visitor industry activities are in keeping with the social, economic, and physical needs and aspirations of Hawai‘i's people. | | | X |
| (3) Improve the quality of existing visitor destination areas. | | | X |
| (4) Encourage cooperation and coordination between the government and private sectors in developing and maintaining well-designed, adequately serviced visitor industry and related developments which are sensitive to neighboring communities and activities. | | | X |
| (5) Develop the industry in a manner that will continue to provide new job opportunities and steady employment for Hawai‘i's people. | | | X |
| (6) Provide opportunities for Hawai‘i's people to obtain job training and education that will allow for upward mobility within the visitor industry. | | | X |
| (7) Foster a recognition of the contribution of the visitor industry to Hawai‘i's economy and the need to perpetuate the aloha spirit. | | | X |
| (8) Foster an understanding by visitors of the aloha spirit and of the unique and sensitive character of Hawai‘i's cultures and values. | | | X |

| Table 5-1: Hawai‘i State Plan<br>Part 1. Overall Theme, Goals, Objectives, and Policies<br>S = Supportive, N/S = Not Supportive, N/A = Not Applicable | S | N/S | N/A |
|---|---|---|---|
| Discussion: The objectives and policies specified in HRS, §226-8 are not directly applicable to the Project. | | | |
| §226-9 Objective and policies for the economy--federal expenditures.<br>(a) Planning for the State's economy with regard to federal expenditures shall be directed towards achievement of the objective of a stable federal investment base as an integral component of Hawai‘i's economy.<br>(b) To achieve the federal expenditures objective, it shall be the policy of this State to: | | | |
| (1) Encourage the sustained flow of federal expenditures in Hawai‘i that generates long-term government civilian employment. | | | X |
| (2) Promote Hawai‘i's supportive role in national defense. | | | X |
| (3) Promote the development of federally supported activities in Hawai‘i that respect state-wide economic concerns, are sensitive to community needs, and minimize adverse impacts on Hawai‘i's environment. | | | X |
| (4) Increase opportunities for entry and advancement of Hawai‘i's people into federal government service. | | | X |
| (5) Promote federal use of local commodities, services, and facilities available in Hawai‘i. | | | X |
| (6) Strengthen federal-state-county communication and coordination in all federal activities that affect Hawai‘i. | | | X |
| (7) Pursue the return of federally controlled lands in Hawai‘i that are not required for either the defense of the nation or for other purposes of national importance, and promote the mutually beneficial exchanges of land between federal agencies, the State, and the counties. | | | X |
| Discussion: The objectives and policies specified in HRS, §226-9 are not directly applicable to the Project. | | | |
| §226-10 Objectives and policies for the economy--potential growth and innovative activities.<br>(a) Planning for the State's economy with regard to potential growth and innovative activities shall be directed towards achievement of the objective of development and expansion of potential growth and innovative activities that serve to increase and diversify Hawai‘i's economic base.<br>(b) To achieve the potential growth and innovative activity objective, it shall be the policy of this State to: | | | |
| (1) Facilitate investment and employment growth in economic activities that have the potential to expand and diversify Hawai‘i's economy, including but not limited to diversified agriculture, aquaculture, renewable energy development, creative media, health care, and science and technology-based sectors; | | | x |
| (2) Facilitate investment in innovative activity that may pose risks or be less labor-intensive than other traditional business activity, but if successful, will generate revenue in Hawai‘i through the export of services or products or substitution of imported services or products; | | | x |
| (3) Encourage entrepreneurship in innovative activity by academic researchers and instructors who may not have the background, skill, or initial inclination to commercially exploit their discoveries or achievements; | | | x |
| (4) Recognize that innovative activity is not exclusively dependent upon individuals with advanced formal education, but that many self-taught, motivated individuals are able, willing, sufficiently knowledgeable, and equipped with the attitude necessary to undertake innovative activity; | | | x |
| (5) Increase the opportunities for investors in innovative activity and talent engaged in innovative activity to personally meet and interact at cultural, art, entertainment, culinary, athletic, or visitor-oriented events without a business focus; | | | x |
| (6) Expand Hawai‘i's capacity to attract and service international programs and activities that generate employment for Hawai‘i's people; | | | x |
| (7) Enhance and promote Hawai‘i's role as a center for international relations, trade, finance, services, technology, education, culture, and the arts; | | | x |
| (8) Accelerate research and development of new energy-related industries based on wind, solar, ocean, underground resources, and solid waste; | | | x |

| Table 5-1: Hawai‘i State Plan<br>Part 1. Overall Theme, Goals, Objectives, and Policies<br>S = Supportive, N/S = Not Supportive, N/A = Not Applicable | S | N/S | N/A |
|---|---|---|---|
| (9) Promote Hawai‘i's geographic, environmental, social, and technological advantages to attract new or innovative economic activities into the State; | | | x |
| (10) Provide public incentives and encourage private initiative to attract new or innovative industries that best support Hawai‘i's social, economic, physical, and environmental objectives; | | | x |
| (11) Increase research and the development of ocean-related economic activities such as mining, food production, and scientific research; | | | x |
| (12) Develop, promote, and support research and educational and training programs that will enhance Hawai‘i's ability to attract and develop economic activities of benefit to Hawai‘i; | | | x |
| (13) Foster a broader public recognition and understanding of the potential benefits of new or innovative growth-oriented industry in Hawai‘i; | | | x |
| (14) Encourage the development and implementation of joint federal and state initiatives to attract federal programs and projects that will support Hawai‘i's social, economic, physical, and environmental objectives; | | | x |
| (15) Increase research and development of businesses and services in the telecommunications and information industries; | | | x |
| (16) Foster the research and development of nonfossil fuel and energy efficient modes of transportation; and | | | x |
| (17) Recognize and promote health care and health care information technology as growth industries. | | | x |
| Discussion: The objectives and policies specified in HRS, §226-10 are not directly applicable to the Project. | | | |
| §226-10.5 Objectives and policies for the economy--information industry.<br>(a) Planning for the State's economy with regard to telecommunications and information technology shall be directed toward recognizing that broadband and wireless communication capability and infrastructure are foundations for an innovative economy and positioning Hawai‘i as a leader in broadband and wireless communications and applications in the Pacific Region.<br>(b) To achieve the information industry objective, it shall be the policy of this State to: | | | |
| (1) Promote efforts to attain the highest speeds of electronic and wireless communication within Hawai‘i and between Hawai‘i and the world, and make high speed communication available to all residents and businesses in Hawai‘i; | | | X |
| (2) Encourage the continued development and expansion of the telecommunications infrastructure serving Hawai‘i to accommodate future growth and innovation in Hawai‘i's economy; | | | X |
| (3) Facilitate the development of new or innovative business and service ventures in the information industry which will provide employment opportunities for the people of Hawai‘i; | | | X |
| (4) Encourage mainland- and foreign-based companies of all sizes, whether information technology-focused or not, to allow their principals, employees, or contractors to live in and work from Hawai‘i, using technology to communicate with their headquarters, offices, or customers located out-of-state; | | | X |
| (5) Encourage greater cooperation between the public and private sectors in developing and maintaining a well-designed information industry; | | | X |
| (6) Ensure that the development of new businesses and services in the industry are in keeping with the social, economic, and physical needs and aspirations of Hawai‘i's people; | | | X |
| (7) Provide opportunities for Hawai‘i's people to obtain job training and education that will allow for upward mobility within the information industry; | | | X |
| (8) Foster a recognition of the contribution of the information industry to Hawai‘i's economy; and | | | X |
| (9) Assist in the promotion of Hawai‘i as a broker, creator, and processor of information in the Pacific. | | | X |
| Discussion: The objectives and policies specified in HRS, §226-10 are not directly applicable to the Project. | | | |

| Table 5-1: Hawai‘i State Plan<br>Part 1. Overall Theme, Goals, Objectives, and Policies<br>S = Supportive, N/S = Not Supportive, N/A = Not Applicable | S | N/S | N/A |
|---|---|---|---|
| **§226-11 Objectives and policies for the physical environment--land-based, shoreline, and marine resources.** | | | |
| (a) Planning for the State's physical environment with regard to land-based, shoreline, and marine resources shall be directed towards achievement of the following objectives: | | | |
| (1) Prudent use of Hawai‘i's land-based, shoreline, and marine resources. | X | | |
| (2) Effective protection of Hawai‘i's unique and fragile environmental resources. | | | X |
| (b) To achieve the land-based, shoreline, and marine resources objectives, it shall be the policy of this State to: | | | |
| (1) Exercise an overall conservation ethic in the use of Hawai‘i's natural resources. | X | | |
| (2) Ensure compatibility between land-based and water-based activities and natural resources and ecological systems. | | | X |
| (3) Take into account the physical attributes of areas when planning and designing activities and facilities. | X | | |
| (4) Manage natural resources and environs to encourage their beneficial and multiple use without generating costly or irreparable environmental damage. | | | X |
| (5) Consider multiple uses in watershed areas, provided such uses do not detrimentally affect water quality and recharge functions. | | | X |
| (6) Encourage the protection of rare or endangered plant and animal species and habitats native to Hawai‘i. | X | | |
| (7) Provide public incentives that encourage private actions to protect significant natural resources from degradation or unnecessary depletion. | | | X |
| (8) Pursue compatible relationships among activities, facilities and natural resources. | X | | |
| (9) Promote increased accessibility and prudent use of inland and shoreline areas for public recreational, educational and scientific purposes. | X | | |
| Discussion: The Project’s is consistent with State and County land use designations. The Project is outside of the SMA and shoreline area. No protected, threatened, or endangered flora or fauna species or critical habitat are present within the Project site. The Project is being developed on the existing MHS campus within urban Honolulu and does not involve costly or irreparable damage to the environment. During the selection of the preferred alternative, the physical attributes of the Project site were considered to ensure that land area was used in a prudent manner and the proposed improvements were compatible with existing activities, facilities and natural resources. For further discussion, see Section 3.5, Flora and Fauna; and Sections 4.3, Alternative C – Different Location and 4.4, Alternative D – Different Design. | | | |
| **§226-12 Objective and policies for the physical environment--scenic, natural beauty, and historic resources.** | | | |
| (a) Planning for the State's physical environment shall be directed towards achievement of the objective of enhancement of Hawai‘i's scenic assets, natural beauty, and multi-cultural/historical resources. | | | |
| (b) To achieve the scenic, natural beauty, and historic resources objectives, it shall be the policy of this State to: | | | |
| (1) Promote the preservation and restoration of significant natural and historic resources. | X | | |
| (2) Provide incentives to maintain and enhance historic, cultural, and scenic amenities. | | | X |
| (3) Promote the preservation of views and vistas to enhance the visual and aesthetic enjoyment of mountains, ocean, scenic landscapes, and other natural features. | X | | |
| (4) Protect those special areas, structures, and elements that are an integral and functional part of Hawai‘i's ethnic and cultural heritage. | X | | |
| (5) Encourage the design of developments and activities that complement the natural beauty of the islands. | | | X |

| Table 5-1: Hawai‘i State Plan<br>Part 1. Overall Theme, Goals, Objectives, and Policies<br>S = Supportive, N/S = Not Supportive, N/A = Not Applicable | S | N/S | N/A |
|---|---|---|---|
| Discussion: The Project is not anticipated to have an impact on significant natural and historic resources or view sheds and vistas. The Project will be designed to complement the existing built environment and will not detract from surrounding natural beauty of the islands. For further discussion, see Section 3.11, Historic, Archaeological, and Cultural Resources and Section 3.13, Visual and Scenic Resources. | | | |
| §226-13 Objectives and policies for the physical environment--land, air, and water quality.<br>(a) Planning for the State's physical environment with regard to land, air, and water quality shall be directed towards achievement of the following objectives: | | | |
| (1) Maintenance and pursuit of improved quality in Hawai‘i's land, air, and water resources. | X | | |
| (2) Greater public awareness and appreciation of Hawai‘i's environmental resources. | | | X |
| (b) To achieve the land, air, and water quality objectives, it shall be the policy of this State to: | | | |
| (1) Foster educational activities that promote a better understanding of Hawai‘i's limited environmental resources. | | | X |
| (2) Promote the proper management of Hawai‘i's land and water resources. | X | | |
| (3) Promote effective measures to achieve desired quality in Hawai‘i's surface, ground and coastal waters. | X | | |
| (4) Encourage actions to maintain or improve aural and air quality levels to enhance the health and well-being of Hawai‘i's people. | X | | |
| (5) Reduce the threat to life and property from erosion, flooding, tsunamis, hurricanes, earthquakes, volcanic eruptions, and other natural or man-induced hazards and disasters. | | | X |
| (6) Encourage design and construction practices that enhance the physical qualities of Hawai‘i's communities. | | | X |
| (7) Encourage urban developments in close proximity to existing services and facilities. | X | | |
| (8) Foster recognition of the importance and value of the land, air, and water resources to Hawai‘i's people, their cultures and visitors. | | | X |
| Discussion: The Project is not anticipated to have an impact on land, air, and water resources. For further discussion, see Section 3.1, Geology, Topography and Soils, Section 3.6, Air Quality, and Section 3.4, Water Resources. | | | |
| §226-14 Objective and policies for facility systems--in general.<br>(a) Planning for the State's facility systems in general shall be directed towards achievement of the objective of water, transportation, waste disposal, and energy and telecommunication systems that support statewide social, economic, and physical objectives.<br>(b) To achieve the general facility systems objective, it shall be the policy of this State to: | | | |
| (1) Accommodate the needs of Hawai‘i's people through coordination of facility systems and capital improvement priorities in consonance with state and county plans. | | | X |
| (2) Encourage flexibility in the design and development of facility systems to promote prudent use of resources and accommodate changing public demands and priorities. | | | X |
| (3) Ensure that required facility systems can be supported within resource capacities and at reasonable cost to the user. | | | X |
| (4) Pursue alternative methods of financing programs and projects and cost-saving techniques in the planning, construction, and maintenance of facility systems. | | | X |
| Discussion: The objectives and policies specified in HRS, §226-14 are not directly applicable to the Project. | | | |
| §226-15 Objectives and policies for facility systems--solid and liquid wastes.<br>(a) Planning for the State's facility systems with regard to solid and liquid wastes shall be directed towards the achievement of the following objectives: | | | |

| Table 5-1: Hawai'i State Plan<br>Part 1. Overall Theme, Goals, Objectives, and Policies<br>S = Supportive, N/S = Not Supportive, N/A = Not Applicable | S | N/S | N/A |
|---|---|---|---|
| (1) Maintenance of basic public health and sanitation standards relating to treatment and disposal of solid and liquid wastes. | X | | |
| (2) Provision of adequate sewerage facilities for physical and economic activities that alleviate problems in housing, employment, mobility, and other areas. | | | X |
| (b) To achieve solid and liquid waste objectives, it shall be the policy of this State to: | | | |
| (1) Encourage the adequate development of sewerage facilities that complement planned growth. | X | | |
| (2) Promote re-use and recycling to reduce solid and liquid wastes and employ a conservation ethic. | | | X |
| (3) Promote research to develop more efficient and economical treatment and disposal of solid and liquid wastes. | | | X |
| Discussion: Existing solid and liquid waste disposal practices and wastewater infrastructure at the MHS will continue to adequately serve the Project. | | | |
| §226-16 Objective and policies for facility systems--water.<br>(a) Planning for the State's facility systems with regard to water shall be directed towards achievement of the objective of the provision of water to adequately accommodate domestic, agricultural, commercial, industrial, recreational, and other needs within resource capacities.<br>(b) To achieve the facility systems water objective, it shall be the policy of this State to: | | | |
| (1) Coordinate development of land use activities with existing and potential water supply. | X | | |
| (2) Support research and development of alternative methods to meet future water requirements well in advance of anticipated needs. | | | X |
| (3) Reclaim and encourage the productive use of runoff water and wastewater discharges. | X | | |
| (4) Assist in improving the quality, efficiency, service, and storage capabilities of water systems for domestic and agricultural use. | | | X |
| (5) Support water supply services to areas experiencing critical water problems. | | | X |
| (6) Promote water conservation programs and practices in government, private industry, and the general public to help ensure adequate water to meet long-term needs. | X | | |
| Discussion: The existing water system is adequate to accommodate the proposed Project. However, the availability of water will be confirmed when the building permit application is submitted. The DOE will implement water conservation measures such as incorporating drought tolerant landscaping to reduce water irrigation demands and investigate in the feasibility of sourcing and using nonpotable water for irrigation of the athletic complex. For further discussion, see Section 3.8.1, Potable Water. | | | |
| §226-17 Objectives and policies for facility systems--transportation.<br>(a) Planning for the State's facility systems with regard to transportation shall be directed towards the achievement of the following objectives: | | | |
| (1) An integrated multi-modal transportation system that services statewide needs and promotes the efficient, economical, safe, and convenient movement of people and goods. | | | X |
| (2) A statewide transportation system that is consistent with and will accommodate planned growth objectives throughout the State. | | | X |
| (b) To achieve the transportation objectives, it shall be the policy of this State to: | | | |
| (1) Design, program, and develop a multi-modal system in conformance with desired growth and physical development as stated in this chapter; | | | X |

| Table 5-1: Hawai‘i State Plan<br>Part 1. Overall Theme, Goals, Objectives, and Policies<br>S = Supportive, N/S = Not Supportive, N/A = Not Applicable | S | N/S | N/A |
|---|---|---|---|
| (2) Coordinate state, county, federal, and private transportation activities and programs toward the achievement of statewide objectives; | | | X |
| (3) Encourage a reasonable distribution of financial responsibilities for transportation among participating governmental and private parties; | | | X |
| (4) Provide for improved accessibility to shipping, docking, and storage facilities; | | | X |
| (5) Promote a reasonable level and variety of mass transportation services that adequately meet statewide and community needs; | | | X |
| (6) Encourage transportation systems that serve to accommodate present and future development needs of communities; | | | X |
| (7) Encourage a variety of carriers to offer increased opportunities and advantages to inter-island movement of people and goods; | | | X |
| (8) Increase the capacities of airport and harbor systems and support facilities to effectively accommodate transshipment and storage needs; | | | X |
| (9) Encourage the development of transportation systems and programs which would assist statewide economic growth and diversification; | | | X |
| (10) Encourage the design and development of transportation systems sensitive to the needs of affected communities and the quality of Hawai‘i's natural environment; | | | X |
| (11) Encourage safe and convenient use of low-cost, energy- efficient, non-polluting means of transportation; | | | X |
| (12) Coordinate intergovernmental land use and transportation planning activities to ensure the timely delivery of supporting transportation infrastructure in order to accommodate planned growth objectives; and | | | X |
| (13) Encourage diversification of transportation modes and infrastructure to promote alternate fuels and energy efficiency. | | | X |
| Discussion: The objectives and policies specified in HRS, §226-17 are not directly applicable to the Project. However, the MHS campus has sufficient space to accommodate a major sport event at the athletic complex. The Project includes the creation of a gravel parking area with space for 41 unmarked parking stalls. For further discussion, see Section 3.9, Transportation System. | | | |
| §226-18 Objectives and policies for facility systems--energy.<br>(a) Planning for the State's facility systems with regard to energy shall be directed toward the achievement of the following objectives, giving due consideration to all: | | | |
| (1) Dependable, efficient, and economical statewide energy systems capable of supporting the needs of the people; | | | X |
| (2) Increased energy security and self-sufficiency through the reduction and ultimate elimination of Hawai‘i's dependence on imported fuels for electrical generation and ground transportation; | | | X |
| (3) Greater diversification of energy generation in the face of threats to Hawai‘i's energy supplies and systems; | | | X |
| (4) Reduction, avoidance, or sequestration of greenhouse gas emissions from energy supply and use; and | | | X |
| (5) Utility models that make the social and financial interests of Hawai‘i's utility customers a priority. | | | X |
| (b) To achieve the energy objectives, it shall be the policy of this State to ensure the short- and long-term provision of adequate, reasonably priced, and dependable energy services to accommodate demand.<br>(c) To further achieve the energy objectives, it shall be the policy of this State to: | | | |
| (1) Support research and development as well as promote the use of renewable energy sources; | | | X |

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|---|---|---|---|
| (2) Ensure that the combination of energy supplies and energy-saving systems is sufficient to support the demands of growth; | | | X |
| (3) Base decisions of least-cost supply-side and demand-side energy resource options on a comparison of their total costs and benefits when a least-cost is determined by a reasonably comprehensive, quantitative, and qualitative accounting of their long-term, direct and indirect economic, environmental, social, cultural, and public health costs and benefits; | | | X |
| (4) Promote all cost-effective conservation of power and fuel supplies through measures, including:<br>(A) Development of cost-effective demand-side management programs;<br>(B) Education;<br>(C) Adoption of energy-efficient practices and technologies; and<br>(D) Increasing energy efficiency and decreasing energy use in public infrastructure; | | | X |
| (5) Ensure to the extent that new supply-side resources are needed, the development or expansion of energy systems utilizes the least-cost energy supply option and maximizes efficient technologies; | | | X |
| (6) Support research, development, and demonstration of energy efficiency, load management, and other demand-side management programs, practices, and technologies; | | | X |
| (7) Promote alternate fuels and energy efficiency by encouraging diversification of transportation modes and infrastructure; | | | X |
| (8) Support actions that reduce, avoid, or sequester greenhouse gases in utility, transportation, and industrial sector applications; and | | | X |
| (9) Support actions that reduce, avoid, or sequester Hawai‘i's greenhouse gas emissions through agriculture and forestry initiatives. | | | X |
| (10) Provide priority handling and processing for all state and county permits required for renewable energy projects; | | | X |
| (11) Ensure that liquefied natural gas is used only as a cost-effective transitional, limited-term replacement of petroleum for electricity generation and does not impede the development and use of other cost-effective renewable energy sources; and | | | X |
| (12) Promote the development of indigenous geothermal energy resources that are located on public trust land as an affordable and reliable source of firm power for Hawai‘i. | | | X |
| Discussion: The objectives and policies specified in HRS, §226-18 are not directly applicable to the Project. However, energy efficient lighting will be used for the interior and exterior lights at the P.E. & Athletic Building, and four to eight light poles near the bleachers for the track and field. Additionally, the installation of landscaping such as shade trees within raised planters and grass near the plaza and bench seating will help to absorb local GHG. For further discussion, see Section 3.2, Climate, Climate Change, and Sea Level Rise. | | | |
| §226-18.5 Objectives and policies for facility systems--telecommunications.<br>(a) Planning for the State's telecommunications facility systems shall be directed towards the achievement of dependable, efficient, and economical statewide telecommunications systems capable of supporting the needs of the people.<br>(b) To achieve the telecommunications objective, it shall be the policy of this State to ensure the provision of adequate, reasonably priced, and dependable telecommunications services to accommodate demand.<br>(c) To further achieve the telecommunications objective, it shall be the policy of this State to: | | | |
| (1) Facilitate research and development of telecommunications systems and resources; | | | X |
| (2) Encourage public and private sector efforts to develop means for adequate, ongoing telecommunications planning; | | | X |
| (3) Promote efficient management and use of existing telecommunications systems and services; and | | | X |

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|---|---|---|---|
| (4) Facilitate the development of education and training of telecommunications personnel. | | | X |
| Discussion: The objectives and policies specified in HRS, §226-18 are not directly applicable to the Project. | | | |
| §226-19 Objectives and policies for socio-cultural advancement--housing.<br>(a) Planning for the State's socio- cultural advancement with regard to housing shall be directed toward the achievement of the following objectives: | | | |
| (1) Greater opportunities for Hawai‘i's people to secure reasonably priced, safe, sanitary, and livable homes, located in suitable environments that satisfactorily accommodate the needs and desires of families and individuals, through collaboration and cooperation between government and nonprofit and for-profit developers to ensure that more rental and for sale affordable housing is made available to extremely low-, very low-, lower-, moderate-, and above moderate-income segments of Hawai‘i's population. | | | X |
| (2) The orderly development of residential areas sensitive to community needs and other land uses. | | | X |
| (3) The development and provision of affordable rental housing by the State to meet the housing needs of Hawai‘i's people. | | | X |
| (b) To achieve the housing objectives, it shall be the policy of this State to: | | | |
| (1) Effectively accommodate the housing needs of Hawai‘i's people. | | | X |
| (2) Stimulate and promote feasible approaches that increase affordable rental and for sale housing choices for extremely low-, very low-, lower-, moderate-, and above moderate-income households. | | | X |
| (3) Increase homeownership and rental opportunities and choices in terms of quality, location, cost, densities, style, and size of housing. | | | X |
| (4) Promote appropriate improvement, rehabilitation, and maintenance of existing rental and for sale housing units and residential areas. | | | X |
| (5) Promote design and location of housing developments taking into account the physical setting, accessibility to public facilities and services, and other concerns of existing communities and surrounding areas. | | | X |
| (6) Facilitate the use of available vacant, developable, and underutilized urban lands for housing. | | | X |
| (7) Foster a variety of lifestyles traditional to Hawai‘i through the design and maintenance of neighborhoods that reflect the culture and values of the community. | | | X |
| (8) Promote research and development of methods to reduce the cost of housing construction in Hawai‘i. | | | X |
| Discussion: The objectives and policies specified in HRS, §226-19 are not directly applicable to the Project. | | | |
| §226-20 Objectives and policies for socio-cultural advancement--health.<br>(a) Planning for the State's socio- cultural advancement with regard to health shall be directed towards achievement of the following objectives: | | | |
| (1) Fulfillment of basic individual health needs of the general public. | | | X |
| (2) Maintenance of sanitary and environmentally healthful conditions in Hawai‘i's communities. | X | | |
| (b) To achieve the health objectives, it shall be the policy of this State to: | | | |
| (1) Provide adequate and accessible services and facilities for prevention and treatment of physical and mental health problems, including substance abuse. | | | X |
| (2) Encourage improved cooperation among public and private sectors in the provision of health care to accommodate the total health needs of individuals throughout the State. | | | X |
| (3) Encourage public and private efforts to develop and promote statewide and local strategies to reduce health care and related insurance costs. | | | X |

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|---|---|---|---|
| (4) Foster an awareness of the need for personal health maintenance and preventive health care through education and other measures. | | | X |
| (5) Provide programs, services, and activities that ensure environmentally healthful and sanitary conditions. | | | X |
| (6) Improve the State's capabilities in preventing contamination by pesticides and other potentially hazardous substances through increased coordination, education, monitoring, and enforcement. | | | X |
| (7) Prioritize programs, services, interventions, and activities that address identified social determinants of health to improve native Hawaiian health and well-being consistent with the United States Congress' declaration of policy as codified in title 42 United States Code section 11702, and to reduce health disparities of disproportionately affected demographics, including native Hawaiians, other Pacific Islanders, and Filipinos. The prioritization of affected demographic groups other than native Hawaiians may be reviewed every ten years and revised based on the best available epidemiological and public health data. | | | X |
| Discussion: The objectives and policies specified in HRS, §226-20(b) are not directly applicable to the Project. However, the Project involves the development of an improved publicly owned athletic complex that will benefit MHS students, staff, and community members. The improved athletic complex facilities involve the provision of accessible facilities that may be utilized by the public to enhance individual health needs and aid in the prevention of physical health problems. | | | |
| §226-21 Objective and policies for socio-cultural advancement--education.<br>(a) Planning for the State's socio- cultural advancement with regard to education shall be directed towards achievement of the objective of the provision of a variety of educational opportunities to enable individuals to fulfill their needs, responsibilities, and aspirations.<br>(b) To achieve the education objective, it shall be the policy of this State to: | | | |
| (1) Support educational programs and activities that enhance personal development, physical fitness, recreation, and cultural pursuits of all groups. | X | | |
| (2) Ensure the provision of adequate and accessible educational services and facilities that are designed to meet individual and community needs. | X | | |
| (3) Provide appropriate educational opportunities for groups with special needs. | X | | |
| (4) Promote educational programs which enhance understanding of Hawai‘i's cultural heritage. | X | | |
| (5) Provide higher educational opportunities that enable Hawai‘i's people to adapt to changing employment demands. | | | X |
| (6) Assist individuals, especially those experiencing critical employment problems or barriers, or undergoing employment transitions, by providing appropriate employment training programs and other related educational opportunities. | | | X |
| (7) Promote programs and activities that facilitate the acquisition of basic skills, such as reading, writing, computing, listening, speaking, and reasoning. | | | X |
| (8) Emphasize quality educational programs in Hawai‘i's institutions to promote academic excellence. | | | X |
| (9) Support research programs and activities that enhance the education programs of the State. | | | X |
| Discussion: The purpose of the Project is to provide MHS students and community members with an improved athletic complex and quality athletic facilities, to primarily support the MHS P.E. program, athletic team practices, and games. The Project will comply with provisions and intent of Title IX and ADA and HRS, §103-50. For further discussion, see Section 5.1, Title IX of the Education Amendments of 1972 and Section 5.2, Americans with Disabilities Act of 1991. | | | |
| §226-22 Objective and policies for socio-cultural advancement--social services.<br>(a) Planning for the State's socio-cultural advancement with regard to social services shall be directed towards the achievement of the objective of improved public and private social services and activities that enable individuals, families, and groups to become more self-reliant and confident to improve their well-being.<br>(b) To achieve the social service objective, it shall be the policy of the State to: | | | |

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|---|---|---|---|
| (1) Assist individuals, especially those in need of attaining a minimally adequate standard of living and those confronted by social and economic hardship conditions, through social services and activities within the State's fiscal capacities. | | | X |
| (2) Promote coordination and integrative approaches among public and private agencies and programs to jointly address social problems that will enable individuals, families, and groups to deal effectively with social problems and to enhance their participation in society. | | | X |
| (3) Facilitate the adjustment of new residents, especially recently arrived immigrants, into Hawai‘i's communities. | | | X |
| (4) Promote alternatives to institutional care in the provision of long-term care for elder and disabled populations. | | | X |
| (5) Support public and private efforts to prevent domestic abuse and child molestation, and assist victims of abuse and neglect. | | | X |
| (6) Promote programs which assist people in need of family planning services to enable them to meet their needs. | | | X |
| Discussion: The objectives and policies specified in HRS, §226-22 are not directly applicable to the Project. | | | |
| §226-23 Objective and policies for socio-cultural advancement--leisure.<br>(a) Planning for the State's socio- cultural advancement with regard to leisure shall be directed towards the achievement of the objective of the adequate provision of resources to accommodate diverse cultural, artistic, and recreational needs for present and future generations.<br>(b) To achieve the leisure objective, it shall be the policy of this State to: | | | |
| (1) Foster and preserve Hawai‘i's multi-cultural heritage through supportive cultural, artistic, recreational, and humanities-oriented programs and activities. | X | | |
| (2) Provide a wide range of activities and facilities to fulfill the cultural, artistic, and recreational needs of all diverse and special groups effectively and efficiently. | X | | |
| (3) Enhance the enjoyment of recreational experiences through safety and security measures, educational opportunities, and improved facility design and maintenance. | X | | |
| (4) Promote the recreational and educational potential of natural resources having scenic, open space, cultural, historical, geological, or biological values while ensuring that their inherent values are preserved. | X | | |
| (5) Ensure opportunities for everyone to use and enjoy Hawai‘i's recreational resources. | X | | |
| (6) Assure the availability of sufficient resources to provide for future cultural, artistic, and recreational needs. | X | | |
| (7) Provide adequate and accessible physical fitness programs to promote the physical and mental well-being of Hawai‘i's people. | X | | |
| (8) Increase opportunities for appreciation and participation in the creative arts, including the literary, theatrical, visual, musical, folk, and traditional art forms. | | | X |
| (9) Encourage the development of creative expression in the artistic disciplines to enable all segments of Hawai‘i's population to participate in the creative arts. | | | X |
| (10) Assure adequate access to significant natural and cultural resources in public ownership. | | | X |
| Discussion: The purpose of the Project is to provide MHS students and community members with an improved athletic complex and quality athletic facilities, to primarily support the MHS P.E. program, athletic team practices, and games. Additionally, the MHS campus contains the largest publicly-owned outdoor recreation facilities, mauka (mountain side) of the Ala Moana/Kaka‘ako/Ward neighborhood, which are available to community members. | | | |

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|---|---|---|---|
| **§226-24 Objective and policies for socio-cultural advancement--individual rights and personal well-being.**<br>(a) Planning for the State's socio-cultural advancement with regard to individual rights and personal well-being shall be directed towards achievement of the objective of increased opportunities and protection of individual rights to enable individuals to fulfill their socio-economic needs and aspirations.<br>(b) To achieve the individual rights and personal well-being objective, it shall be the policy of this State to: | | | |
| (1) Provide effective services and activities that protect individuals from criminal acts and unfair practices and that alleviate the consequences of criminal acts in order to foster a safe and secure environment. | | | X |
| (2) Uphold and protect the national and state constitutional rights of every individual. | | | X |
| (3) Assure access to, and availability of, legal assistance, consumer protection, and other public services which strive to attain social justice. | | | X |
| (4) Ensure equal opportunities for individual participation in society. | | | X |
| Discussion: The objectives and policies specified in HRS, §226-24 are not directly applicable to the Project. | | | |
| **§226-25 Objective and policies for socio-cultural advancement--culture.**<br>(a) Planning for the State's socio-cultural advancement with regard to culture shall be directed toward the achievement of the objective of enhancement of cultural identities, traditions, values, customs, and arts of Hawai‘i's people.<br>(b) To achieve the culture objective, it shall be the policy of this State to: | | | |
| (1) Foster increased knowledge and understanding of Hawai‘i's ethnic and cultural heritages and the history of Hawai‘i. | X | | |
| (2) Support activities and conditions that promote cultural values, customs, and arts that enrich the lifestyles of Hawai‘i's people and which are sensitive and responsive to family and community needs. | | | X |
| (3) Encourage increased awareness of the effects of proposed public and private actions on the integrity and quality of cultural and community lifestyles in Hawai‘i. | | | X |
| (4) Encourage the essence of the aloha spirit in people's daily activities to promote harmonious relationships among Hawai‘i's people and visitors. | | | X |
| Discussion: Further discussion on cultural resources is included in Section 3.11.2, Cultural Resources. | | | |
| **§226-26 Objectives and policies for socio-cultural advancement--public safety.**<br>(a) Planning for the State's socio-cultural advancement with regard to public safety shall be directed towards the achievement of the following objectives: | | | |
| (1) Assurance of public safety and adequate protection of life and property for all people. | | | X |
| (2) Optimum organizational readiness and capability in all phases of emergency management to maintain the strength, resources, and social and economic well-being of the community in the event of civil disruptions, wars, natural disasters, and other major disturbances. | | | X |
| (3) Promotion of a sense of community responsibility for the welfare and safety of Hawai‘i's people. | | | X |
| (b) To achieve the public safety objectives, it shall be the policy of this State to: | | | |
| (1) Ensure that public safety programs are effective and responsive to community needs. | | | X |
| (2) Encourage increased community awareness and participation in public safety programs. | | | X |
| (c) To further achieve public safety objectives related to criminal justice, it shall be the policy of this State to: | | | |
| (1) Support criminal justice programs aimed at preventing and curtailing criminal activities. | | | X |

| Table 5-1: Hawai‘i State Plan<br>Part 1. Overall Theme, Goals, Objectives, and Policies<br>S = Supportive, N/S = Not Supportive, N/A = Not Applicable | S | N/S | N/A |
|---|---|---|---|
| (2) Develop a coordinated, systematic approach to criminal justice administration among all criminal justice agencies. | | | X |
| (3) Provide a range of correctional resources which may include facilities and alternatives to traditional incarceration in order to address the varied security needs of the community and successfully reintegrate offenders into the community. | | | X |
| (d) To further achieve public safety objectives related to emergency management, it shall be the policy of this State to: | | | |
| (1) Ensure that responsible organizations are in a proper state of readiness to respond to major war-related, natural, or technological disasters and civil disturbances at all times. | | | X |
| (2) Enhance the coordination between emergency management programs throughout the State. | | | X |
| Discussion: The objectives and policies specified in HRS, §226-26 are not directly applicable to the Project. However, during construction, Federal, State and CCH requirements will be implemented to ensure the safety of staff, construction crews and community members from natural hazards at the Project site. For further discussion, see **Section 3.3, Natural Hazards.** | | | |
| §226-27 Objectives and policies for socio-cultural advancement--government.<br>(a) Planning the State's socio-cultural advancement with regard to government shall be directed towards the achievement of the following objectives: | | | |
| (1) Efficient, effective, and responsive government services at all levels in the State. | X | | |
| (2) Fiscal integrity, responsibility, and efficiency in the state government and county governments. | X | | |
| (b) To achieve the government objectives, it shall be the policy of this State to: | | | |
| (1) Provide for necessary public goods and services not assumed by the private sector. | | | X |
| (2) Pursue an openness and responsiveness in government that permits the flow of public information, interaction, and response. | | | X |
| (3) Minimize the size of government to that necessary to be effective. | | | X |
| (4) Stimulate the responsibility in citizens to productively participate in government for a better Hawai‘i. | | | X |
| (5) Assure that government attitudes, actions, and services are sensitive to community needs and concerns. | | | X |
| (6) Provide for a balanced fiscal budget. | | | X |
| (7) Improve the fiscal budgeting and management system of the State. | | | X |
| (8) Promote the consolidation of state and county governmental functions to increase the effective and efficient delivery of government programs and services and to eliminate duplicative services wherever feasible. | | | X |
| Discussion: The Project will be undertaken with fiscal integrity, responsibility, and efficiency. | | | |
| §226-101 Purpose. The purpose of this part is to establish overall priority guidelines to address areas of statewide concern. | | | |
| §226-102 Overall direction. The State shall strive to improve the quality of life for Hawai‘i's present and future population through the pursuit of desirable courses of action in seven major areas of statewide concern which merit priority attention: economic development, population growth and land resource management, affordable housing, crime and criminal justice, quality education, principles of sustainability, and climate change adaptation. | | | |
| Discussion: The Project supports the overall direction of the State of Hawai‘i with regards to quality education. The purpose of the Project is to provide MHS students and community members with an improved athletic complex and quality athletic facilities, to primarily support the MHS P.E. program, athletic team practices, and games. | | | |

| Table 5-1: Hawai‘i State Plan<br>Part 1. Overall Theme, Goals, Objectives, and Policies<br>S = Supportive, N/S = Not Supportive, N/A = Not Applicable | S | N/S | N/A |
|---|---|---|---|
| §226-103 Economic priority guidelines.<br>(a) Priority guidelines to stimulate economic growth and encourage business expansion and development to provide needed jobs for Hawai‘i's people and achieve a stable and diversified economy: | | | |
| (1) Seek a variety of means to increase the availability of investment capital for new and expanding enterprises.<br>(A) Encourage investments which: | | | |
| (i) Reflect long term commitments to the State; | | | X |
| (ii) Rely on economic linkages within the local economy; | | | X |
| (iii) Diversify the economy; | | | X |
| (iv) Reinvest in the local economy; | | | X |
| (v) Are sensitive to community needs and priorities; and | | | X |
| (vi) Demonstrate a commitment to provide management opportunities to Hawai‘i residents. | | | X |
| (B) Encourage investments in innovative activities that have a nexus to the State, such as: | | | X |
| (i) Present or former residents acting as entrepreneurs or principals; | | | X |
| (ii) Academic support from an institution of higher education in Hawai‘i; | | | X |
| (iii) Investment interest from Hawai‘i residents; | | | X |
| (iv) Resources unique to Hawai‘i that are required for innovative activity; and | | | X |
| (v) Complementary or supportive industries or government programs or projects. | | | X |
| (2) Encourage the expansion of technological research to assist industry development and support the development and commercialization of technological advancements. | | | X |
| (3) Improve the quality, accessibility, and range of services provided by government to business, including data and reference services and assistance in complying with governmental regulations. | | | X |
| (4) Seek to ensure that state business tax and labor laws and administrative policies are equitable, rational, and predictable. | | | X |
| (5) Streamline the processes for building and development permit and review and telecommunication infrastructure installation approval and eliminate or consolidate other burdensome or duplicative governmental requirements imposed on business, where scientific evidence indicates that public health, safety, and welfare would not be adversely affected. | | | X |
| (6) Encourage the formation of cooperatives and other favorable marketing or distribution arrangements at the regional or local level to assist Hawai‘i's small-scale producers, manufacturers, and distributors. | | | X |
| (7) Continue to seek legislation to protect Hawai‘i from transportation interruptions between Hawai‘i and the continental United States. | | | X |
| (8) Provide public incentives and encourage private initiative to develop and attract industries which promise long-term growth potentials and which have the following characteristics: | | | X |
| (A) An industry that can take advantage of Hawai‘i's unique location and available physical and human resources. | | | X |
| (B) A clean industry that would have minimal adverse effects on Hawai‘i's environment. | | | X |
| (C) An industry that is willing to hire and train Hawai‘i's people to meet the industry's labor needs at all levels of employment. | | | X |

| Table 5-1: Hawai‘i State Plan<br>Part 1. Overall Theme, Goals, Objectives, and Policies<br>S = Supportive, N/S = Not Supportive, N/A = Not Applicable | S | N/S | N/A |
|---|---|---|---|
| (D) An industry that would provide reasonable income and steady employment. | | | X |
| (9) Support and encourage, through educational and technical assistance programs and other means, expanded opportunities for employee ownership and participation in Hawai‘i business. | | | X |
| (10) Enhance the quality of Hawai‘i's labor force and develop and maintain career opportunities for Hawai‘i's people through the following actions: | | | X |
| (A) Expand vocational training in diversified agriculture, aquaculture, information industry, and other areas where growth is desired and feasible. | | | X |
| (B) Encourage more effective career counseling and guidance in high schools and post-secondary institutions to inform students of present and future career opportunities. | | | X |
| (C) Allocate educational resources to career areas where high employment is expected and where growth of new industries is desired. | | | X |
| (D) Promote career opportunities in all industries for Hawai‘i's people by encouraging firms doing business in the State to hire residents. | | | X |
| (E) Promote greater public and private sector cooperation in determining industrial training needs and in developing relevant curricula and on- the-job training opportunities. | | | X |
| (F) Provide retraining programs and other support services to assist entry of displaced workers into alternative employment. | | | X |
| (b) Priority guidelines to promote the economic health and quality of the visitor industry: | | | |
| (1) Promote visitor satisfaction by fostering an environment which enhances the aloha spirit and minimizes inconveniences to Hawai‘i's residents and visitors. | | | X |
| (2) Encourage the development and maintenance of well-designed, adequately serviced hotels and resort destination areas which are sensitive to neighboring communities and activities and which provide for adequate shoreline setbacks and beach access. | | | X |
| (3) Support appropriate capital improvements to enhance the quality of existing resort destination areas and provide incentives to encourage investment in upgrading, repair, and maintenance of visitor facilities. | | | X |
| (4) Encourage visitor industry practices and activities which respect, preserve, and enhance Hawai‘i's significant natural, scenic, historic, and cultural resources. | | | X |
| (5) Develop and maintain career opportunities in the visitor industry for Hawai‘i's people, with emphasis on managerial positions. | | | X |
| (6) Support and coordinate tourism promotion abroad to enhance Hawai‘i's share of existing and potential visitor markets. | | | X |
| (7) Maintain and encourage a more favorable resort investment climate consistent with the objectives of this chapter. | | | X |
| (8) Support law enforcement activities that provide a safer environment for both visitors and residents alike. | | | X |
| (9) Coordinate visitor industry activities and promotions to business visitors through the state network of advanced data communication techniques. | | | X |
| (c) Priority guidelines to promote the continued viability of the sugar and pineapple industries: | | | |
| (1) Provide adequate agricultural lands to support the economic viability of the sugar and pineapple industries. | | | X |
| (2) Continue efforts to maintain federal support to provide stable sugar prices high enough to allow profitable operations in Hawai‘i. | | | X |
| (3) Support research and development, as appropriate, to improve the quality and production of sugar and pineapple crops. | | | X |

| Table 5-1: Hawai‘i State Plan<br>Part 1. Overall Theme, Goals, Objectives, and Policies<br>S = Supportive, N/S = Not Supportive, N/A = Not Applicable | S | N/S | N/A |
|---|---|---|---|
| (d) Priority guidelines to promote the growth and development of diversified agriculture and aquaculture: | | | |
| (1) Identify, conserve, and protect agricultural and aquacultural lands of importance and initiate affirmative and comprehensive programs to promote economically productive agricultural and aquacultural uses of such lands. | | | X |
| (2) Assist in providing adequate, reasonably priced water for agricultural activities. | | | X |
| (3) Encourage public and private investment to increase water supply and to improve transmission, storage, and irrigation facilities in support of diversified agriculture and aquaculture. | | | X |
| (4) Assist in the formation and operation of production and marketing associations and cooperatives to reduce production and marketing costs. | | | X |
| (5) Encourage and assist with the development of a waterborne and airborne freight and cargo system capable of meeting the needs of Hawai‘i's agricultural community. | | | X |
| (6) Seek favorable freight rates for Hawai‘i's agricultural products from interisland and overseas transportation operators. | | | X |
| (7) Encourage the development and expansion of agricultural and aquacultural activities which offer long-term economic growth potential and employment opportunities. | | | X |
| (8) Continue the development of agricultural parks and other programs to assist small independent farmers in securing agricultural lands and loans. | | | X |
| (9) Require agricultural uses in agricultural subdivisions and closely monitor the uses in these subdivisions. | | | X |
| (10) Support the continuation of land currently in use for diversified agriculture. | | | X |
| (11) Encourage residents and visitors to support Hawai‘i's farmers by purchasing locally grown food and food products. | | | X |
| (e) Priority guidelines for water use and development: | | | |
| (1) Maintain and improve water conservation programs to reduce the overall water consumption rate. | X | | |
| (2) Encourage the improvement of irrigation technology and promote the use of nonpotable water for agricultural and landscaping purposes. | | | X |
| (3) Increase the support for research and development of economically feasible alternative water sources. | | | X |
| (4) Explore alternative funding sources and approaches to support future water development programs and water system improvements. | | | X |
| (f) Priority guidelines for energy use and development: | | | |
| (1) Encourage the development, demonstration, and commercialization of renewable energy sources. | | | X |
| (2) Initiate, maintain, and improve energy conservation programs aimed at reducing energy waste and increasing public awareness of the need to conserve energy. | | | X |
| (3) Provide incentives to encourage the use of energy conserving technology in residential, industrial, and other buildings. | X | | |
| (4) Encourage the development and use of energy conserving and cost-efficient transportation systems. | | | X |
| (g) Priority guidelines to promote the development of the information industry: | | | |
| (1) Establish an information network that will serve as the catalyst for establishing a viable information industry in Hawai‘i. | | | X |

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|---|---|---|---|
| (2) Encourage the development of services such as financial data processing, a products and services exchange, foreign language translations, telemarketing, teleconferencing, a twenty-four-hour international stock exchange, international banking, and a Pacific Rim management center. | | | X |
| (3) Encourage the development of small businesses in the information field such as software development, the development of new information systems and peripherals, data conversion and data entry services, and home or cottage services such as computer programming, secretarial, and accounting services. | | | X |
| (4) Encourage the development or expansion of educational and training opportunities for residents in the information and telecommunications fields. | | | X |
| (5) Encourage research activities, including legal research in the information and telecommunications fields. | | | X |
| (6) Support promotional activities to market Hawai‘i's information industry services. | | | X |
| (7) Encourage the location or co-location of telecommunication or wireless information relay facilities in the community, including public areas, where scientific evidence indicates that the public health, safety, and welfare would not be adversely affected. | | | X |
| Discussion: The Project will maintain water conservation programs to reduce water consumption. The Project will encourage the use of energy conserving technology in proposed buildings. For further discussion, see Sections 3.2, Climate, Climate Change, and Sea Level Rise and 3.8.1, Potable Water. | | | |
| §226-104 Population growth and land resources priority guidelines.<br>(a) Priority guidelines to effect desired statewide growth and distribution: | | | |
| (1) Encourage planning and resource management to insure that population growth rates throughout the State are consistent with available and planned resource capacities and reflect the needs and desires of Hawai‘i's people. | | | X |
| (2) Manage a growth rate for Hawai‘i's economy that will parallel future employment needs for Hawai‘i's people. | | | X |
| (3) Ensure that adequate support services and facilities are provided to accommodate the desired distribution of future growth throughout the State. | | | X |
| (4) Encourage major state and federal investments and services to promote economic development and private investment to the neighbor islands, as appropriate. | | | X |
| (5) Explore the possibility of making available urban land, low-interest loans, and housing subsidies to encourage the provision of housing to support selective economic and population growth on the neighbor islands. | | | X |
| (6) Seek federal funds and other funding sources outside the State for research, program development, and training to provide future employment opportunities on the neighbor islands. | | | X |
| (7) Support the development of high technology parks on the neighbor islands. | | | X |
| (b) Priority guidelines for regional growth distribution and land resource utilization: | | | |
| (1) Encourage urban growth primarily to existing urban areas where adequate public facilities are already available or can be provided with reasonable public expenditures, and away from areas where other important benefits are present, such as protection of important agricultural land or preservation of lifestyles. | | | X |
| (2) Make available marginal or nonessential agricultural lands for appropriate urban uses while maintaining agricultural lands of importance in the agricultural district. | | | X |
| (3) Restrict development when drafting of water would result in exceeding the sustainable yield or in significantly diminishing the recharge capacity of any groundwater area. | | | X |
| (4) Encourage restriction of new urban development in areas where water is insufficient from any source for both agricultural and domestic use. | | | X |

| Table 5-1: Hawai‘i State Plan<br>Part 1. Overall Theme, Goals, Objectives, and Policies<br>S = Supportive, N/S = Not Supportive, N/A = Not Applicable | S | N/S | N/A |
|---|---|---|---|
| (5) In order to preserve green belts, give priority to state capital-improvement funds which encourage location of urban development within existing urban areas except where compelling public interest dictates development of a noncontiguous new urban core. | | | X |
| (6) Seek participation from the private sector for the cost of building infrastructure and utilities, and maintaining open spaces. | | | X |
| (7) Pursue rehabilitation of appropriate urban areas. | X | | |
| (8) Support the redevelopment of Kaka‘ako into a viable residential, industrial, and commercial community. | X | | |
| (9) Direct future urban development away from critical environmental areas or impose mitigating measures so that negative impacts on the environment would be minimized. | | | X |
| (10) Identify critical environmental areas in Hawai‘i to include but not be limited to the following: watershed and recharge areas; wildlife habitats (on land and in the ocean); areas with endangered species of plants and wildlife; natural streams and water bodies; scenic and recreational shoreline resources; open space and natural areas; historic and cultural sites; areas particularly sensitive to reduction in water and air quality; and scenic resources. | X | | |
| (11) Identify all areas where priority should be given to preserving rural character and lifestyle. | | | X |
| (12) Utilize Hawai‘i's limited land resources wisely, providing adequate land to accommodate projected population and economic growth needs while ensuring the protection of the environment and the availability of the shoreline, conservation lands, and other limited resources for future generations. | | | X |
| (13) Protect and enhance Hawai‘i's shoreline, open spaces, and scenic resources. | X | | |
| Discussion: The Project involves improving an existing athletic and recreation facility at the only public high school in the Ala Moana/Kaka‘ako/Ward neighborhood. This improvement will serve as an invaluable asset to the Kaka‘ako residential community. Additionally, the Project will identify and protect areas with endangered species and historic and cultural sites; for further discussion see **Sections 3.5, Flora and Fauna** and **3.11, Historic, Archaeological, and Cultural Resources.** The Project will protect scenic resources; for further discussion see **Section 3.13, Visual and Scenic Resources.** | | | |
| §226-105 Crime and criminal justice. Priority guidelines in the area of crime and criminal justice: | | | |
| (1) Support law enforcement activities and other criminal justice efforts that are directed to provide a safer environment. | | | X |
| (2) Target state and local resources on efforts to reduce the incidence of violent crime and on programs relating to the apprehension and prosecution of repeat offenders. | | | X |
| (3) Support community and neighborhood program initiatives that enable residents to assist law enforcement agencies in preventing criminal activities. | | | X |
| (4) Reduce overcrowding or substandard conditions in correctional facilities through a comprehensive approach among all criminal justice agencies which may include sentencing law revisions and use of alternative sanctions other than incarceration for persons who pose no danger to their community. | | | X |
| (5) Provide a range of appropriate sanctions for juvenile offenders, including community-based programs and other alternative sanctions. | | | X |
| (6) Increase public and private efforts to assist witnesses and victims of crimes and to minimize the costs of victimization. | | | X |
| Discussion: The priority guidelines specified in HRS, §226-105 are not directly applicable to the Project. | | | |
| §226-106 Affordable housing. Priority guidelines for the provision of affordable housing: | | | |
| (1) Seek to use marginal or nonessential agricultural land, urban land, and public land to meet housing needs of extremely low-, very low-, lower-, moderate-, and above moderate-income households. | | | X |

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|---|---|---|---|
| (2) Encourage the use of alternative construction and development methods as a means of reducing production costs. | | | X |
| (3) Improve information and analysis relative to land availability and suitability for housing. | | | X |
| (4) Create incentives for development which would increase home ownership and rental opportunities for Hawai‘i's extremely low-, very low-, lower-, and moderate-income households and residents with special needs. | | | X |
| (5) Encourage continued support for government or private housing programs that provide low interest mortgages to Hawai‘i's people for the purchase of initial owner-occupied housing. | | | X |
| (6) Encourage public and private sector cooperation in the development of rental housing alternatives. | | | X |
| (7) Encourage improved coordination between various agencies and levels of government to deal with housing policies and regulations. | | | X |
| (8) Give higher priority to the provision of quality housing that is affordable for Hawai‘i's residents and less priority to development of housing intended primarily for individuals outside of Hawai‘i. | | | X |
| Discussion: The priority guidelines specified in HRS, §226-106 are not directly applicable to the Project. | | | |
| §226-107 Quality education. Priority guidelines to promote quality education: | | | |
| (1) Pursue effective programs which reflect the varied district, school, and student needs to strengthen basic skills achievement; | | | X |
| (2) Continue emphasis on general education "core" requirements to provide common background to students and essential support to other university programs; | | | X |
| (3) Initiate efforts to improve the quality of education by improving the capabilities of the education workforce; | | | X |
| (4) Promote increased opportunities for greater autonomy and flexibility of educational institutions in their decision-making responsibilities; | | | X |
| (5) Increase and improve the use of information technology in education by the availability of telecommunications equipment for: | | | |
| (A) The electronic exchange of information; | | | X |
| (B) Statewide electronic mail; and | | | X |
| (C) Access to the Internet. | | | X |
| Encourage programs that increase the public's awareness and understanding of the impact of information technologies on our lives; | | | X |
| (6) Pursue the establishment of Hawai‘i's public and private universities and colleges as research and training centers of the Pacific; | | | X |
| (7) Develop resources and programs for early childhood education; | | | X |
| (8) Explore alternatives for funding and delivery of educational services to improve the overall quality of education; and | | | X |
| (9) Strengthen and expand educational programs and services for students with special needs. | | | X |
| Discussion: The priority guidelines specified in HRS, §226-107 are not directly applicable to the Project. However, the purpose of the Project is to provide MHS students and community members with an improved athletic complex and quality athletic facilities, to primarily support the MHS P.E. program, athletic team practices, and games. The Project will comply with provisions and intent of Title IX and ADA and HRS, §103-50. For further discussion, see **Section 5.1, Title IX of the Education Amendments of 1972** and **Section 5.2, Americans with Disabilities Act of 1991**. | | | |
| §226-108 Sustainability. Priority guidelines and principles to promote sustainability shall include: | | | |
| (1) Encouraging balanced economic, social, community, and environmental priorities; | | | X |

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|---|---|---|---|
| (2) Encouraging planning that respects and promotes living within the natural resources and limits of the State; | | | X |
| (3) Promoting a diversified and dynamic economy; | | | X |
| (4) Encouraging respect for the host culture; | | | X |
| (5) Promoting decisions based on meeting the needs of the present without compromising the needs of future generations; | | | X |
| (6) Considering the principles of the ahupua'a system; and | | | X |
| (7) Emphasizing that everyone, including individuals, families, communities, businesses, and government, has the responsibility for achieving a sustainable Hawai'i. | | | X |
| Discussion: The priority guidelines specified in HRS, §226-108 are not directly applicable to the Project. However, energy efficient lighting will be used for the interior and exterior lights at the P.E. & Athletic Building, and four to eight light poles near the bleachers for the track and field. Additionally, the installation of landscaping such as shade trees within raised planters and grass near the plaza and bench seating will help to absorb local GHG. For further discussion, see **Section 3.2, Climate, Climate Change, and Sea Level Rise.** | | | |
| §226-109 Climate change adaptation priority guidelines. Priority guidelines to prepare the State to address the impacts of climate change, including impacts to the areas of agriculture; conservation lands; coastal and nearshore marine areas; natural and cultural resources; education; energy; higher education; health; historic preservation; water resources; the built environment, such as housing, recreation, transportation; and the economy shall: | | | |
| (1) Ensure that Hawai'i's people are educated, informed, and aware of the impacts climate change may have on their communities; | | | X |
| (2) Encourage community stewardship groups and local stakeholders to participate in planning and implementation of climate change policies; | | | X |
| (3) Invest in continued monitoring and research of Hawai'i's climate and the impacts of climate change on the State; | | | X |
| (4) Consider native Hawaiian traditional knowledge and practices in planning for the impacts of climate change; | | | X |
| (5) Encourage the preservation and restoration of natural landscape features, such as coral reefs, beaches and dunes, forests, streams, floodplains, and wetlands, that have the inherent capacity to avoid, minimize, or mitigate the impacts of climate change; | | | X |
| (6) Explore adaptation strategies that moderate harm or exploit beneficial opportunities in response to actual or expected climate change impacts to the natural and built environments; | | | X |
| (7) Promote sector resilience in areas such as water, roads, airports, and public health, by encouraging the identification of climate change threats, assessment of potential consequences, and evaluation of adaptation options; | | | X |
| (8) Foster cross-jurisdictional collaboration between county, state, and federal agencies and partnerships between government and private entities and other nongovernmental entities, including nonprofit entities; | | | X |
| (9) Use management and implementation approaches that encourage the continual collection, evaluation, and integration of new information and strategies into new and existing practices, policies, and plans; and | | | X |
| (10) Encourage planning and management of the natural and built environments that effectively integrate climate change policy. | | | X |
| Discussion: The priority guidelines specified in HRS, §226-109 are not directly applicable to the Project. However, energy efficient lighting will be used for the interior and exterior lights at the P.E. & Athletic Building, and four to eight light poles near the bleachers for the track and field. Additionally, the installation of landscaping such as shade trees within raised planters and grass near the plaza and bench seating will help to absorb local GHG. For further discussion, see **Section 3.2, Climate, Climate Change, and Sea Level Rise.** | | | |

## 5.4 Hawai‘i 2050 Sustainability Plan

The long-term strategy of the *Hawai‘i 2050 Sustainability Plan* is supported by its main goals and objectives of respect for culture, character, beauty, and history of the State's island communities; balance among economic, community, and environmental priorities; and an effort to meet the needs of the present without compromising the ability of future generations to meet their own needs.

The 2050 Plan delineates five goals toward a sustainable Hawai‘i accompanied by strategic actions for implementation and indicators to measure success or failure. The goals and strategic actions that are pertinent to the Project are as follows:

Goal One: *Living sustainably is part of our daily practice in Hawai‘i.* Strategic Actions: *Develop a sustainability ethic.*

Goal Two: *Our diversified and globally competitive economy enables us to meaningfully live, work, and play in Hawai‘i.* Strategic Actions: *Develop a more diverse and resilient economy; support the building blocks for economic stability and sustainability.*

Goal Three: *Our natural resources are responsibly and respectfully used, replenished, and preserved for future generations*. Strategic Actions: *Provide greater protection for air, and land-, fresh water- and ocean-based habitats; conserve agricultural, open space and conservation lands and resources.*

Goal Four: *Our community is strong, healthy, vibrant and nurturing, providing safety nets for those in need.* Strategic Actions: *Provide access to diverse recreational facilities and opportunities*.

Goal Five: *Our Kanaka Maoli and island cultures and values are thriving and perpetuated.* Strategic Actions: *Honor Kanaka Maoli culture and heritage; Celebrate our cultural diversity and island way of life.*

Discussion

The Project will be developed in a sustainable manner that implements energy and water conservation measures where possible. The Project will provide short-term employment for the development of a publicly owned and maintained athletic complex that will be a recreational asset to the surrounding community. The Project will be developed in a manner that prioritizes the protection of air, land, water and other natural resources. The Project will respect the Kanaka Maoli culture and heritage by adhering to the State historic preservation laws and processes.

## 5.5 Hawai‘i State Land Use District Boundaries

The Hawai‘i SLU law, HRS, Chapter 205, was adopted in 1961. The law is meant to preserve and protect the state's lands and encourage the uses to which the lands are best suited.

Under HRS, Chapter 205, all lands of the State are to be classified in one of four categories: (1) Conservation, (2) Agricultural, (3) Urban, and (4) Rural. The State Land Use Commission (LUC) is responsible for each district's standards and for determining the boundaries of each district.

The Urban District generally includes lands characterized by "city-like" concentrations of people, structures and services. This District also includes vacant areas for future development. Jurisdiction

of this district lies primarily with the respective counties. Generally, lot sizes and uses permitted in the district area are established by the respective County through ordinances or rules.

Discussion: The Project site is situated within the State Urban District. The Project is consistent with permitted uses for the Urban District. See *Figure 5-1, State Land Use District*.

## 5.6 Kaka‘ako Community Development District Mauka Area Plan

Pursuant to Act 153, SLH 1976, authority was granted by the Legislature to the HCDA to supersede CCH ordinances and controls such as CCH Development Plans and Zoning. HCDA is responsible for the revitalization plans of underused and deteriorating urban areas in the State. These areas are designated as “Community Development Districts” (CDD). The Kaka‘ako area was designated as the first CDD, and is composed of the Kaka‘ako Mauka Area (“Mauka Area”) and Kaka‘ako Makai Area.

HCDA’s vision for the Kaka‘ako CDD is that it “becomes the most sustainable, livable urban community in the State, a place where people can work, live, visit, learn and play. The intent is to establish a community that offers people choices – a range of housing opportunities with parks, recreation areas, shopping and workplaces, and commuting options that will make life more comfortable and convenient.”

HCDA’s *Mauka Area Plan* (2011) sets forth policies for improvements within the Mauka Area over the next 10-20 years. The *Mauka Area Plan* principles include the following:

- Develop Urban Village Neighborhoods – “An urban village is where people can live, work, shop and recreate within their neighborhood. It is a self-sustainable and environmentally sensitive neighborhood that promotes community development and cohesiveness…Urban villages consist of a mix of land uses with a strong residential foundation…a mixture of densities, heights and buildings types will accommodate residents of varying incomes, ages and families.”
- Create Great Places – “Sustainable neighborhoods need great public spaces where people can congregate and recreate. Public spaces may include parks and plazas and can take a variety of forms and sizes…”
- Make the Connections – “To foster the development of an urban village environment, it is essential to restore a balance to support other modes of transportation. A variety of routes for vehicles, bicycles and pedestrians is proposed to distribute traffic and provide alternative ways to navigate through and around the district.”

The *Mauka Area Plan* divides the Mauka Area into seven neighborhoods which have differing building form standards. The MHS is situated in the “Thomas Square” neighborhood, of which the Thomas Square historic park is the central focus. HAR, §15-217, *Mauka Area Rules* contain specific definitions and development standards for the Thomas Square neighborhood. Per HAR, §15-217-6(2), when conflicts occur between the *Mauka Area Plan* and the *Mauka Area Rules,* the latter should take precedence.

Discussion: The Project will conform to the design standards in the *Mauka Area Plan* and the development standards in the *Mauka Area Rules.* Per HAR, §15-217, the MHS is considered an “Educational” land use. The Project does not require a development permit, as it is a public facility. Per HRS, §206E-13 any project or activity of any county or agency of the State in a designated community development district shall be constructed, renovated, or improved in consultation with the Authority. Thus, the DOE and MHS will present the Project and proposed amendments to the 2011 MHS ACMP FEA-FONSI to the HCDA.

## 5.7 City and County of Honolulu Zoning

Land uses within the CCH's jurisdiction are regulated under ROH, Chapter 21, *Land Use Ordinance*. As stated in ROH, Section 21-1.20(a), the purpose of the LUO is:

> *"…to regulate land use in a manner that will encourage orderly development in accordance with adopted land use policies, including the city's general plan, and development and sustainable communities plans, and, as may be appropriate, adopted neighborhood plans, and to promote and protect the public health, safety and welfare…"*

Discussion: The subject property is not in a CCH zoning district, as it is under the HCDA's jurisdiction. As noted in **Section 5.4**, **Kaka'ako Community Development District Mauka Area Plan**, the MHS is situated in the Mauka area of the Kaka'ako Development District. See *Figure 5-2, City and County of Honolulu Zoning.*

**Figure 5-1** **State Land Use District**

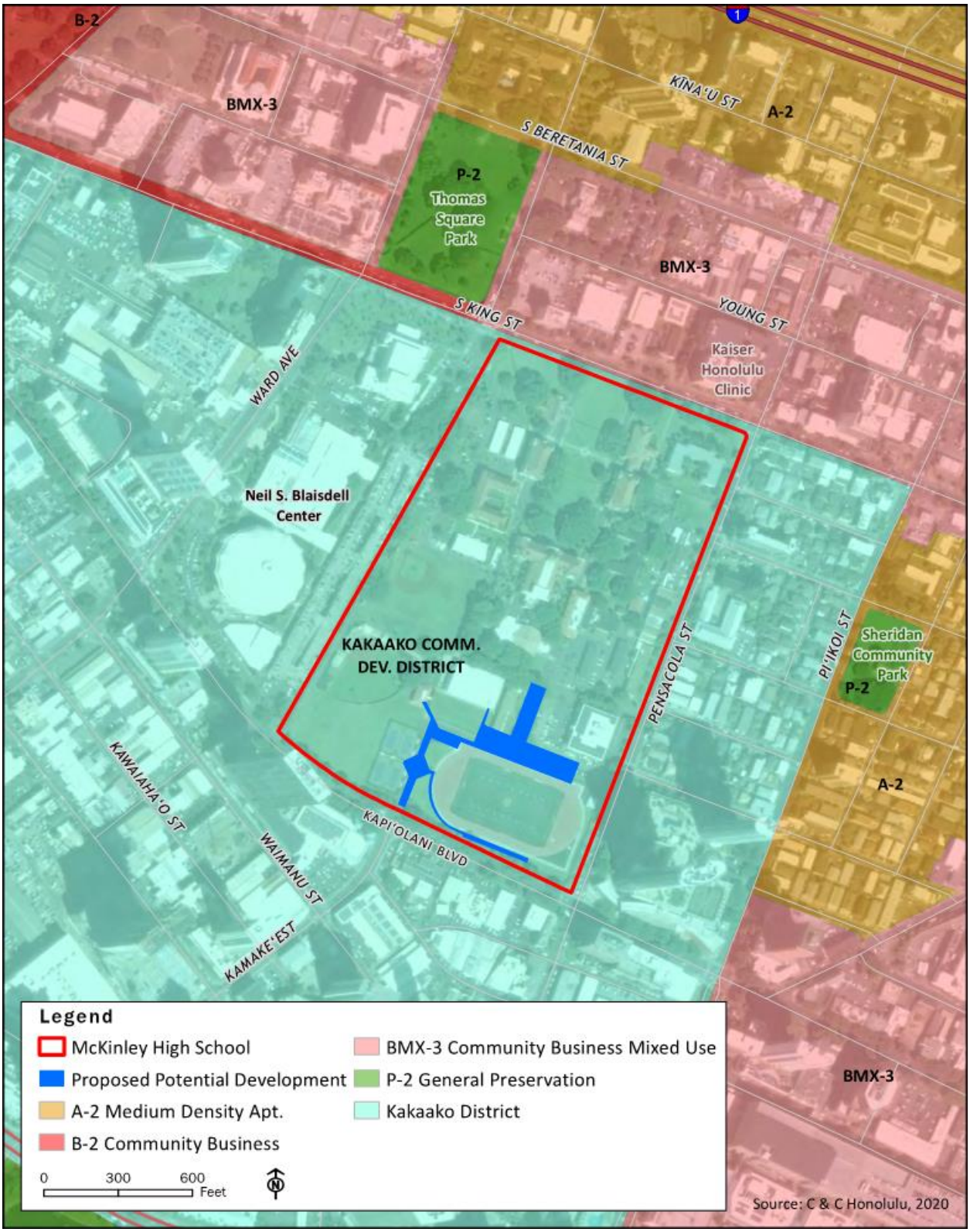


**Figure 5-2** **City and County of Honolulu Zoning**

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Chapter 6

# Findings Supporting the Anticipated Determination

Chapter 6

# Findings Supporting the Anticipated Determination

## 6.1 Anticipated Determination

Based on a review of the significance criteria outlined in HRS, Chapter 343, and HAR 11-200.1, the Project has been determined to not result in significant impacts on the natural or human environment. A FONSI is anticipated.

The potential impacts of the Project have been fully examined and discussed in this EA. As stated earlier, there are no significant environmental impacts expected to result from the Project. This determination is based on the assessments as presented below for criterion (1) to (13).

*(1) Irrevocably commit a natural, cultural, or historic resource.*

The Project will not irrevocably commit a natural, cultural, or historic resource. For further discussion on proposed mitigation measures see **Section 3.11, Historic, Archaeological, and Cultural Resources**.

*(2) Curtail the range of beneficial uses of the environment.*

The Project will not curtail the range of beneficial uses of the environment. The Project involves improvements to the existing MHS athletic complex. Thus, the proposed improvements are contained within the existing MHS campus and will not alter the existing land use or designations.

*(3) Conflict with the State's environmental policies or long-term environmental goals established by law.*

The Project does not conflict with the State's long-term environmental policies or goals and guidelines as expressed in HRS, Chapter 344, and any revisions thereof and amendments thereto, court decisions, or executive orders. The purpose of the Project is to provide MHS students and community members with an improved athletic complex and quality athletic facilities.

*(4) Have a substantial adverse effect on the economic welfare, social welfare, or cultural practices of the community and State.*

The Project will result in short-term economic benefits during construction that include direct, indirect, and induced employment opportunities and multiplier impacts. The Project is not anticipated to have a substantial adverse effect on cultural practices within the State, as the Project includes improvements to the existing MHS athletic complex. Moreover, the support of student athletics brings community together and is a part of contemporary "local culture." For further discussion on proposed mitigation measures see **Section 3.11, Historic, Archaeological, and Cultural Resources.** The Project

will have a beneficial effect on the community's social welfare, as the MHS athletic complex facilities will continue to be available to community members.

*(5) Have a substantial adverse effect on public health.*

The Project is consistent with existing land uses and is not anticipated to have a substantial adverse effect public health. During construction, there is the potential for temporary, short-term impacts on existing air quality, noise conditions and surrounding traffic network in the immediate Project vicinity. The Project will comply with federal, State and CCH regulations during the construction and will implement BMPs to minimize temporary impacts. For further discussion on proposed mitigation measures see **Section 3.6, Air Quality, Section 3.7, Noise Conditions** and **Section 3.9 Transportation System.**

*(6) Involve adverse secondary impacts, such as population changes or effects on public facilities.*

The Project is not anticipated to have adverse secondary impacts, such as population changes or effects on public facilities. The purpose of the Project is to provide MHS students and community members with an improved athletic complex and quality athletic facilities, which is a public benefit.

*(7) Involve a substantial degradation of environmental quality.*

The Project is not anticipated to involve a substantial degradation of environmental quality. Long-term impacts to soils, climate, water quality, flora/fauna, air quality, noise conditions, and natural resources are not anticipated. For further discussion on proposed mitigation measures see **Section 3.1, Geology, Topography, and Soils**, **Section 3.2, Climate, Climate Change, and Sea Level Rise, Section 3.4, Water Resources, Section 3.5, Flora and Fauna, Section 3.6, Air Quality,** and **Section 3.7, Noise Conditions**.

*(8) Be individually limited but cumulatively have substantial adverse effect upon the environment or involves a commitment for larger actions.*

The Project is not anticipated to cumulatively have a substantial adverse effect upon the environment or involve a commitment for larger actions. The Project involves improvements to the existing MHS athletic complex. The development of the Project will have a very limited and negligible impact on the surrounding natural and cultural environment.

*(9) Have a substantial adverse effect on a rare, threatened or endangered species, or its habitat.*

The Project site does not contain known rare, threatened, or endangered species or a critical habitat. During construction, mitigation measures will be implemented to minimize potential impacts to Hawaiian hoary bats and Hawaiian seabirds. For further discussion on proposed mitigation measures see **Section 3.5, Flora and Fauna**.

*(10) Have a substantial adverse effect on air or water quality or ambient noise levels.*

The Project is not anticipated to have a substantial adverse effect on air or water quality or ambient noise levels. During construction, there is the potential for temporary, short-term impacts on existing air quality, noise conditions in the immediate Project vicinity. The Project will comply with federal, State and CCH regulations during the construction and will implement BMPs to minimize temporary impacts. For further discussion on proposed mitigation measures see **Section 3.6, Air Quality, Section 3.7, Noise Conditions** and **Section 3.4, Water Resources.**

*(11) Have a substantial adverse effect on or be likely to suffer damage by being located in an environmentally sensitive area such as flood plain, tsunami zone, sea level rise exposure area, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.*

The Project is not anticipated to have a substantial adverse effect on or is likely to suffer damage by being located in an environmentally sensitive area such as flood plain, tsunami zone, sea level rise exposure area, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters. For further discussion on proposed mitigation measures see **Section 3.2, Climate, Climate Change, and Sea Level Rise** and **Section 3.3, Natural Hazards**.

*(12) Have a substantial adverse effect on scenic vistas and viewplanes, during day or night, identified in county or state plans or studies.*

The Project is not anticipated to have a substantial adverse effect on scenic vistas and viewplanes, during day or night, as identified in the *Mauka Area Plan*. For further discussion on proposed mitigation measures see **Section 3.13, Visual and Scenic Resources**.

*(13) Require substantial energy consumption or emit substantial greenhouse gases.*

The Project is not anticipated to require substantial energy consumption or emit substantial GHGs. Construction of the Project will result in a moderate amount of energy consumed, relative to other Projects. For further discussion on proposed mitigation measures see, **Section 3.2, Climate, Climate Change, and Sea Level Rise.**

## 6.2 Summary

Based on the information and findings in this EA and coordination with local, state, and federal regulatory agencies and public, it is determined that (with the implementation of mitigation measures) the Project will have no significant impact on the natural or human environment. Further evaluation of the Project's potential impacts through the preparation of an Environmental Impact Statement is not warranted. A FONSI is anticipated for this Project.

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Chapter 7

# Agencies, Organizations and Individuals Consulted in the EA Process

## Chapter 7

# Agencies, Organizations, and Individuals Consulted in the EA Process

An early consultation letter and information handout for the Project was mailed on April 21, 2020 to stakeholders (e.g., State and CCH agencies, elected officials, organizations, and neighbors) to initiate the environmental review process. A copy of the early consultation letter and information handout are in *Appendix F, Early Consultation Package*. Copies of the written comments received (via mail and email) during the early consultation period are addressed in this Draft EA and are in *Appendix G: Early Consultation Comments*. *Table 7-1* lists the stakeholders who were contacted during the early consultation period; stakeholders who provided a comment letter and stakeholders who will receive notification of the publication of the Draft EA. *Table 7-2* lists a *summary* of the written comments received and associated responses.

**Table 7-1 Consultation with Agencies, Organizations, and Individuals**

| Respondents and Distribution | Early Consultation | Written Comments Received | Notification of Draft EA |
|---|---|---|---|
| **State of Hawai'i Agencies** | | | |
| Department of Education, Facilities Development Branch | X | | X |
| Department of Land and Natural Resources | X | | X |
| Department of Transportation | X | X | X |
| Hawai'i Community Development Authority | X | X | X |
| McKinley High School | X | | X |
| **City and County of Honolulu Agencies** | | | |
| Department of Environmental Services | X | | X |
| Department of Planning and Permitting | X | X | X |
| Department of Transportation Services | X | | X |
| Honolulu Board of Water Supply | X | X | X |
| Honolulu Fire Department | X | X | X |
| Honolulu Police Department | X | X | |
| **Elected Officials** | | | |
| Hawai'i State Senator Sharon Y. Moriwaki, Senate District 12 | X | | X |

**Table 7-1 Consultation with Agencies, Organizations, and Individuals**

| Respondents and Distribution | Early Consultation | Written Comments Received | Notification of Draft EA |
|---|---|---|---|
| House Representative Scott K. Saiki, 26th Representative District | X | | X |
| Council Member Ann Kobayashi, Honolulu City Council District 5 | X | | X |
| Council Member Carol Fukunaga, Honolulu City Council District 6 | X | | X |
| Neighborhood Board No. 11 - Ala Moana/Kakaʻako | X | | X |
| **Organizations, Neighbors, and Individuals** | | | |
| Hawaiian Electric Company | X | | X |
| Hawaiʻi High School Athletic Association | X | | X |
| Kakaʻako Improvement Association | X | | X |
| Moana Pacific AOAO | X | | X |
| Neal S. Blaisdell Center | X | | X |
| Pacifica Honolulu | X | | X |
| Symphony Honolulu | X | | X |
| 909 Kapiolani Condos | X | | X |
| Ruth A. Pagell – Resident of Admiral Thomas | | X | |
| Merlyn E. Raco – Member of MHS Alumni Association | | X | |
| Laverne Moore | | X | |

| Table 7-2 Early Consultation – Summary of Comments and Responses | | |
|---|---|---|
| **Commenter and (Date of Comment Letter)** | **Summary of Comments Received** | **Responses to Comments** |
| **State of Hawai'i Agencies** | | |
| Hawai'i Community Development Authority (5/18/2020) | We have no comments to offer at this time. | • Thank you for your comment. The DOE will continue to consult with HCDA. |
| Department of Transportation (5/26/2020) | • The school is bordered by three County roadways; South King St. to the north, Pensacola St. to the east, and Kapiolani Blvd. to the south. There is no information on the project site's access points at this time.<br>• Based on the information provided, the proposed project does not appear to significantly impact the State highway system. Therefore, Hawaii DOT has no comments. However, in the event there are any unexpected traffic issues attributed to the project, the applicant shall mitigate them to the satisfaction of the HDOT. | • Thank you for your comment. Access points into the MHS campus will not be altered. Access points are discussed in **Section 3.9, Transportation System**. The DOE will continue to consult with the DOT re: potential traffic impacts and mitigation measures. |
| **City and County of Honolulu Agencies** | | |
| Honolulu Fire Department (5/4/2020) | • Fire department access roads shall be provided such that any portion of the facility or any portion of an exterior wall of the first story of the building is located not more than 150 FT from fire department access roads as measured by an approved route around the exterior of the building or facility. A fire department access road shall extend to within 50 FT of at least one exterior door that can be opened form the outside and that provides access to the interior of the building.<br>• A water supply approved by the county, capable of supplying the required fire flow for fire protection, shall be provided to all premises upon which facilities or buildings, or portions thereof, are hereafter constructed, or moved into or within the county. When any portion of the facility or building is in excess of 150 FT from a water supply on a fire apparatus access road, as measured by an approved route around the exterior of the facility or building, on-site fire hydrants and mains capable of supplying the required fire flow shall be provided when required by the Authority Having Jurisdiction.<br>• The unobstructed width and unobstructed vertical clearance of a fire apparatus access road shall meet county requirements.<br>• Submit civil drawings to the HFD for review and approval. | • Thank you for your comment. The DOE will provide adequate fire department access roads that meet the distance requirements stated.<br>• The DOE will provide adequate water supply for fire protection of the proposed buildings and facilities that meet the distance requirements stated, including on-site fire hydrants where necessary.<br>• The DOE will provide fire apparatus access roads with unobstructed width and vertical clearance that meet county requirements.<br>• The DOE will submit civil drawings to the HFD for review and approval. |
| Honolulu Board of Water Supply (5/7/2020) | • The existing water system is adequate to accommodate the proposed development. The final decision on the availability of water will be confirmed when the building permit application is submitted for approval.<br>• When water is made available, the applicant will be required to pay our Water System Facilities Charges for resource development, transmission, and daily storage. | • Thank you for your comment. The DOE understands that the availability of water will be confirmed when the building permit application is submitted. |

| Table 7-2 Early Consultation – Summary of Comments and Responses | | |
|---|---|---|
| **Commenter and (Date of Comment Letter)** | **Summary of Comments Received** | **Responses to Comments** |
| | • Water conservation measures are required for all proposed developments. These measures include utilization of non-potable water for irrigation using rain catchment, drought tolerant plants, xeriscape landscaping, efficient irrigation systems, such as a drip system and moisture sensors, and the use of Water Sense labeled ultra-low flow water fixtures and toilets.<br>• The developer should investigate the feasibility of using non-potable water for irrigation of the proposed renovated athletic complex. If non-potable water is either unavailable or infeasible, a report of the investigation including proposed irrigation demands should be submitted to us before we will consider the use of potable water. | • The DOE will pay a Water System Facilities Charges for resource development, transmission, and daily storage.<br>• The DOE will implement water conservation measures to the extent feasible.<br>• The DOE will investigate the feasibility of sourcing and using non-potable water for irrigation of the proposed athletic complex. |
| Department of Planning and Permitting<br>(5/8/2020) | We have reviewed the Pre-DEA for the McKinley High School Athletic Complex Improvements (received April 23, 2020) and have no comment related to zoning and land use. The Project is within the Kakaako Community Development District (KCDD) which is outside the zoning and land use jurisdiction of the Department of Planning and Permitting. The KCDD is regulated by the HCDA, which is responsible for development in the District. | • Thank you for your comment. The DOE acknowledges that the Project is within the KCDD, which is regulated by the HCDA. |
| Honolulu Police Department<br>(5/13/2020) | • The HPD anticipates short-term impacts to pedestrian and vehicular traffic during the construction phase of the project, particularly along Kapiolani Blvd. and Pensacola St. as they are both busy roadways.<br>• The HPD recommends that all necessary signs, lights, barricades, and other safety equipment be installed and maintained by the contactor to facilitate the flow of traffic during the construction phase of the project.<br>• The HPD recommends that a parking area for first responders be reserved that is easily accessible to the main entrance of the construction area.<br>• Due to the project's proximity to the Neal S. Blaisdell Center, the contractor should maintain communication with the venue to avoid any disruption with scheduled events. | • Thank you for your comment. Potential traffic impacts and mitigation measures are discussed in **Section 3.9, Transportation System**.<br>• The Contractor will be responsible for implementing a TCP to facilitate the flow of traffic during construction of the Project.<br>• The DOE will reserve a parking area for first responders that is accessible to the main entrance of the construction area.<br>• The Contractor will communicate with NBC to avoid disruptions with scheduled events. |
| **Organizations, Neighbors, and Individuals** | | |
| Ruth A. Pagell – Resident of Admiral Thomas<br>(4/25/2020) | I support the concept using the existing vacant land to improve the athletic facility but with four reservations:<br>• Community access: We were told with the first upgrade there would be community access and there is virtually NO community access to the track. We were better off with the three- quarter dirt track which was available all year round. I have never found a | • Thank you for your comment. Community members are currently allowed to use the track only during sports teams' practices throughout the year, provided that the use does not interfere with the practices. |

| Table 7-2 Early Consultation – Summary of Comments and Responses | | |
|---|---|---|
| **Commenter and (Date of Comment Letter)** | **Summary of Comments Received** | **Responses to Comments** |
| | time when the track is available based on existing rules. It is ironic that I have more access to the Punahou track then the track that was built in my neighborhood with my tax money.<br>• Lights: The lights from the softball field already are a problem since they shine into all our bedrooms. Neighbors on all sides need to be considered when planning the placement of the lights and the type of lighting used. The lights from Roosevelt, almost a mile away, also shine into the buildings in Makiki. I happened to have been on a local planning board in one place I lived and while we strongly supported a project being proposed, the lighting became the major stumbling block.<br>• New P.E. Building: Is this facility Title IX compliant and designed to provide the same level of facilities for both male and female students?<br>• Parking: The plan talks about adding over 3400 seats and 41 parking stalls. Where will everyone park?<br>If all of these issues are addressed, I would support the project. | Community members may use the track without prior notification or reservation; however, members are required to leave once practice ends.<br>• Lighting will be shielded to the extent possible and Best Practices will be implemented to limit impacts to surrounding areas.<br>• The Project will comply with Title IX.<br>• The MHS currently has adequate special event/overflow parking spaces on campus to accommodate large sports event with maximum spectator capacity. Spectators are anticipated to utilize different modes of transportation to MHS. |
| Laverne Moore (4/29/2020) | Where is the funding coming from when schools are being under funded and state workers and going to be put on furloughs or 20% pay cut. | Thank you for your comment. The planning and entitlement of the Project is funded by legislative add-on funding via line item appropriations per Act 124/16 (G-52.02), Act 49/17 (G-69) and Act 53/18 (G-69). Future funding will be needed for design and construction. |
| Merlyn E. Raco – Member of MHS Alumni Association (5/10/2020) | • McKinely High School is one of the first high schools built in Hawaii. Lots of addition and renovation over the years. Not much ‘aina to expand, however the opportunity to transformed a much needed and modernized athletic facility/complex, would bring the Tigers to the forefront, in addition to its awesome educational/academic excellence.<br>• As an alumni class of ’62, I can remember the days of practicing and playing football/running track on the old field filled with gravel and grass. A member of the swim team (25 yd. pool) and using the make shift locker room under the concrete swim pool. A wooden wall that separated the boys and girls changing area with no showers. The swim pool was demolished years after. The athletic facilities was not discouraging, rather I was proud to be part of McKinley High School.<br>• My past experiences did not discourage me, instead it lead me to the challenge, to be creative and overcome the obstacles to enjoy the athletic programs and opportunities. MHS Athletic | Thank you for your comment. The DOE agrees that the existing athletic complex needs improvement. |

| Table 7-2 Early Consultation – Summary of Comments and Responses | | |
|---|---|---|
| **Commenter and (Date of Comment Letter)** | **Summary of Comments Received** | **Responses to Comments** |
| | facilities/equipment is of the past and deserves the best for the present and future students athletic exposure and experiences. A proposal/consideration for the development of MHS Athletic Complex/facility would be a blessing and long overdue. "Change is the law of life. And those who look only to the past or present are certain to miss the future," John F. Kennedy – "Change will not come if we wait for some other time. We are the ones we've been waiting for. We are the change we seek," Barack Obama. | |

Chapter 8

# References

## Chapter 8

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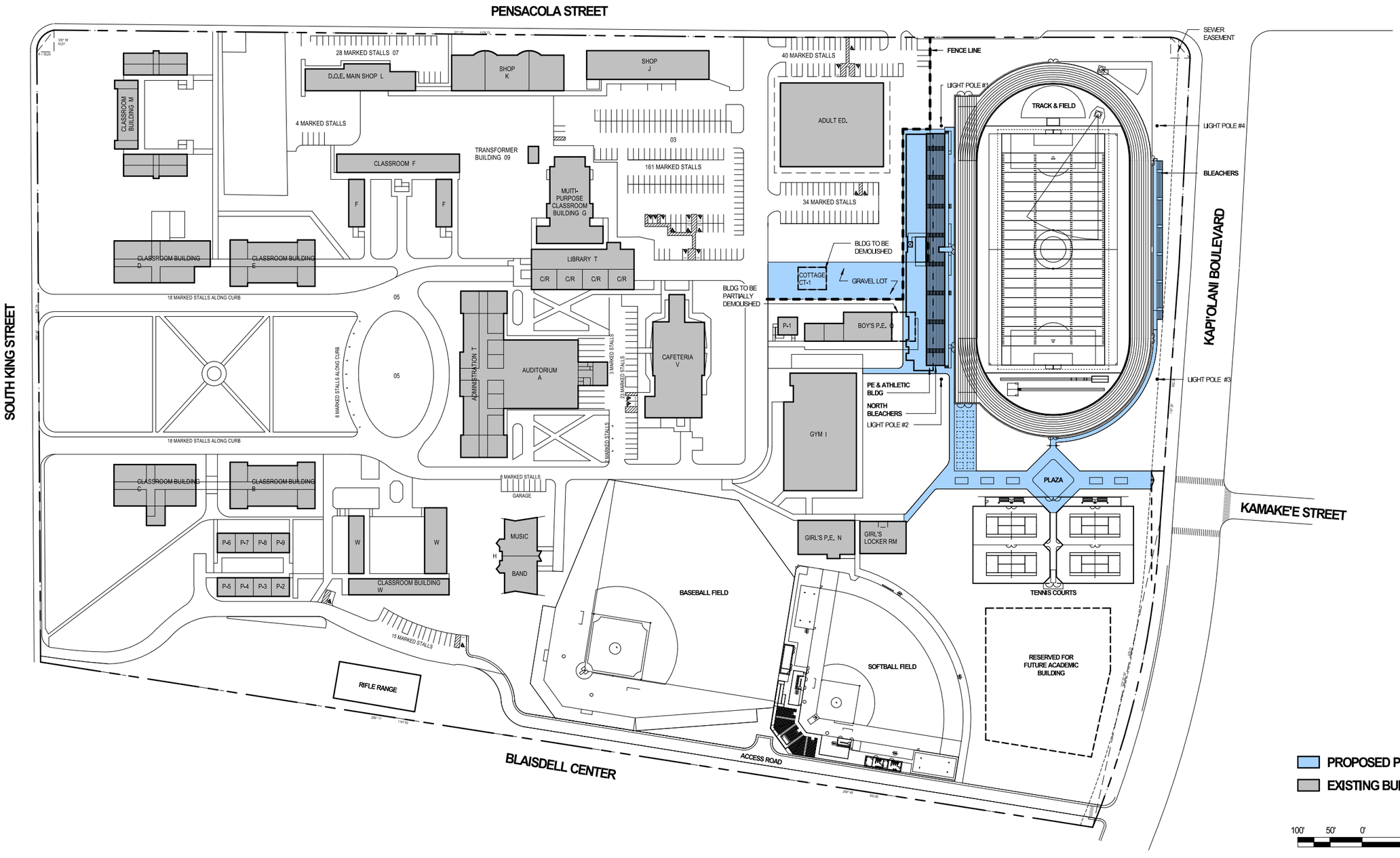
# Appendices

Appendix A

# Conceptual Plans

*G70, October 2020*




G70

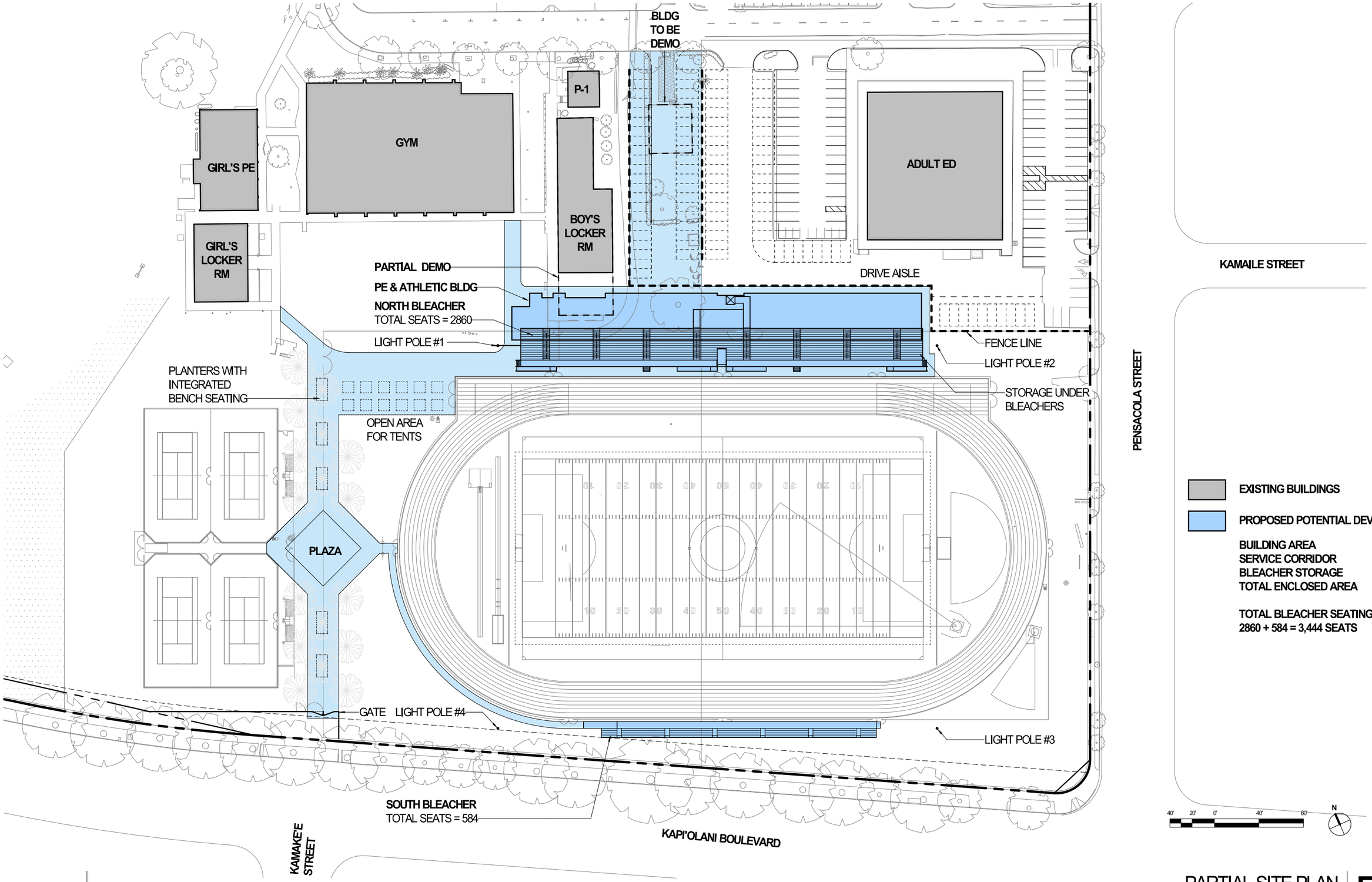
# CAMPUS SITE PLAN

**CONCEPT DESIGN**

MCKINLEY HIGH SCHOOL ATHLETICS

**EA-1**

10/20/2020




EXISTING BUILDINGS

PROPOSED POTENTIAL DEVELOPMENT

| | |
|---|---|
| BUILDING AREA | 15,900 SF |
| SERVICE CORRIDOR | 2,400 SF |
| BLEACHER STORAGE | 1,800 SF |
| TOTAL ENCLOSED AREA | 20,100 SF |

TOTAL BLEACHER SEATING =
2860 + 584 = 3,444 SEATS

G70

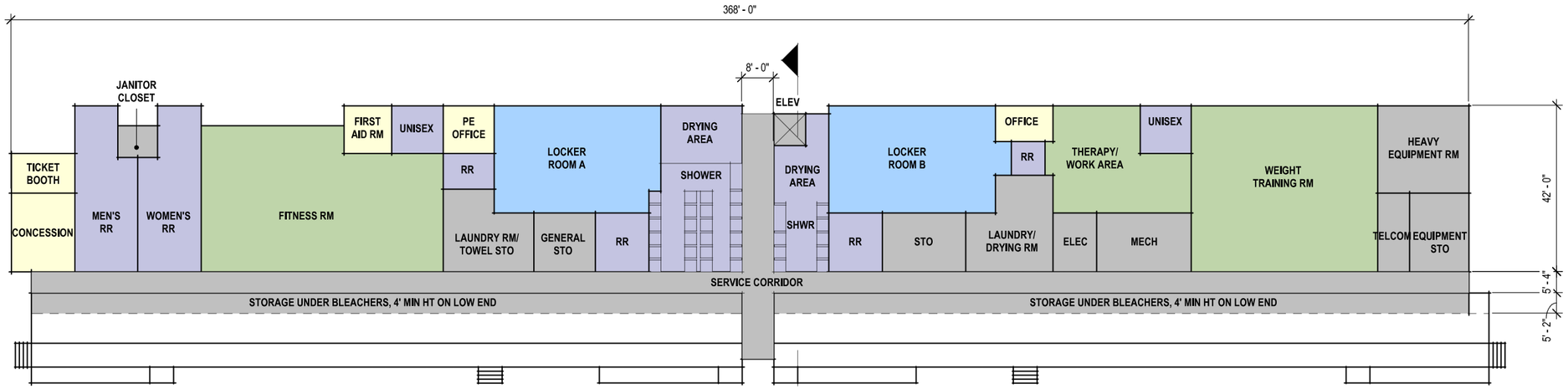
PARTIAL SITE PLAN

CONCEPT DESIGN

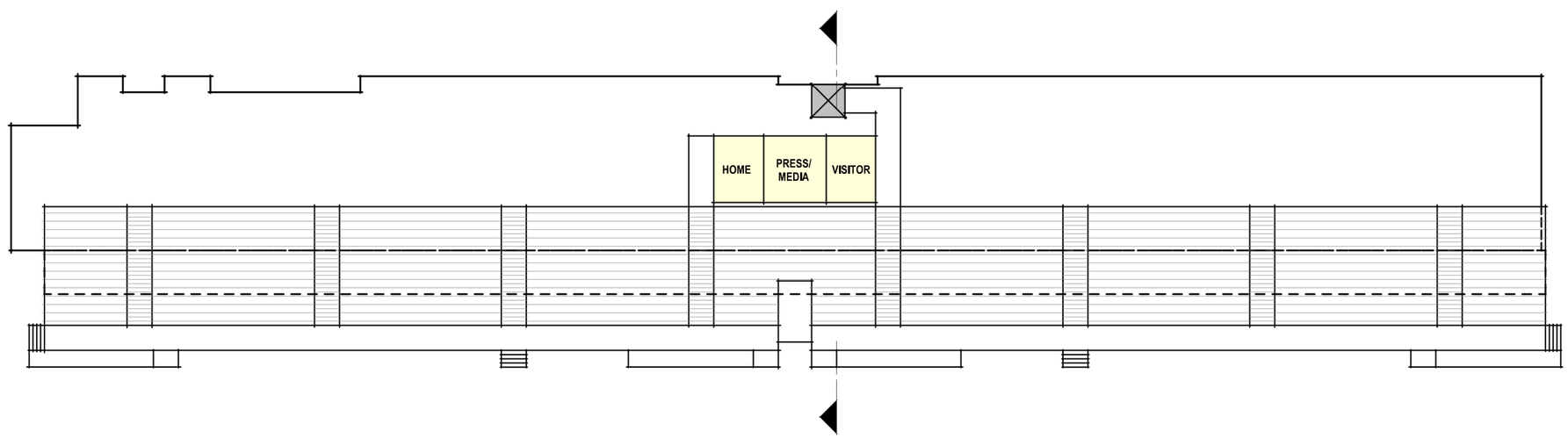
MCKINLEY HIGH SCHOOL ATHLETICS

**EA-2**

10/20/2020




## 1ST FLOOR




## 2ND FLOOR

16' 8' 0' 16' 32'

G70

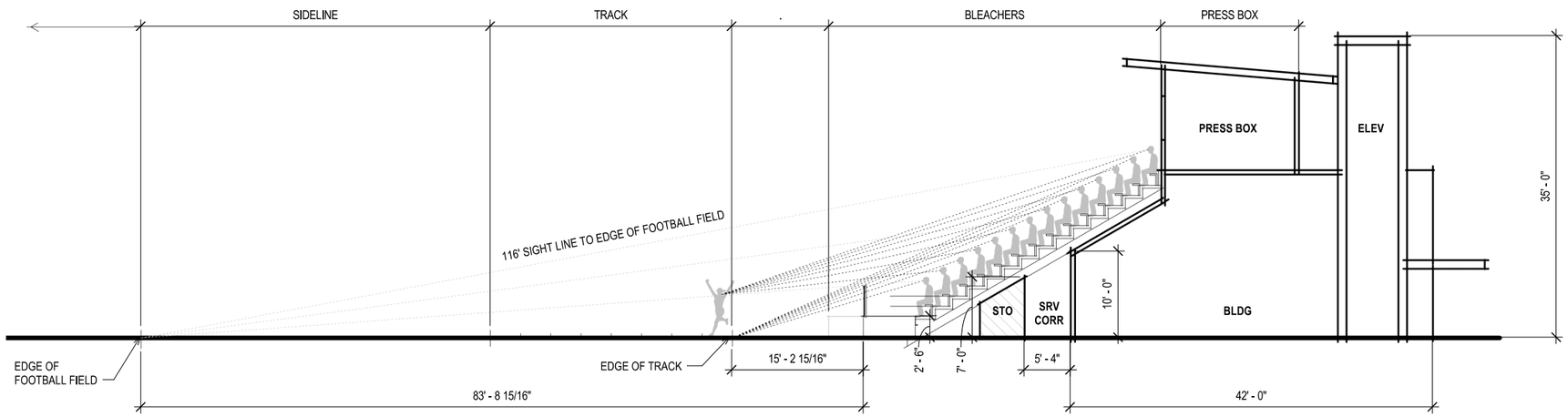
FLOOR PLANS

**CONCEPT DESIGN**

MCKINLEY HIGH SCHOOL BOY'S ATHLETICS

**EA-3**

2/7/2020



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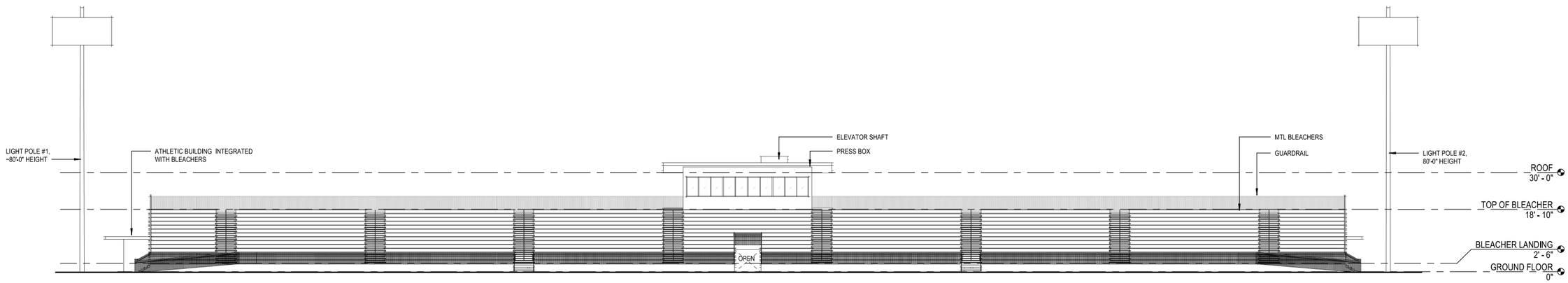
# NORTH BLEACHER SECTION

**CONCEPT DESIGN**

MCKINLEY HIGH SCHOOL BOY'S ATHLETICS

**EA-4**

2/7/2020



G70

ELEVATIONS

**CONCEPT DESIGN**

MCKINLEY HIGH SCHOOL BOY'S ATHLETICS

**EA-5**

2/7/2020

Appendix B

# Noise Study

*Y. Ebisu & Associates, September 2020*

**Y. Ebisu & Associates**
Acoustical and Electronic Engineers

1126 12th Ave., Room 305
Honolulu, Hawaii 96816
Ph. (808) 735-1634
email: ebisuyassoc@aol.com

September 25, 2020
YEA Job #56.040

G70
111 S. King Street, Suite 170
Honolulu, Hawaii 96813

Attention: Ms. Vi Verawudh, ACIP, LEED AP

Subject: Noise Study for the McKinley High School Athletic Complex Improvements, Phase 2

Dear Ms. Verawudh:

In accordance with my fee proposal dated February 1, 2018, evaluations of the potential noise impacts associated with the additional improvements to the McKinley High School Athletic Complex (see Figure 1) were performed. The improvements include a new PE & Athletic Building, and the addition of mauka and makai Bleachers at the existing football/soccer/track field. Evaluations of potential traffic noise impacts were performed through the use of the U.S. Federal Highway Administration Traffic Noise Model (FHWA TNM) Version 2.5 [FHWA Highway Traffic Noise Model User's Guide; FHWA-PD-96-009, Federal Highway Administration; Washington, D.C.; January 1998 and Version 2.5 Upgrade (April 14, 2004)]. Comparisons of the increases in traffic noise levels with and without the athletic complex improvements in the future were used to evaluate risks of potential adverse traffic noise impacts from events at the athletic complex. Evaluations of potential noise impacts associated with crowd noise and the Public Address System at the football/soccer/track field were also made by examining the sound levels of potential sources within the athletic complex and by predicting the resulting sound levels at the closest residential receptors. Potential construction noise impacts were also described, with noise mitigation measures also provided.

Traffic Noise Impacts. Base Year (2017) and future traffic noise levels were estimated along the streets which are expected to service the athletic complex using traffic data developed for the project (Traffic Impact Assessment Report, Parking Management Plan; AECOM; September 2020 and 9/21/20 email from Wayne Yoshioka, AECOM). The Base Year and future mainline traffic volumes along Kapiolani Boulevard, Pensacola Street, and South King Street are shown in Table 1. The calculated traffic noise levels are shown in Tables 2, 3, and 4 for the Base Year, future (without project), and future (with maximum spectator sports event) scenarios at distances of 50, 100, and 150 feet from the centerlines of the streets servicing the project during the PM peak traffic hour. Based on the results shown in Table 2,

Base Year traffic noise levels at residences along Kapiolani Boulevard and South King Street currently exceed the 66 Leq(h) (or Hourly Equivalent Sound Level) threshold that is used by the State Department of Transportation, Highways Division, for identifying potential traffic noise impacts (Highway Noise Policy and Abatement Guidelines; Hawaii State Department of Transportation and U.S. Federal Highway Administration; April 18, 2016). Future traffic noise levels are not expected to exceed Base Year values along the streets in the project environs, except during days with large spectator events at the athletic complex. Table 5 presents the predicted increases in future traffic noise levels during the PM peak traffic hour with and without the proposed Phase 2 Athletic Complex Improvements, with the increases in future traffic noise levels associated with the occurrence of a maximum capacity spectator sport event. As shown in Table 5, the predicted increases in future traffic noise levels associated with the proposed Phase 2 Athletic Complex Improvements are relatively small (1.1 dB) or less, and will be very difficult to measure or perceive, with the largest increase occurring along Pensacola Street, where the Base Year traffic noise levels are the lowest. Therefore, it was concluded that the proposed athletic complex improvements would not cause any measurable or perceivable increases in future traffic noise levels in the project environs, and, therefore, future traffic noise impacts should not occur as a result of the proposed athletic complex improvements.

It should be noted that the Base Year traffic volumes and resulting noise levels were slightly (by approximately 0.5 dB) higher than those measured along Kapiolani Boulevard in February 2020. Base Year traffic volumes and resulting noise levels were slightly (by approximately 0.2 dB) lower than those measured along Pensacola Street in February 2020. The results of these traffic noise measurements and PM peak hour traffic counts at measurement Locations C and H are shown in Table 6. Figure 2 shows the traffic noise measurement Locations C and H. The traffic noise level predictions shown in Table 6 were obtained using the FHWA TNM, Version 2.5 using the corresponding traffic volumes and speeds shown in the table. Figures 3 and 4 depict the short term fluctuations measured at Locations C and H, respectively, during the noise measurement periods. It should be noted that the short term fluctuations exceed the measured Leq values of Table 6 by approximately 5 to 10 dB. The residences near Kamaile Street experienced traffic noise levels similar to those shown in Figure 4. The condominium residences at the Moana Pacific facing Pensacola Street experienced traffic noise levels approximately 3 dB less than those shown in Figure 4. The condominium residences at the Moana Pacific facing Kapiolani Boulevard experienced traffic noise levels approximately 4 dB less than those shown in Figure 3, and the condominium residences at Pacifica Honolulu experienced traffic noise levels approximately 7 dB less than those shown in Figure 3.

<u>Crowd Noise from Proposed New Bleachers</u>. The proposed new on-site facilities

associated with the Phase 2 Athletic Complex Improvements (see Figure 1) represent potential concentrations of high level noise emitters in the form of crowd noise during sporting events which occur at the existing football/soccer/track & field facility. Maximum crowd noise sound levels within the bleacher seating areas are expected to be in the 85 to 95 dBA range, and are characterized as being intermittent rather than continuous. The crowd noise levels during sports events which are held indoors (volleyball, basketball, judo, etc.) can be attenuated by the enclosing facility (such as the gymnasium), but the crowd noise levels from the new mauka and makai bleachers during outdoor sport events (football, soccer, track & field, etc.) are not attenuated. In addition, a new outdoor Public Address System will emit high levels of sound from the new speakers which will probably be located at the outdoor sports facility.

The addition of mauka and makai bleachers at the existing football field will allow for spectator events with 2,860 seat and 584 seat capacities, respectively. Predicted maximum crowd noise levels at the closest residential receptors along Pensacola Street and Kapiolani Boulevard (see Figure 2) during a maximum capacity sport event with filled bleachers ranged from 61 to 69 dBA. The results of these predictions are shown in Table 7, and were based on the distances between the proposed new bleachers and the closest residential receptor locations shown in Figure 2: Moana Pacific Condominium; residences at Kamaile Street; and Pacifica Honolulu Condominium. Crowd noise levels were assumed to be 69 dBA at 200 feet from the makai bleachers, and 73 dBA at 200 feet from each of the east and west 1430 seat mauka bleacher sections. The crowd noise level predictions assumed that all bleacher sections generated crowd noise simultaneously.

Public Address System Associated with the Proposed New Bleachers. A new Public Address (PA) System will probably be provided in conjunction with the new mauka and makai bleachers. While the PA System has not been designed, it was assumed that outdoor speakers would probably be mounted on Light Poles #1 and #2 which are located near the Ewa and Diamond Head ends of the mauka bleachers where shown in Figure 1. In addition, a third pole mounted speaker centered behind the makai bleachers was also assumed to project approximately 10 dB lower levels from this location to service the makai bleachers. These assumed speaker locations have not been optimized for minimizing sound spill over from the PA System into the closest residential receptor locations.

Using the above assumptions, with approximately 90 dBA sound level output on-axis at 200 feet from the speakers on Light Poles #1 and #2, and with approximately 80 dBA sound level output on-axis at 200 feet from the makai bleacher speaker, the predicted PA System announcer levels during a spectator sport event are shown in the second row of Table 7 as ranging from 65 to 73 dBA at the three residential receptor locations. These predictions were based on speaker distances to each receptor

location, and included 10 to 16 dB speaker directivity effects for off-axis propagation from each speaker to the receptor locations. All three pole mounted speakers were assumed to be energized simultaneously.

It is anticipated that the PA System would also be used during school assemblies at the new mauka and makai bleachers, but that speaker volume levels could be reduced by approximately 10 dBA below those volume level settings used for spectator sport events. Under these assumptions, PA System sound levels at the three closest residential receptor locations were predicted to range from 55 to 63 dBA as shown in the bottom row of Table 7.

Potential Noise Impacts from Non-Traffic Noise Sources. The potential sound levels from three marching bands located at the Diamond Head, Mid Field, and Ewa ends of the football field and playing simultaneously are also shown in Table 7 for comparison with the crowd noise and PA System sound levels. Band music sound levels range from 52 to 60 dBA at the three closest residential receptor locations, with three bands playing simultaneously.

While the sound levels of marching bands on the playing field may not necessarily be the result of adding bleachers to the Athletic Field Complex, they were included to strengthen the conclusion that the PA System and crowd noise would present the highest risk of causing adverse noise impacts at neighboring residences following the proposed Phase 2 improvements shown in Figure 1. Risks of adverse noise impacts from these two sources are highest at the low rise residences at the Kamaile Street and Pensacola Street intersection, and are lowest at the Pacifica Honolulu Condominium.

While the 66 Leq(h) threshold is utilized for traffic noise along roadways, the 65 DNL (or Day-Night Average Sound Level) is used as a noise impact threshold for a broader range of noise sources by the federal government (FHA/HUD, DOD, VA, EPA, FAA, etc.). However, determining the sound level using the DNL metric requires definition of the average sound level, its typical duration during the daytime and nighttime periods, and its frequency of occurrence during a 365 day annual averaging period. Sounds which occur during the nighttime period (10:00 pm to 7:00 am) are also penalized by the addition of a 10 dB penalty to its actual sound level prior to computing the annually averaged DNL value.

For this project, an estimate of the upper DNL value of the noise associated with the addition of the mauka and makai bleachers to the Athletic Field Complex at the Kamaile Street residences was made by assuming the following, with resulting DNL value:

- A continuous average sound level of 73 dBA for a total of 5 hours from 5:00 pm to 10:00 pm. This is an extreme sound level assumption since both PA System announcements or crowd noise would not be continuously at 73 dBA over a period of 5 hours per sporting event.

- A capacity sport event occurs twice per week, and 52 weeks per year. This is also an extreme assumption, but meant to be illustrative of how a 73 dBA event sound level would relate to an annually averaged DNL value under extreme conditions.

- The resulting annually averaged DNL value at the Kamaile Street residences would be:
  $DNL = 73 + 10xLog_{10}(5) - 10xLog_{10}(24) + 10xLog_{10}(52x2) - 10xLog_{10}(365)$
  DNL = 60.7, which is below the 65 DNL federal noise impact threshold.

If all of the 2 weekly sporting events extended into the nighttime noise penalty period after 10:00 pm and ran for a 5 hour period from 6:00 pm to 11:00 pm instead of the previously assumed period of 5:00 pm to 10:00 pm, a 10 dB penalty would be applied to the 73 dBA sound level for the one hour nighttime period between 10:00 pm to 11:00 pm. The resulting upper DNL value of the noise associated with the addition of the mauka and makai bleachers to the Athletic Field Complex at the Kamaile Street residences under those circumstances would increase to 65.2 DNL, and slightly exceed the 65 DNL federal noise impact threshold.

In summary, adverse noise impacts from the noise associated with outdoor sport events which use the new mauka and makai bleachers are not expected to occur as a result of the Phase 2 improvements. It should be noted that traffic noise levels, when expressed in DNL are approximately equal to 0 to 1 dB plus the PM peak hour Leq(h), which would place the Future Year traffic noise levels at the Kamaile Street residences at approximately 64 to 65 DNL (see Table 4). So, traffic noise sources are expected to continue to be the dominant noise sources in the project environs with or without the proposed Phase 2 improvements.

Recommended mitigation measures to minimize the potential noise impacts from outdoor spectator sport events at the Athletic Field Complex include the design of the PA System with High-Q (25+) speakers which are located and pointed so as to maximize PA System sound levels within the spectator areas and to minimize spill over of sound levels into the community. In addition, limiting the period of the outdoor sporting events to the daytime hours prior to 10:00 pm is also recommended to eliminate the increase in DNL levels associated with the 10 dB nighttime penalty period.

<u>Construction Noise Impacts</u>: The potential for adverse noise impacts from short

term construction activities exist, particular during school classroom hours when construction activities typically occur. Fortunately the new athletic complex facilities are located away from the majority of the classroom buildings on the McKinley High School campus, and are grouped together on the Kapiolani Boulevard side of the campus. Typical buffer distances of 150 feet or more should be available between the work sites and Cafeteria or the school's classroom buildings. However, the Adult Education Building is approximately 40 feet from the east end of the PE & Athletic Building (see Figure 1).

Construction noise levels are typically highest during the earthwork (trenching, grading, etc.) phase, and are typically between 85 to 75 dBA at 100 feet (see Figure 5). At 40 feet, the louder construction noise levels could range from 90 to 80 dBA. The use of properly muffled construction equipment, the use of equipment staging and material storage areas away from classroom buildings and noise sensitive neighbors, and the scheduling of very noisy activities to after school hours or on Saturdays are possible noise mitigation measures. In addition, the use of broadband back up alarms rather than high frequency beeper type backup alarms by construction equipment is also recommended, since the broadband alarms are less audible at the longer distances from the operating equipment.

Sincerely,

Yoichi Ebisu, P.E.

encl.

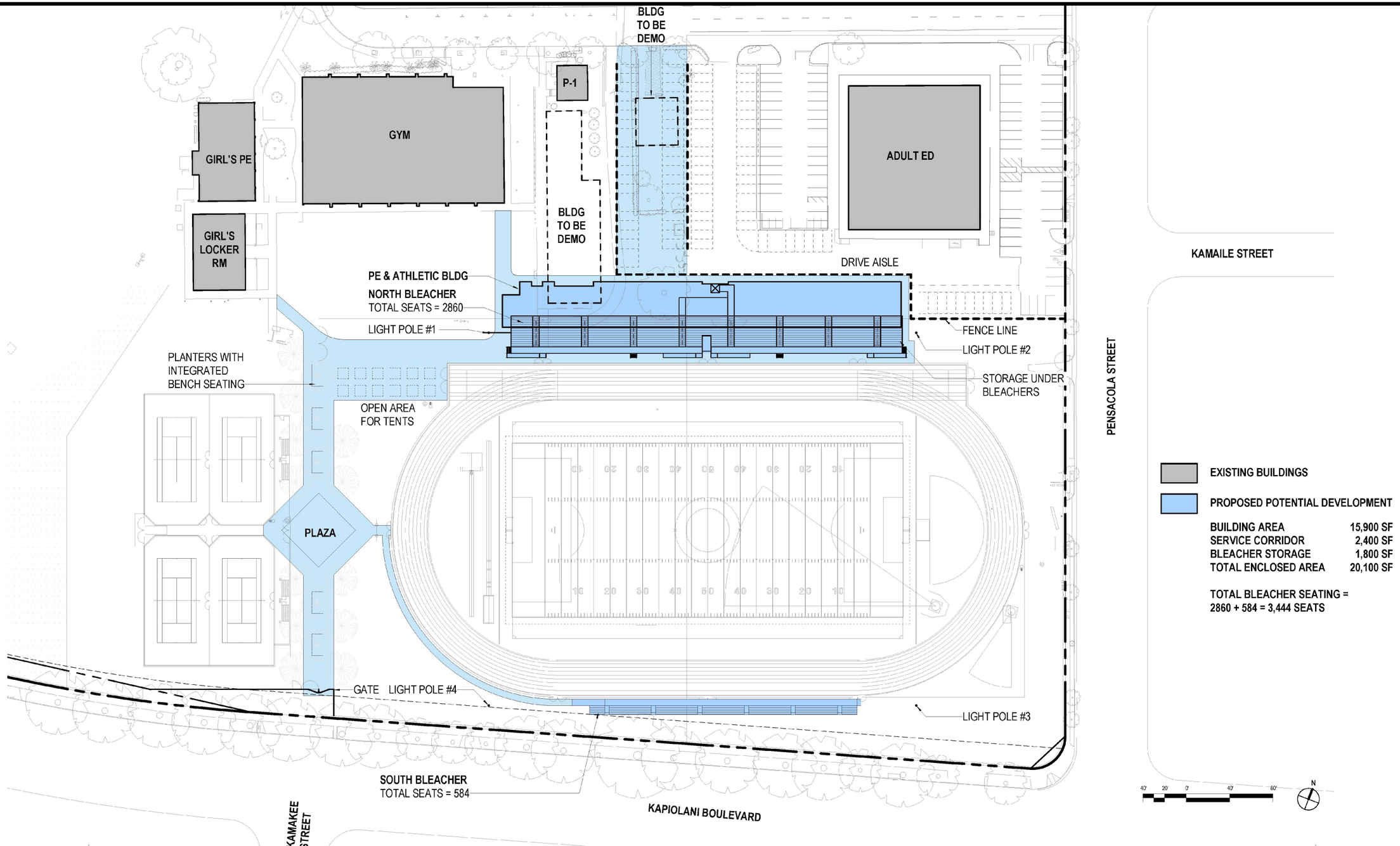

BLDG TO BE DEMO
P-1
GYM
GIRL'S PE
GIRL'S LOCKER RM
BLDG TO BE DEMO
ADULT ED
DRIVE AISLE
KAMAILE STREET
PE & ATHLETIC BLDG
NORTH BLEACHER
TOTAL SEATS = 2860
LIGHT POLE #1
FENCE LINE
LIGHT POLE #2
STORAGE UNDER BLEACHERS
PENSACOLA STREET
PLANTERS WITH INTEGRATED BENCH SEATING
OPEN AREA FOR TENTS
PLAZA
GATE
LIGHT POLE #4
LIGHT POLE #3
SOUTH BLEACHER
TOTAL SEATS = 584
KAPIOLANI BOULEVARD
KAMAKEE STREET
EXISTING BUILDINGS
PROPOSED POTENTIAL DEVELOPMENT
BUILDING AREA 15,900 SF
SERVICE CORRIDOR 2,400 SF
BLEACHER STORAGE 1,800 SF
TOTAL ENCLOSED AREA 20,100 SF
TOTAL BLEACHER SEATING =
2860 + 584 = 3,444 SEATS
N
G70
PARTIAL SITE PLAN
CONCEPT DESIGN
MCKINLEY HIGH SCHOOL BOY'S ATHLETICS
EA-2
2/7/2020

FIGURE 1

**PROJECT LOCATION MAP AND NOISE MEASUREMENT LOCATIONS**

**FIGURE 2**

**FIGURE 3**
**DBA VS. TIME RECORD AT 50 FEET FROM CENTERLINE OF KAPIOLANI BOULEVARD**
**(1600 TO 1700 HOURS; LOCATION C; FEBRUARY 27, 2020)**

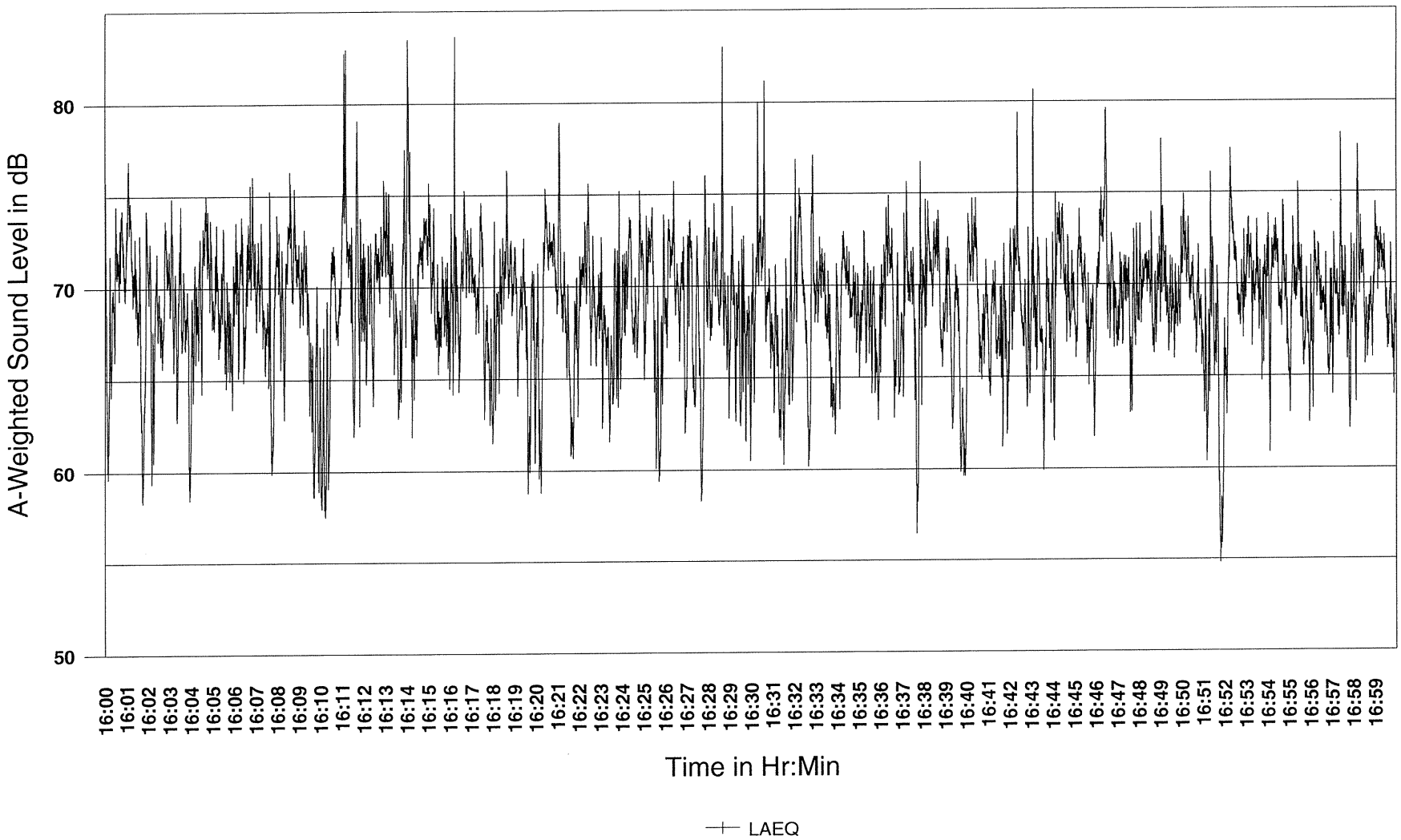
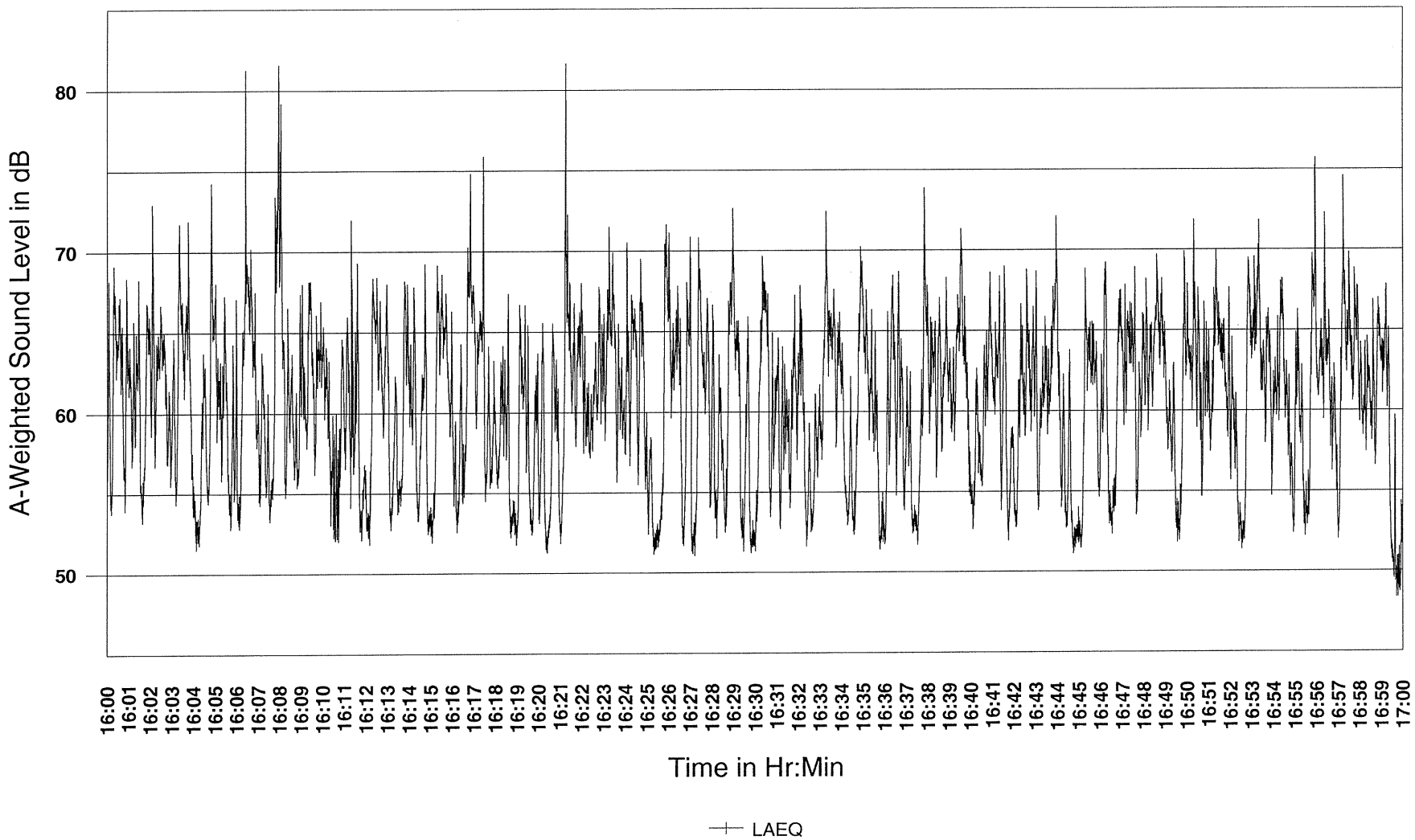
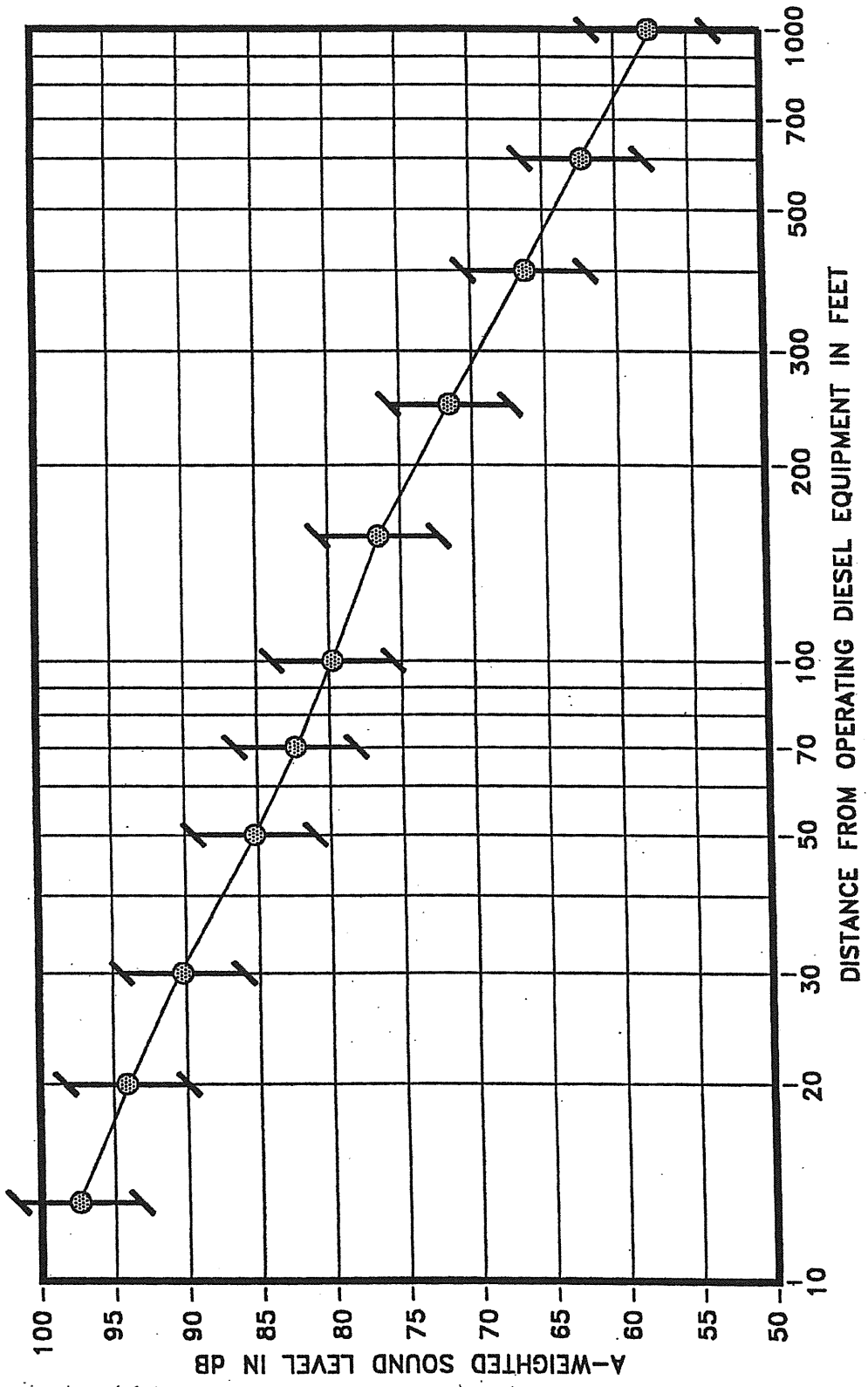


**FIGURE 4**
**DBA VS. TIME RECORD AT 50 FEET FROM CENTERLINE OF PENSACOLA STREET**
**(1600 TO 1700 HOURS; LOCATION H; FEBRUARY 25, 2020)**






**ANTICIPATED RANGE OF CONSTRUCTION NOISE LEVELS VS. DISTANCE**

**FIGURE 5**

## TABLE 1

### SUMMARY OF BASE YEAR AND FUTURE YEAR WITH AND WITHOUT EVENING SPORTING EVENT TRAFFIC VOLUMES IN MCKINLEY HIGH SCHOOL ENVIRONS

| ROADWAY LANES | **** CY 2017 ***** | | FUTURE (NO BUILD) | | FUTURE (BUILD) | |
|---|---|---|---|---|---|---|
| | AM VPH | PM VPH | AM VPH | PM VPH | AM VPH | PM VPH |
| South King St., West of Ward Ave. (EB) | 1,721 | 2,424 | N/A | 2,424 | N/A | 2,596 |
| South King St., Between Ward Ave. and Victoria St. (EB) | 1,579 | 2,200 | N/A | 2,371 | N/A | 2,543 |
| South King St., Between Victoria and Pensacola St. (EB) | 1,810 | 2,443 | N/A | 2,443 | N/A | 2,615 |
| South King St., East of Pensacola St. (EB) | 1,921 | 2,806 | N/A | N/A | N/A | N/A |
| Kapiolani Blvd., West of Ward Ave. (WB) | 1,622 | 1,469 | N/A | 1,469 | N/A | 1,469 |
| Kapiolani Blvd., West of Ward Ave. (EB) | 599 | 1,463 | N/A | 1,463 | N/A | 1,463 |
| Two-Way | 2,221 | 2,932 | N/A | 2,932 | N/A | 2,932 |
| Kapiolani Blvd., Between Ward Ave. and Access Rd. (WB) | 1,564 | 1,245 | N/A | 1,361 | N/A | 1,361 |
| Kapiolani Blvd., Between Ward Ave. and Access Rd. (EB) | 758 | 1,863 | N/A | 1,863 | N/A | 1,863 |
| Two-Way | 2,322 | 3,108 | N/A | 3,224 | N/A | 3,224 |
| Kapiolani Blvd., Between Access Rd. and Kamakee St. (WB) | 1,617 | 1,072 | N/A | 1,072 | N/A | 1,416 |
| Kapiolani Blvd., Between Access Rd. and Kamakee St. (EB) | 758 | 1,883 | N/A | 1,883 | N/A | 1,883 |
| Two-Way | 2,375 | 2,955 | N/A | 2,955 | N/A | 3,299 |
| Kapiolani Blvd., Between Kamakee and Pensacola St. (WB) | 1,743 | 996 | N/A | 996 | N/A | 1,340 |
| Kapiolani Blvd., Between Kamakee and Pensacola St. (EB) | 743 | 1,898 | N/A | 1,898 | N/A | 1,898 |
| Two-Way | 2,486 | 2,894 | N/A | 2,894 | N/A | 3,238 |
| Kapiolani Blvd., East of Pensacola St. (WB) | 1,520 | 793 | N/A | 793 | N/A | 1,137 |
| Kapiolani Blvd., East of Pensacola St. (EB) | 994 | 2,179 | N/A | 2,179 | N/A | 2,179 |
| Two-Way | 2,514 | 2,972 | N/A | 2,972 | N/A | 3,316 |
| Pensacola St., North of S. King St. (SB) | 1,360 | 1,145 | N/A | 1,145 | N/A | 1,489 |
| Pensacola St., Between S. King St. and Kapiolani Blvd. (SB) | 1,169 | 1,058 | N/A | 1,058 | N/A | 1,235 |
| Pensacola St., South of Kapiolani Blvd. (SB) | 601 | 596 | N/A | 596 | N/A | 596 |

NOTES:

1. "No Build" Represents Future PM Peak Hour Conditions without McKinley High School Athletic Complex Improvements, Phase 2.
2. "Build" Represents Future PM Peak Hour Conditions with McKinley High School Athletic Complex Improvements, Phase 2, On A Sport Event Day At Maximum Spectator Seating Capacity of the Proposed Bleachers.

# TABLE 2

## BASE YEAR (CY 2017) TRAFFIC VOLUMES AND NOISE LEVELS ALONG VARIOUS SECTIONS OF ROADWAYS IN THE PROJECT AREA ( PM PEAK HOUR )

| LOCATION | SPEED (MPH) | TOTAL VPH | ********* VOLUMES (VPH) ********** AUTOS | M TRUCKS | H TRUCKS | 50' Leq | 100' Leq | 150' Leq |
|---|---|---|---|---|---|---|---|---|
| South King St., West of Ward Ave. | 35 | 2,424 | 2,351 | 12 | 61 | 70.0 | 66.4 | 64.6 |
| South King St., Between Ward Ave. and Victoria St. | 35 | 2,200 | 2,134 | 11 | 55 | 69.6 | 66.0 | 64.1 |
| South King St., Between Victoria and Pensacola St. | 35 | 2,443 | 2,370 | 12 | 61 | 70.0 | 66.4 | 64.6 |
| South King St., East of Pensacola St. | 35 | 2,806 | 2,722 | 14 | 70 | 70.6 | 67.0 | 65.2 |
| Kapiolani Blvd., West of Ward Ave. | 35 | 2,932 | 2,844 | 15 | 73 | 70.7 | 67.0 | 65.1 |
| Kapiolani Blvd., Between Ward Ave. and Access Rd. | 35 | 3,108 | 3,014 | 16 | 78 | 70.9 | 67.3 | 65.4 |
| Kapiolani Blvd., Between Access Rd. and Kamakee St. | 35 | 2,955 | 2,866 | 15 | 74 | 70.7 | 67.1 | 65.1 |
| Kapiolani Blvd., Between Kamakee and Pensacola St. | 35 | 2,894 | 2,808 | 14 | 72 | 70.6 | 67.0 | 65.0 |
| Kapiolani Blvd., East of Pensacola St. | 35 | 2,972 | 2,883 | 15 | 74 | 70.7 | 67.1 | 65.1 |
| Pensacola St., North of S. King St. | 30 | 1,145 | 1,128 | 6 | 11 | 63.6 | 60.4 | 58.5 |
| Pensacola St., Between S. King St. and Kapiolani Blvd. | 30 | 1,058 | 1,042 | 5 | 11 | 63.3 | 60.1 | 58.2 |
| Pensacola St., South of Kapiolani Blvd. | 30 | 596 | 587 | 3 | 6 | 60.8 | 57.6 | 55.7 |

# TABLE 3

## FUTURE TRAFFIC VOLUMES AND NOISE LEVELS ALONG VARIOUS SECTIONS OF ROADWAYS IN THE PROJECT AREA ( PM PEAK HOUR ON DAY WITHOUT THE PROJECT)

| LOCATION | SPEED (MPH) | TOTAL VPH | ********* VOLUMES (VPH) ********** AUTOS | M TRUCKS | H TRUCKS | 50' Leq | 100' Leq | 150' Leq |
|---|---|---|---|---|---|---|---|---|
| South King St., West of Ward Ave. | 35 | 2,424 | 2,351 | 12 | 61 | 70.0 | 66.4 | 64.6 |
| South King St., Between Ward Ave. and Victoria St. | 35 | 2,371 | 2,300 | 12 | 59 | 69.9 | 66.3 | 64.4 |
| South King St., Between Victoria and Pensacola St. | 35 | 2,443 | 2,370 | 12 | 61 | 70.0 | 66.4 | 64.6 |
| South King St., East of Pensacola St. | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Kapiolani Blvd., West of Ward Ave. | 35 | 2,932 | 2,844 | 15 | 73 | 70.7 | 67.0 | 65.1 |
| Kapiolani Blvd., Between Ward Ave. and Access Rd. | 35 | 3,224 | 3,127 | 16 | 81 | 71.1 | 67.5 | 65.5 |
| Kapiolani Blvd., Between Access Rd. and Kamakee St. | 35 | 2,955 | 2,866 | 15 | 74 | 70.7 | 67.1 | 65.1 |
| Kapiolani Blvd., Between Kamakee and Pensacola St. | 35 | 2,894 | 2,808 | 14 | 72 | 70.6 | 67.0 | 65.0 |
| Kapiolani Blvd., East of Pensacola St. | 35 | 2,972 | 2,883 | 15 | 74 | 70.7 | 67.1 | 65.1 |
| Pensacola St., North of S. King St. | 30 | 1,145 | 1,128 | 6 | 11 | 63.6 | 60.4 | 58.5 |
| Pensacola St., Between S. King St. and Kapiolani Blvd. | 30 | 1,058 | 1,042 | 5 | 11 | 63.3 | 60.1 | 58.2 |
| Pensacola St., South of Kapiolani Blvd. | 30 | 596 | 587 | 3 | 6 | 60.8 | 57.6 | 55.7 |

# TABLE 4

## FUTURE TRAFFIC VOLUMES AND NOISE LEVELS ALONG VARIOUS SECTIONS OF ROADWAYS IN THE PROJECT AREA ( PM PEAK HOUR ON DAY WITH SPORTS EVENT)

| LOCATION | SPEED (MPH) | TOTAL VPH | ********* VOLUMES (VPH) ********** AUTOS | M TRUCKS | H TRUCKS | 50' Leq | 100' Leq | 150' Leq |
|---|---|---|---|---|---|---|---|---|
| South King St., West of Ward Ave. | 35 | 2,596 | 2,518 | 13 | 65 | 70.3 | 66.7 | 64.8 |
| South King St., Between Ward Ave. and Victoria St. | 35 | 2,543 | 2,466 | 13 | 64 | 70.2 | 66.6 | 64.8 |
| South King St., Between Victoria and Pensacola St. | 35 | 2,615 | 2,537 | 13 | 65 | 70.3 | 66.7 | 64.9 |
| South King St., East of Pensacola St. | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Kapiolani Blvd., West of Ward Ave. | 35 | 2,932 | 2,844 | 15 | 73 | 70.7 | 67.0 | 65.1 |
| Kapiolani Blvd., Between Ward Ave. and Access Rd. | 35 | 3,224 | 3,127 | 16 | 81 | 71.1 | 67.5 | 65.5 |
| Kapiolani Blvd., Between Access Rd. and Kamakee St. | 35 | 3,299 | 3,201 | 16 | 82 | 71.2 | 67.6 | 65.6 |
| Kapiolani Blvd., Between Kamakee and Pensacola St. | 35 | 3,238 | 3,141 | 16 | 81 | 71.1 | 67.5 | 65.5 |
| Kapiolani Blvd., East of Pensacola St. | 35 | 3,316 | 3,216 | 17 | 83 | 71.2 | 67.6 | 65.6 |
| Pensacola St., North of S. King St. | 30 | 1,489 | 1,467 | 7 | 15 | 64.7 | 61.6 | 59.7 |
| Pensacola St., Between S. King St. and Kapiolani Blvd. | 30 | 1,235 | 1,217 | 6 | 12 | 63.9 | 60.7 | 58.8 |
| Pensacola St., South of Kapiolani Blvd. | 30 | 596 | 587 | 3 | 6 | 60.8 | 57.6 | 55.7 |

# TABLE 5

## CALCULATIONS OF PROJECT AND NON-PROJECT FUTURE TRAFFIC NOISE CONTRIBUTIONS ( PM PEAK HOUR )

| H-1 FREEWAY SECTION | NOISE LEVEL (DB) INCREASE DUE TO: NON-PROJECT TRAFFIC | PROJECT TRAFFIC |
|---|---|---|
| South King St., West of Ward Ave. | 0.00 | 0.30 |
| South King St., Between Ward Ave. and Victoria St. | 0.30 | 0.30 |
| South King St., Between Victoria and Pensacola St. | 0.00 | 0.30 |
| Kapiolani Blvd., West of Ward Ave. | 0.00 | 0.00 |
| Kapiolani Blvd., Between Ward Ave. and Access Rd. | 0.20 | 0.00 |
| Kapiolani Blvd., Between Access Rd. and Kamakee St. | 0.00 | 0.50 |
| Kapiolani Blvd., Between Kamakee and Pensacola St. | 0.00 | 0.50 |
| Kapiolani Blvd., East of Pensacola St. | 0.00 | 0.50 |
| Pensacola St., North of S. King St. | 0.00 | 1.10 |
| Pensacola St., Between S. King St. and Kapiolani Blvd. | 0.00 | 0.60 |
| Pensacola St., South of Kapiolani Blvd. | 0.00 | 0.00 |

Note:

PM Peak Hour Traffic with Project Occurs During Day with Sport Event At Maximum Bleacher Seating Capacity.

# TABLE 6
# TRAFFIC AND BACKGROUND NOISE MEASUREMENT RESULTS

| | LOCATION | Time of Day (HRS) | Ave. Speed (MPH) | Hourly Traffic Volume AUTO | M.TRUCK | H.TRUCK | Measured Leq (dB) | Predicted Leq (dB) |
|---|---|---|---|---|---|---|---|---|
| C | 50 FT from the centerline of Kapiolani Blvd. (2/27/20) | 1600 TO 1700 | 35 | 2,582 | 15 | 66 | 70.4 | 70.3 |
| H | 50 FT from the centerline of Pensacola St. (2/25/20) | 1600 TO 1700 | 30 | 1,069 | 7 | 12 | 63.5 | 63.5 |

**TABLE 7**
**COMPARISONS OF PREDICTED SOUND LEVELS FROM VARIOUS SOURCES DURING SPECTATOR SPORT EVENTS AT AT FOOTBALL/SOCCER/ TRACK FIELD**

| | ---------- A-WEIGHTED SOUND LEVEL ---------- | | |
|---|---|---|---|
| **SOUND SOURCE** | **Moana Pacific** | **Kamaile St.** | **Pacifica Hon.** |
| Crowd Noise (Football Game) | 67.3 | 69.4 | 61.0 |
| PA System Speakers (Event) | 70.7 | 73.1 | 65.1 |
| Marching Band (3 Total): | 60.0 | 58.4 | 51.8 |
| Band At Ewa End | 50.0 | 50.0 | 49.0 |
| Band At Mid Field | 53.6 | 53.0 | 46.5 |
| Band At D. Head End | 58.2 | 56.0 | 44.4 |
| PA System Spkrs. (Assembly): | 60.7 | 63.1 | 55.1 |

Appendix C

# Preliminary Engineering Report

***Fukunaga & Associates, Inc., October 2020***

# PRELIMINARY ENGINEERING REPORT
# (WATER, SEWER, & DRAIN)
# FOR
# MCKINLEY HIGH SCHOOL BOY'S PE & ATHLETIC COMPLEX AND BLEACHERS

**DOE JOB NO. Q23000-18**
**Tax Map Key: 2-3-009:001**

Prepared For:

STATE OF HAWAII
DEPARTMENT OF EDUCATION
HONOLULU, OAHU, HAWAII

Prepared By:

Fukunaga & Associates, Inc.
1357 Kapiolani Boulevard, Suite 1530
Honolulu, Hawaii 96814

October 9, 2020

# CHAPTER 1
# INTRODUCTION

## A. General

This Utility Preliminary Engineering Report evaluated the capacity of the existing utilities for water, sewer, and drainage for the new athletic complex improvements which includes the P.E. & Athletic Building, parking lot, plaza, and bleachers.

## B. Objectives

The prime objective of this report is as follows:

1. Provide essential information on existing utilities and evaluate water, sewer, and drainage utilities to facilitate proper planning for the new improvements.

## C. Methodology

The following general work items were undertaken to accomplish the above objective:

1. Preparation of existing utility maps for water, sewer, and drainage, within the campus and along frontage roads using available as-built construction plans.

2. Analysis of the capacity of existing on-campus utilities to provide adequate service for the new facility.

3. Preparation of utility maps indicating alignment and line size of future utilities to support the new facility.

# CHAPTER 2
# PLANNING CONSIDERATIONS

## A. Existing Conditions

The existing campus utility maps were compiled from as-built drawings however there are remaining "pockets" of unknown utilities where improvements went unrecorded. Utility locations will need to be confirmed during the actual design phase.

The existing campus utilities and new athletic complex improvements is as shown on Figures 1-3, and reflects existing buildings and known utilities as of March 2020.

## B. Enrollment

The school has a design enrollment of 2,200 students during the academic year (Grades 9 through 12).

# CHAPTER 3
# SEWER EVALUATION

## A. General

The sewer evaluation analyzed on-campus sewer facilities for adequacy for the new athletic complex improvements. The City and County of Honolulu Wastewater System Design Standards, Volume I, dated July 2017 have been adopted for use in this evaluation, and will be referenced hereinafter as the Sewer Standards.

## B. Existing Sewer System

The existing on-campus sewer system consists of sewer lines ranging from 6 to 12-inches in diameter connecting into two of the City and County of Honolulu's sewer mains. There is a 48-inch sewer main in Pensacola Street and a 36-inch sewer main in Kapiolani Boulevard, as shown on Figure 1.

## C. Sewer System Criteria

### 1. Long-range Development Plans

Sewer lines should be located in accessible and open areas such as roadways, grass areas, and mall areas to facilitate maintenance and minimize conflicts with any future improvements.

### 2. Sewage Flows

The on-campus sewage flow is generated primarily from domestic use and ground water infiltration. Flow estimates based on the Sewer Standards are utilized for this sewer system evaluation. The estimation procedures based on the Sewer Standards are discussed in detail later in this chapter.

## D. Sewer System Evaluation

The sewer system evaluation assessed on-campus facilities for adequacy with the new facility.

### 1. On-Campus Sewer System Evaluation:

The City and County sewer connection and building permit review process includes evaluation of design peak sewage flows to be generated by the proposed facility to be discharged into the City system.

The existing and future design peak sewage flows were calculated per the Sewer Standards to verify if an increase in sewer flow would result from the new facility. The existing and future design peak flow calculations are tabulated in Table 3-2 and calculated as follows:

Design Peak Flow = (Maximum Rate of Flow + DWI/I + WWI/I)

Maximum Rate of Flow = (Average Daily Flow) x (Flow Factor)
DWI/I = Dry Weather Infiltration / Inflow
WWI/I = Wet Weather Infiltration / Inflow

The first step in estimating the design peak flow is to calculate average daily wastewater flow.

i. Average Daily Wastewater Flow

Average daily wastewater flow may be estimated using 80 gallons per day per resident and 25 gallons per day per student, faculty, or support staff member. The calculations and campus populations are reflected in Table 3-1.

**TABLE 3-1**
**AVERAGE DAILY WASTEWATER FLOW CALCULATIONS**

| Average Daily Wastewater Flow | Student Population (A) | Avg. Daily Flow From Students (A) x 25 gal./day | Avg. Daily Flow Total (gallons) |
|---|---|---|---|
| Existing (Design Student Population) | 2,200 | 55,000 | 55,000 |
| New Athletic Complex Improvements | 1,901 | 47,525 | 47,525 |

ii. Maximum Flow Factor

The second step in obtaining the design peak flow is to obtain the maximum flow factor which is applied to the average daily wastewater flow to obtain the maximum rate of sewage flow. In the Design Standards, a flow factor of 2.5 is used to obtain the maximum rate of wastewater flows.

iii. Maximum Rate of Sewage Flow

The maximum rate of sewage flow is obtained by multiplying the average daily wastewater flow by the maximum flow factor.

Existing Max. Rate of Flow = 55,000 gallons per day x 2.5
=137,500 gallons per day

Future Max. Rate of Flow = 47,525 gallons per day x 2.5
=118,813 gallons per day

iv. Dry Weather and Wet Weather Infiltration/Inflow (I/I)

The final item in the design peak flow calculation is the amount of dry weather and wet weather infiltration/inflow. The infiltration amount varies depending on materials, workmanship, ground water elevation, etc. Dry and wet weather I/I accounts for ground water leaking into the sewer through manhole covers and sewer joints. The Design Standards have established estimates for dry and wet weather I/I as follows:

Dry Weather I/I: McKinley's sewer lines are located below the normal ground water table, and the amount of dry weather I/I is estimated at 35 gallons per capita per day.

Existing DWI/I = 2,200 (campus population) x 35 gallons
= 77,000 gallons per day

Future DWI/I = 1,901 (campus population) x 35 gallons
= 66,535 gallons per day

Wet Weather I/I: Sewer lines are located below the normal ground water table, and the amount of wet weather I/I is estimated at 2,750 gallons per acre per day.

Exist. WWI/I = 39.5 acres x 2,750 gallons / acre
= 108,625 gallons per day

Future WWI/I = 39.5 acres x 2,750 gallons / acre
= 108,625 gallons per day

The design peak flow is the sum of the previously calculated items as shown in Table 3-2 and as follows:

Design Peak Flow = (Max. Rate of Flow + DWI/I + WWI/I)

Maximum Rate of Flow = (Avg. Daily Flow) x (Flow Factor)
DWI/I = Dry Weather Infiltration / Inflow
WWI/I = Wet Weather Infiltration / Inflow

**TABLE 3-2**
**DESIGN PEAK FLOW CALCULATIONS FOR MCKINLEY HIGH SCHOOL**

| McKinley School Sewer System | Campus Area (Acres) (A) | Student, Faculty, and Staff Pop. (B) | Avg. Daily Flow (B) x 25 gal/day (gal.) | Max. Flow Factor | Max. Flow (gal.) | Dry Weather I/I (B) x 35 (gal.) | Wet Weather I/I (A) x 2,750 (gal.) | Design Peak Flow (gal.) |
|---|---|---|---|---|---|---|---|---|
| Exist. | 39.5 | 2,200 | 55,000 | 2.5 | 137,500 | 77,000 | 108,625 | 323,125 |
| New Athletic Complex Improvements | 39.5 | 1,901 | 47,525 | 2.5 | 118,813 | 66,535 | 108,625 | 293,973 |

The above design peak flow calculations confirm that based on the existing student population, the new facility will not have any anticipated complications during building permit application for sewer capacity.

## E. Sewer Improvements

Figure 3 reflects new sewer line and alignment to service the new P.E. & Athletic Building. New sewer lines should be designed to carry the peak flow of sewage without surcharging (rule of thumb: 85% of max. capacity) in accordance with Sewer Standards. The Manning formula is recommended for use in determining the capacity of sewer lines. The formula and "n" values are given below:

$$V = (1.486/n) \times (r^{2/3}) \times (S^{1/2})$$

Where,

V = velocity (ft/sec)
n = roughness coefficient, dimensionless
r = hydraulic radius (ft)
S = slope (ft/ft)

A minimum “n” roughness coefficient value of 0.013 shall be used for all pipes.

The sewer lines shall also be designed to provide mean velocities of not less than 2.5 feet per second when flowing full to provide adequate scouring. The following minimum slopes are to be used for the different sized pipes:

| Diameter | Minimum Slope |
|---|---|
| 8" (upstream terminal) | 0.0100 |
| 8" | 0.0052 |
| 10" | 0.0039 |
| 12" | 0.0031 |
| 16" | 0.0021 |
| 18" | 0.0018 |
| >18" | 0.0016 |

Existing sewer line locations, diameters, manhole invert elevations, and slopes were transcribed from as-built plans and available data.

The P.E. & Athletic Building future sewer service is shown in Figure 3 and consists of approximately 400 feet of new 8-inch sewer line and a new manhole.

# CHAPTER 4
# WATER EVALUATION

## A. General

This Water Evaluation assessed the campus water system for adequacy for the new athletic complex improvements. The Water System Standards of the Board of Water Supply (BWS), City and County of Honolulu dated 2002 have been adopted for use in this evaluation, and will be referenced hereinafter as the BWS Standards.

## B. Existing Water System

The existing water distribution system for McKinley High School is shown on Figure 1, and reflects existing buildings and known utilities as of March 2020. The BWS system supplies potable water to the McKinley High School campus.

## C. Criteria for Water Service

Waterlines should be located in accessible and open areas such as roadways, grass areas, and mall areas to facilitate maintenance and minimize conflicts with any future improvements.

## D. Water System Evaluation

The BWS has established that the existing water system is adequate for long-range development plans as stipulated in the existing Site Plan Review Permit. The availability of water will be reconfirmed during building permit review for the proposed facilities, but no complications are anticipated at this time.

## E. Water Consumption Per BWS Standards

### 1. Estimated Water Demand Based on BWS Standards

For planning and water allocation purposes, the average daily water demand may be estimated based on BWS Standards using student population, campus acreage, building square footage, or combinations thereof.

The estimated water demand was calculated using the following combinations and as shown on Table 4-1. The existing building square footage tabulation is included in Table 4-2.

i. Student Population: 60 gallons per student per day

ii. Campus Acreage: 4,000 gallons per acre per day

iii. Building Square Footage: 120 gallons per 1,000 sf per day

Campus Acreage (Irrig.): 4,000 gallons per acre per day

2. Demand Based on Student Population

a. Demand Based on Student Population

The BWS Standards have established an average daily water demand rate of 60 gallons per student for planning and estimating purposes. The 60 gallons per student is conservative and includes water demand from faculty, staff, and irrigation. The estimated annual water demand based on the current student population is 48,180,000 gallons per year.

3. Demand Based on Campus Acreage

a. Demand Based on Campus Acreage

The BWS Standards have established an average daily water demand rate of 4,000 gallons per acre for planning and estimating purposes. The 4,000 gallons per acre is conservative and includes water demand from students, faculty, staff, and irrigation. The estimated water demand based on acreage alone is 57,670,000 gallons per year.

4. Demand Based on Square Footage

a. Demand Based on Building Square Footage

The BWS Standards have established an average daily water demand rate of 120 gallons per 1,000 square feet of building area for a commercial/residential mix property and an average

daily water demand rate of 4,000 gallons per acre for irrigation. The estimated annual water demand based on building square footage and irrigation is 59,944,257 gallons per year.

b. Comparison

The 120 gallons per 1,000 square feet of building area includes water demand from students, faculty, staff, but does not include demand from irrigation (approximately 34.46 acres). Landscape irrigation may be accounted for using 4,000 gallons per acre for an estimated irrigation demand of 137,680 gallons per day.

**TABLE 4-1:**
**METERED WATER CONSUMPTION COMPARED WITH BWS STANDARDS**

| | Avg. Daily Demand Based On | | | | Gallons | |
|---|---|---|---|---|---|---|
| | Population: 2,200 students (gal. per student) | Acreage: 39.5 acres (gal. per unit) | Building SF: 221,257 sf (5.08 acres) (gal per 1,000 sf) | Acreage (Irrigation): 34.42 acres (gal. per unit) | Daily | Yearly |
| Est. i | 60 | | | | | |
| Total | 132,000 | | | | 132,000 | 48,180,000 |
| | | | | | | |
| Est. ii | | 4,000 | | | | |
| Total | | 158,000 | | | 158,000 | 57,670,000 |
| | | | | | | |
| Est. iii | | | 120 | 4,000 | | |
| Total | | | 26,551 | 137,680 | 164,231 | 59,944,257 |

**TABLE 4-2**
**EXISTING BUILDING SQUARE FOOTAGE**

| Building | Existing Building Area (SF) |
|---|---|
| Building M | 10,291 |
| Building D | 9,129 |
| Building C | 9,125 |
| Building E | 8,840 |
| Building B | 8,840 |
| P6-9 | 3,380 |
| P2-5 | 3,247 |
| DOE Main Shop L | 6,237 |
| Building F | 9,049 |
| Building W | 9,545 |
| Shop K | 10,040 |
| Transformer Building | 425 |
| Administration/Auditorium | 31,292 |
| Music/Band | 6,275 |
| Building G | 9,489 |
| Library | 10,228 |
| Shop J | 8,533 |
| Cafeteria | 13,055 |
| Adult Education | 20,950 |
| Cottage CT-1 | 1,700 |
| P1 | 834 |
| Boys PE | 5,833 |
| Gym | 20,121 |
| Girls PE | 4,799 |
| Total Building Square Footage | 221,257 |

## G. Water Demand Evaluation

The projected water demand calculations for the future athletic complex improvements were calculated based on student population or building square footage since there will be no increase in acreage. Water demand projections based on the student enrollment population and building square footage are as follows:

1. Water Demand Based on Student Population

The water demand calculations were based on the design student enrollment population of 2,200 students. The calculations are shown in Table 4-3.

**TABLE 4-3**
**WATER DEMAND BASED ON STUDENT POPULATION**

| | Student Population | Average Daily Water Demand (gal/per/day) | Total Average Daily Demand (gal/day) | Total Average Yearly Demand (gal/year) |
|---|---|---|---|---|
| Existing Design Student Enrollment | 2,200 | 60 | 132,000 | 48,180,000 |

The projections reveal the projected water demand is estimated to be 132,000 gallons per day or 48,180,000 gallons per year. The BWS has already ascertained that the existing water system has adequate capacity to service the Site Master Plan, but the availability of water will be reconfirmed during the review of building permits for the new facilities.

2. Projected Water Demand Based on Building Square Footage

Although the design student enrollment population remains relatively unchanged, the athletic complex improvements will modify overall building square footage on campus.

The projected water demand calculations based on overall change in building area square footage from the new athletic complex improvements plan is as shown in Table 4-4 with calculations shown in Table 4-5.

**TABLE 4-4**
**BUILDING SQUARE FOOTAGE**
**Athletic Complex Improvements**

| Building | Building Area (SF) | Change in Building Area (SF) |
|---|---|---|
| P.E. & Athletic Building | 20,100 | 20,100 |
| South Bleachers | 2,060 | 2,060 |
| Total Change in Square Footage: | | 22,160 |

**TABLE 4-5**
**WATER DEMAND CALCULATIONS BASED ON BUILDING SQUARE FOOTAGE**

| | Increase in Building Area (SF) (A) | Calculated Increase in Average Daily Demand (A) x 120 gal./1000 sf (gallons) | Increase in Average Yearly Demand (gallons) | Total Average Yearly Demand with Irrigation and Existing Building Square Footage |
|---|---|---|---|---|
| New Athletic Complex Improvements | 22,160 | 2,660 | 970,900 | 60,915,157 |
| Existing Campus (for comparison purposes) | 221,257 | | | 59,944,257 |

The total estimated water demand based on the increase in building floor area square footage for the athletic complex improvements is 2,660 gallons per day or 970,900 gallons per year, indicating a 1.6 percent increase over present annual consumption of 59,944,257 gallons per year.

This calculated increase in water demand based on building square footage is conservative since campus population remains relatively unchanged, activities in the new facilities are those transferred from structures already in existence, and irrigation area is decreased. For water service purposes, the more conservative projected water demand based on building floor area will be used rather than student population.

I. Water Distribution System Criteria

Since the BWS is the principal supplier of water in the City and County of Honolulu, their standards govern the planning and design of water distribution facilities. BWS standards applicable are summarized as follows:

1. The capacity of the distribution system shall deliver the maximum daily demand simultaneously with required fire flow with a residual pressure of 20 psi.

2. The distribution system shall deliver peak hour flow (without fire flow) with a minimum residual pressure of 40 psi.

3. Hazen Williams “C” values to be used in determining the carrying capacity of the mains:

| Size | “C” |
|---|---|
| 4", 6" | 100 |
| 8", 12" | 110 |
| 16”, 20” | 120 |
| 24” and Larger | 130 |

4. Maximum velocity in main without fire flow is 6 feet per second.

5. As stated earlier, for Water Master Planning purposes, the more conservative water demand based on building square footage shall be used.

   i. Average Daily Demand = 120 gallons per 1,000 sf of building floor area

   ii. Maximum Daily Demand = 1.5 x Average Day

   iii. Peak Hour Flow = 3 x Average Day

J. Water Improvements

The P.E. & Athletic Building requires new water service as shown on Figure 3 would be a connection to the existing adjacent 6” water.

# CHAPTER 5
# DRAINAGE EVALUATION

## A. General

This Drainage Evaluation assessed the existing campus drainage system for adequacy and compatibility for the new athletic complex improvements. The Rules Relating to Storm Drainage Standards, Department of Planning and Permitting, dated January 2000, has been adopted for use in this evaluation, and will be referenced hereinafter as the Drainage Standards.

## B. Existing Drainage System

The existing drainage system for McKinley High School is shown on Figure 1, and reflects existing buildings and known drainage utilities as of March 2020.

The existing underground drain lines range from 4 to 18-inches in diameter and are located throughout the campus. Existing drainage infrastructure on adjacent streets consists of catch basins and box culverts. On Pensacola Street, there is an existing box culvert that begins near King Street as a 9’ x 5’ concrete box culvert and increases to a double 10’ x 5’ box near Kapiolani Boulevard. On Kapiolani Boulevard, there is an existing 3’ x 3’ box culvert that connects to the double box culvert on Pensacola Street. This box culvert ties in a CRM lined ditch between McKinley High School and Blaisdell Center. These culvert systems discharge into the drainage channel and lagoon system in Ala Moana Park.

## C. Drainage System Criteria

The new drainage system will consist of new drain lines ranging from 8-inches to 24-inches and an underground storm drainage detention system. Drain lines should be located in accessible and open areas such as roadways, grass areas, and mall areas to facilitate maintenance and minimize conflicts with any future improvements.

## D. Drainage System Evaluation

The drainage system evaluation assessed various alternatives to handle the increase in runoff for the new building. The drainage system will need to be reevaluated during the design phase.

1. Surface Runoff Flows

Approximate surface runoff flow determinations were calculated per the Drainage Standards and described as follows:

a. The storm recurrence interval used was 10 years.

b. The rational formula was used to compute storm runoff quantities:

$Q = CiA$

Where:

Q = flow rate in cubic feet per second

C = runoff coefficient

i = rainfall intensity in inches per hour for a duration equal to the time of concentration

A = Drainage area in acres

c. Runoff coefficients were used in the computations as follows:

| | | |
|---|---|---|
| Roads, sidewalks and paved areas: | C = | 0.90 |
| Open vegetated areas: | C = | 0.20 |
| Gravel: | C = | 0.70 |
| Combined School and Open Area: | C = | 0.60 |

E. Drainage Improvements

The existing campus drainage system is as shown on Figure 1.

Based on hydraulic calculations the new athletic complex improvements will have a total runoff of 2.64 cfs, based on a 10-year recurrence interval, 1-hour duration rainfall. This is an increase of 1.06 cfs (3,816 cubic feet) due to approximately 35,000 square feet of new impervious area as shown on Table 5-1.

TABLE 5-1 Drainage Calculations

| Drainage Area | Area (sf) | Area (ac) | % Grass/Dirt (C~0.20) | % Impervious (C~0.90) | C | I | Q (cfs) |
|---|---|---|---|---|---|---|---|
| Existing | 74400 | 1.71 | 59.2 | 40.8 | 0.49 | 1.9 | **1.58** |
| Proposed | 74195 | 1.70 | 12.1 | 87.9 | 0.82 | 1.9 | **2.64** |
| | | | | | | **Increase in Q =** | **1.06** |

A new underground detention system can be installed to retain the increase in storm water runoff, and also replace the displaced existing subdrain pipe system between the tennis courts and football field in conflict with the new sidewalk mall. The underground detention basin would be sized to retain the increase in runoff due to the new facility and improvements as well as the existing storage volume (approximately 1,000 cf).

# CHAPTER 6
# SUMMARY AND COST

This Utility PER supplements the Master Plan prepared by G70, and evaluated the capacity of the existing utilities for water, sewer, and drainage for the new athletic complex improvements which includes the P.E. & Athletic Building, parking lot, plaza, and bleachers.

## A. Sewer System Evaluation

The design peak flow calculations confirm that based on the existing student population, the new athletic complex improvements will not require any increase in sewer capacity.

The P.E. & Athletic Building will obtain future sewer service as shown in Figure 3 which consists of approximately 400 feet of new 8-inch sewer line and a new manhole.

## B. Water System Evaluation

The projected water demand calculations for the future athletic complex improvements were calculated based on student population and building square footage. Water demand calculations based on student population remains unchanged since the student population remains constant however there is an increase in water demand of 2,660 gallons per day or 970,900 gallons per year using building square footage. Therefore, the more conservative number based on building square footage will be utilized, and the BWS has already determined that the existing water system has adequate capacity to service the Site Master Plan, but the availability of water will be reconfirmed during the review of building permits for the new facilities.

The P.E. & Athletic Building will obtain future water service as shown on Figure 3 which consists of connection to the existing adjacent 6” water.

## C. Drainage System Evaluation

Storm water runoff calculations for the future athletic complex improvements indicate that the new facility will have an increase in runoff of 1.06 cfs (3,816 cubic feet).

A new underground detention system can be installed to retain the increase in storm water runoff, and also replace the displaced existing subdrain pipe system between the tennis courts and football field in conflict with the new sidewalk mall. The underground detention basin would be sized to retain the increase in runoff due to the new facility and improvements as well as the existing storage volume (approximately 1,000 cf)

## D. Cost

The estimated construction cost for water, sewer, drainage, and miscellaneous site improvements is $1.7M.

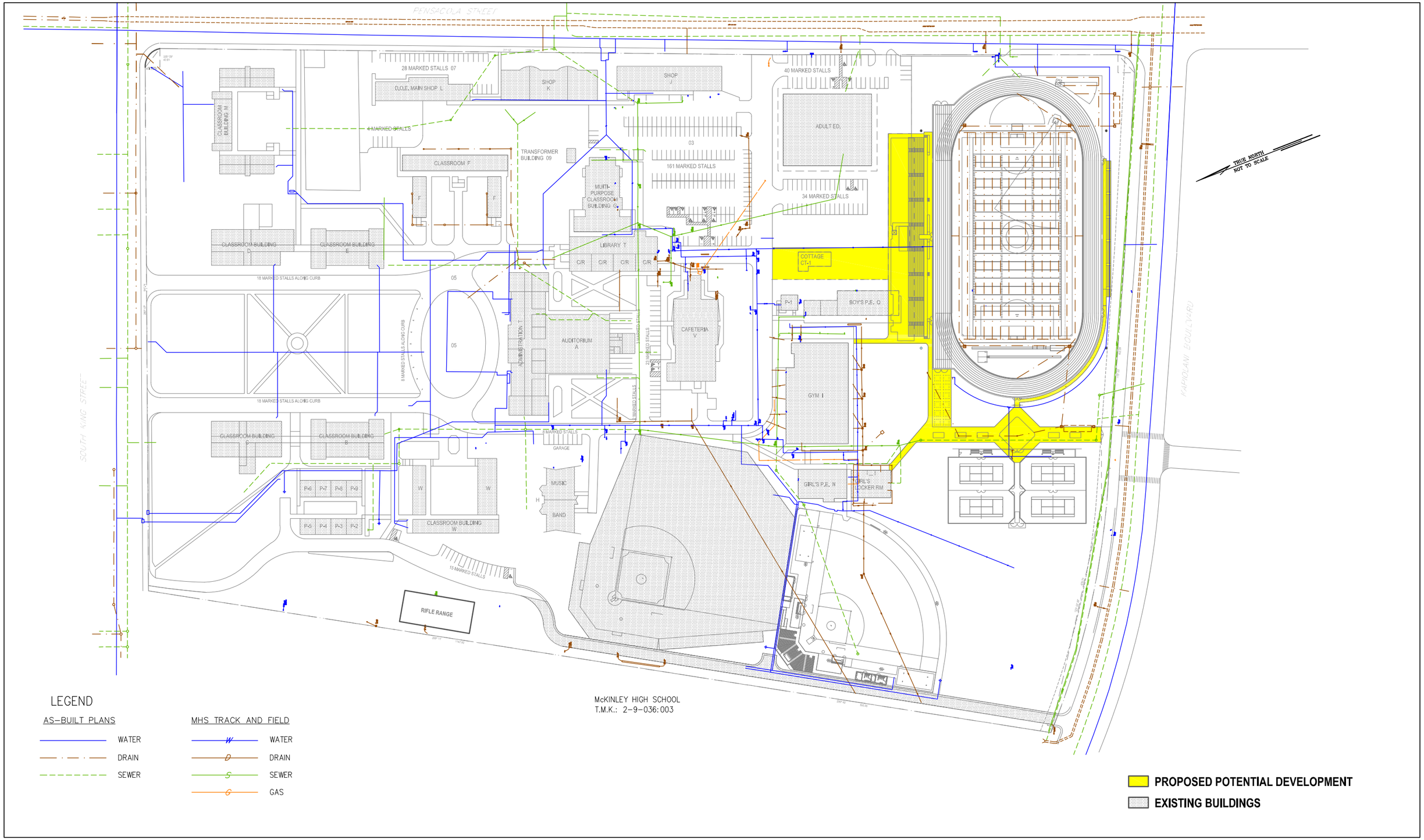



FIGURE 1: EXISTING UTILITIES BASE MAP – McKINLEY HIGH SCHOOL

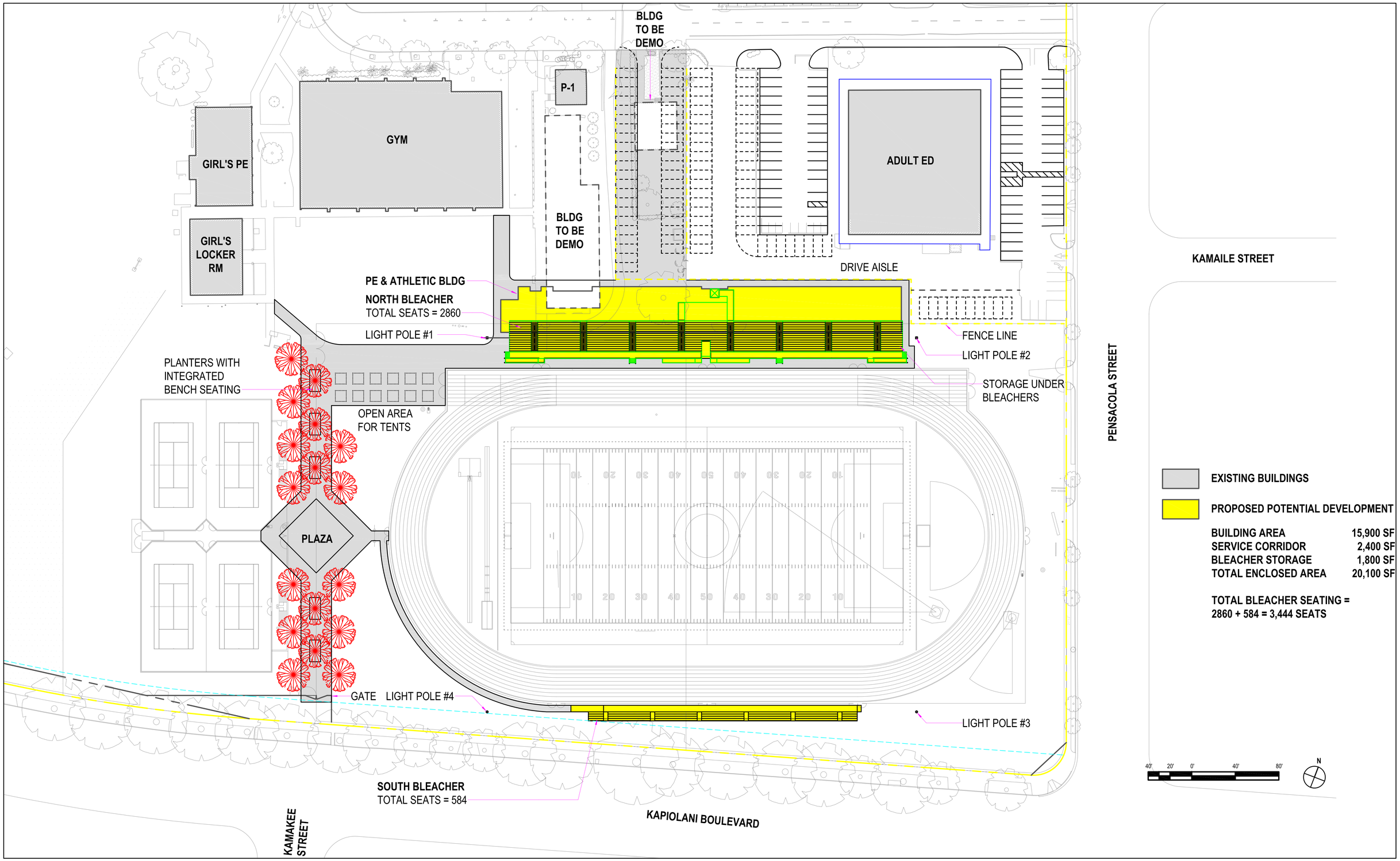



FIGURE 2: PROPOSED BOY'S PE AND ATHLETIC COMPLEX

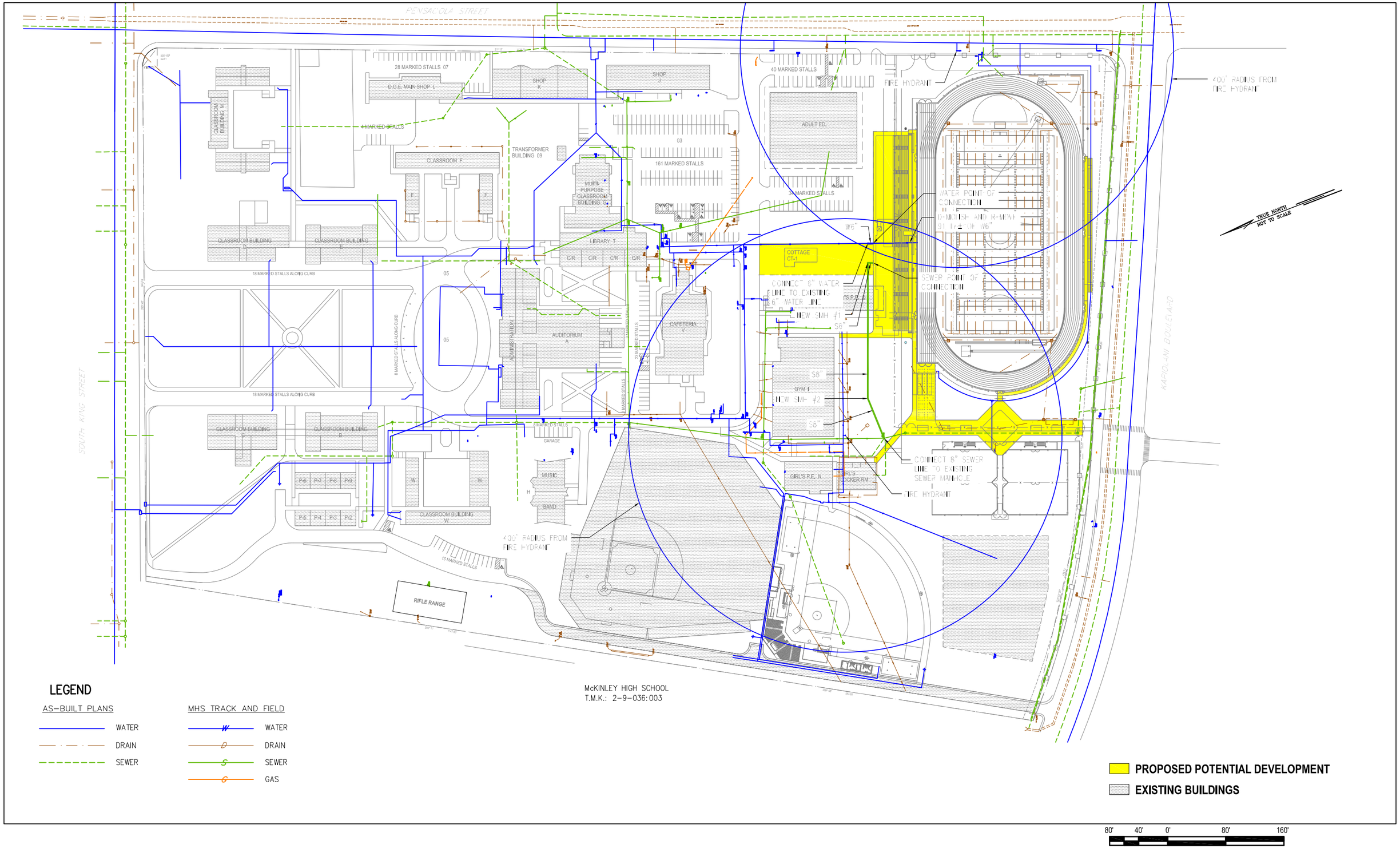



FIGURE 3: PROPOSED UTILITY PLAN

Appendix D

# Transportation Impact Assessment Report Parking Management Plan

*AECOM, December 2020*

# McKINLEY HIGH SCHOOL ATHLETIC COMPLEX IMPROVEMENTS

## Transportation Impact Assessment Report
## Parking Management Plan

**December 2020**

**AECOM Technical Services, Inc.**
1001 Bishop Street, Suite 1600
Honolulu, Hawai‘i 96813
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AECOM Project Number: 60626464

# Transportation Impact Assessment Report Update

# Parking Management Plan

## McKinley High School

## Athletic Complex Improvements

## Honolulu, Hawai‘i

## December 2020

Prepared for:

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# 1.0 INTRODUCTION

McKinley High School is planning improvements to its athletic complex. Included in this improvement is the addition of stadium seating to the existing football/track field and the provision of new locker rooms.

McKinley High School is located in Honolulu, Hawai‘i in the Ala Moana-Kaka‘ako area. Figure 1 shows its location within the Honolulu metro area. Figure 2 is a conceptual site plan that illustrates the McKinley High School campus and the areas affected by the proposed athletic complex improvements.

McKinley High School already accommodates major sporting events on its campus and the proposed athletic complex improvements will allow it to better serve these events. The major expected difference in operation would be the potential for larger attendance at football or track events due to the addition of the stadium seating.

This transportation impact analysis report and parking management study has two primary purposes:

- Assess the traffic operational implications of increased traffic generated by the proposed athletic complex improvements;
- Identify a parking management plan on the McKinley High School campus to handle the increased parking demand that could potentially be created by the proposed athletic complex improvements football/track field.

The current COVID-19 situation made a traditional traffic impact analyses impractical due to atypical traffic conditions due to restrictions on business activity and the resulting reduced demand for travel.

Therefore, this report utilizes data from previous studies in the area to characterize the traffic environment that would interact with events at the improved athletic complex.

The parking management plan identifies parking areas that could accommodate the potential parking demand generated by the improved athletic complex with the goal of containing the parking demand on campus as much as possible.

## Vicinity Map

**McKinley High School Athletic Complex**
**TIAR and Management Plan**

N

0 1,000 2,000 Feet

Date: 8/27/2020

Figure 1 Vicinity Map

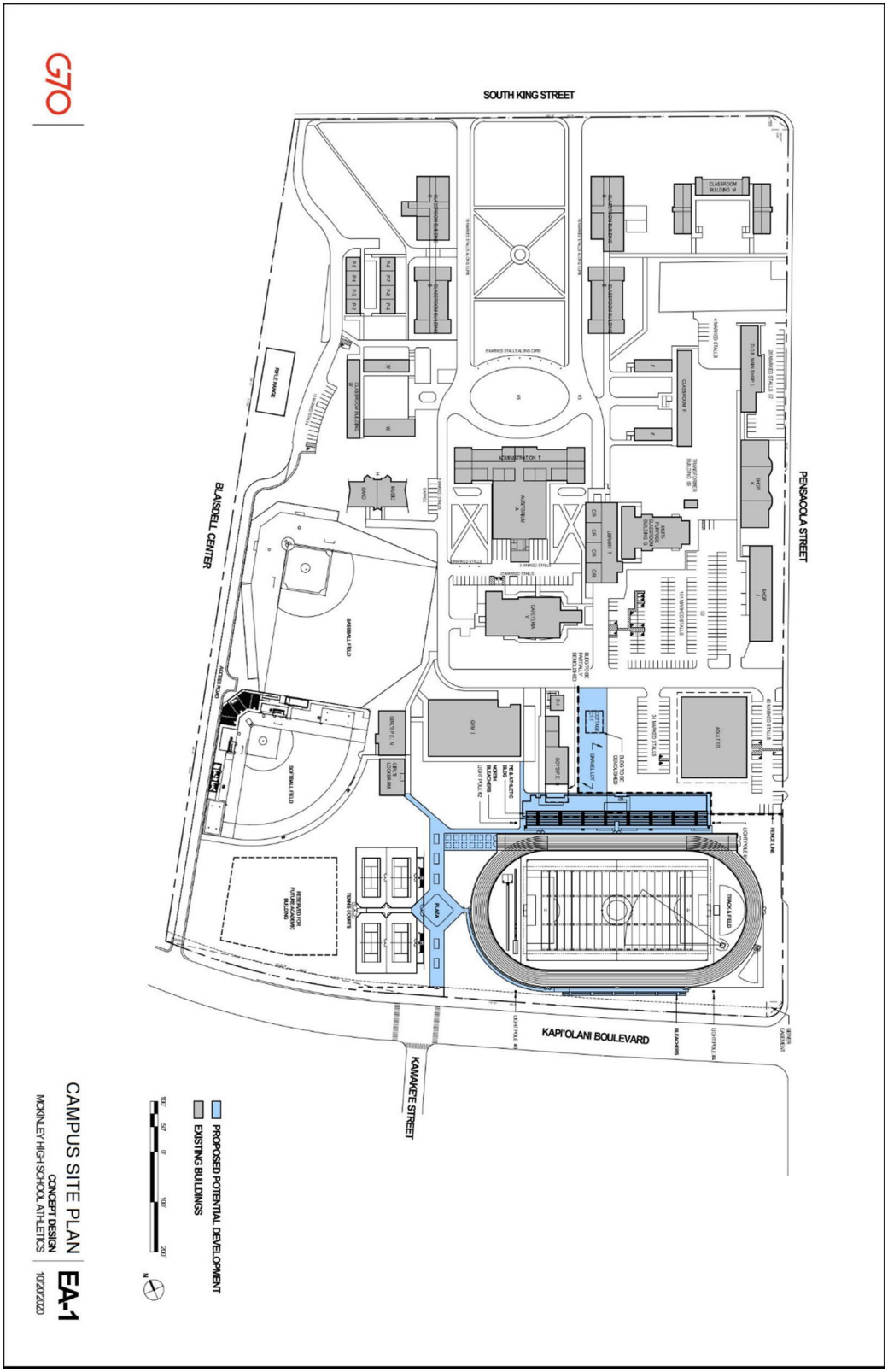


Figure 2 Conceptual Site Plan

# 2.0 EXISITNG CONDITIONS

## 2.1 Site Location

McKinley High School is bounded by South King Street on its mauka side, Pensacola Street on its Koko Head side, Kapiʻolani Boulevard on is makai side, and Neal S. Blaisdell Center on its ʻEwa side.

Land use adjacent to South King Street and Kapiʻolani Boulevard are primarily commercial. The Blaisdell Center is a major event center for the City and County of Honolulu. Land Koko Head of Pensacola Street is a mix of residential and commercial.

## 2.2 Roadway Conditions

Key roads in the vicinity of McKinley High School are as follows:

- South King Street;
- Ward Avenue;
- Victoria Street;
- Kapiʻolani Boulevard;
- Pensacola Street.

### 2.2.1 Roadway Descriptions

South King Street is a one-way arterial roadway oriented in the Koko Head-bound direction. It forms a couplet with the ʻEwa-bound South Beretania Street to provide ʻEwa-Koko Head mobility within the central Honolulu area. In the vicinity of McKinley High School, it has four travel lanes, one parking lane, and a two-way cycle track. McKinley High School's main entrance is located on South King Street. The posted speed limit in the vicinity of McKinley High School is 25 miles per hour (mph). South King Street is under the jurisdiction of the City and County of Honolulu.

Ward Avenue is a mauka-makai-oriented major collector roadway connecting the upper and lower Makiki areas and providing key access to H1 Freeway for the lower Makiki area. It is primarily a four-lane roadway with on-street parallel parking lanes on both sides of the roadway. The posted speed limit in the vicinity of McKinley High School is 25 miles per hour (mph). Ward Avenue is under the jurisdiction of the City and County of Honolulu.

Victoria Street is a mauka-makai-oriented collector roadway between South King Street and H1 Freeway. It provides circulation between the ʻEwa-Koko Head roadways of South King Street, South Beretania Street, and Kinau Street. It is a two-lane, undivided roadway with on-street parallel parking on both sides of the roadway. Its posted speed limit is 25 miles per hour (mph). Victoria Street is under the jurisdiction of the City and County of Honolulu.

Kapiʻolani Boulevard is an arterial roadway that provides ʻEwa-Koko Head mobility within the central Honolulu area. It is a six lane, undivided roadway. During peak commuter hours, Kapiʻolani Boulevard is contra-flowed providing additional directional capacity in the peak direction (ʻEwa-bound during the AM peak, Koko Head-bound during the PM peak). The posted speed limit in the vicinity of McKinley High School is 25 miles per hour (mph). Kapiʻolani Boulevard is under the jurisdiction of the City and County of Honolulu.

Pensacola Street is a one-way major collector oriented in the makai-bound direction. It forms a couplet with Piʻikoi Street to provide mauka-makai circulation in the Makiki area. In the vicinity of McKinley High School, there are three travel lanes with on-street parallel parking lanes on both sides of the roadway. There is also a two-way cycle track located along the Koko Head curb of Pensacola Street. The posted speed limit in the vicinity of McKinley High School is 25 miles per hour (mph). Pensacola Street is under the jurisdiction of the City and County of Honolulu.

### 2.2.2 Roadway Intersection Conditions

These roadways intersect at or near the corners of McKinley High School. These intersections are signalized. The following intersections are noted:

- South King Street/Pensacola Street;
- Kapiʻolani Boulevard/Pensacola Street;
- Kapiʻolani Boulevard/Kamakeʻe Street;
- Kapiʻolani Boulevard/Ward Avenue;
- South King Street/Ward Avenue;
- South King Street/Victoria Street.

The intersection of South King Street and Pensacola Street is a four-legged signalized intersection. Because it is an intersection of two-one-way roadways there are only Koko Head-bound and makai-bound vehicular approaches. The Koko-Head-bound South King Street approach has four through lanes and one shared through/right-turn lane. The makai-bound Pensacola approach has two through lanes, one shared through/left-turn lane, and one exclusive left-turn lane. There are two-way cycle-tracks located on the Koko Head side of Pensacola Street and on the mauka side of South King Street. The traffic signal operation accommodates all movements on the cycle tracks. There are crosswalks on all legs of the intersection, and these are controlled by pedestrian signals.

The intersection of Kapiʻolani Boulevard and Pensacola Street is a four-legged signalized intersection. The Pensacola Street approach consists of an exclusive left-turn lane, two through lanes, and an exclusive right-turn lane. Koko Head-bound Kapiʻolani Boulevard has two through lanes and a shared through/right-turn lane. ʻEwa-bound

Kapiʻolani Boulevard has two through lanes and a shared through/left-turn lane. During the AM peak period, Kapiʻolani Boulevard is contra-flowed to provide an additional ʻEwa-bound through lane. During this time period, the Koko Head-bound approach of Kapiʻolani Boulevard has one through lane and a shared through/right-turn lane. During the PM peak period, Kapiʻolani Boulevard is contra-flowed to provide an additional Koko Head-bound through lane. When this occurs, ʻEwa-bound Kapiʻolani Boulevard has two through lanes. Left turns are prohibited during this time period. There are crosswalks on Pensacola Street, makai and mauka of Kapiʻolani Boulevard and across the Koko Head-bound approach of Kapiʻolani Boulevard. These are controlled by pedestrian signals.

The intersection of Kapiʻolani Boulevard and Kamakeʻe Street is a signalized "T"-intersection. Kamakeʻe Street has separate left and right-turn lanes. Koko Head-bound Kapiʻolani Boulevard has two through lanes and a shared through/right-turn lane. ʻEwa-bound Kapiʻolani Boulevard has two through lanes and a shared through/left-turn lane. During the AM peak period, Kapiʻolani Boulevard is contra-flowed to provide an additional ʻEwa-bound through lane. During this time period, the Koko Head-bound approach of Kapiʻolani Boulevard has one through lane and a shared through/right-turn lane. During the PM peak period, Kapiʻolani Boulevard is contra-flowed to provide an additional Koko Head-bound through lane. When this occurs, ʻEwa-bound Kapiʻolani Boulevard has two through lanes. Left turns are prohibited during this time period. There are crosswalks on Kamakeʻe Street and across both approaches of Kapiʻolani Boulevard. The crosswalks are controlled by pedestrian signals.

The intersection of Kapiʻolani Boulevard and Ward Avenue Street is a four-legged signalized intersection. The Ward Avenue approaches include exclusive left-turn lanes, two through lanes, and exclusive right-turn lanes. Koko Head-bound Kapiʻolani Boulevard has two through lanes and a shared through/right-turn lane. ʻEwa-bound Kapiʻolani Boulevard has an exclusive left-turn lane, one through lane, and a shared through/right-turn lane. During the AM peak period, Kapiʻolani Boulevard is contra-flowed to provide an additional ʻEwa-bound through lane. During this time period, the Koko Head-bound approach of Kapiʻolani Boulevard has one through lane and a shared through/right-turn lane. During the PM peak period, Kapiʻolani Boulevard is contra-flowed to provide an additional Koko Head-bound through lane. When this occurs, the exclusive left-turn lane on ʻEwa-bound Kapiʻolani Boulevard is not available and left-turn are prohibited. There are crosswalks on all approaches of the intersection. These are controlled by pedestrian signals.

The intersection of South King Street and Ward Avenue is a four-legged signalized intersection. Because it is an intersection of two-one-way roadways there are only Koko Head-bound and makai-bound vehicular approaches. The Koko-Head-bound South King Street approach has a shared through/left-turn lane, three through lanes and one

shared through/right-turn lane. The makai-bound Ward Avenue approach has two through lanes. Mauka-bound Ward Avenue has two through lanes and one exclusive right-turn lane. During the AM peak period, makai-bound Ward Avenue is contra-flowed to provide an additional through lane. When this occurs, mauka-bound Ward Avenue has one through lane and one exclusive right-turn lane. A two-way cycle-track is located on the mauka side of South King Street. There are crosswalks on all legs of the intersection, and these are controlled by pedestrian signals.

The intersection of South King Street and Victoria Street is a four-legged signalized intersection. One-way Koko Head-bound South King Street approach has a shared through/left-turn lane, three through lanes and one shared through/right-turn lane. The makai-bound Victoria Street approach has a shared through/left-turn lane and a through lane. The mauka-bound approach at this intersection is the Blaisdell Center driveway. It has one through lane and two exclusive right-turn lanes. A two-way cycle-track is located on the mauka side of South King Street. There are crosswalks on all legs of the intersection, and these are controlled by pedestrian signals.

### 2.2.3 McKinley High School Driveways

There are three McKinley High School Driveways on South King Street. Two of them are associated with the main driveway to McKinley High School and consist of a one-way entrance and a one-way exit located approximately halfway between Victoria Street and Pensacola Street.

Figure 3 McKinley HS Main Driveway - Entrance

Figure 4  McKinley HS Main Driveway Exit

A third driveway is used only for special events.  At other times it is gated.  It can provide supplemental entrance or exit for the McKinley High School campus.

Figure 5 Special Event Driveway-S. King St.

There is a major driveway on Pensacola Street approximately 700 feet mauka of Kapiʻolani Boulevard. Because Pensacola Street is a one-way street, this is a right-in/right-out driveway. This driveway provides the most direct access to the McKinley High School athletic facilities and parking areas.

Figure 6 McKinley HS Driveway on Pensacola St

There are four other driveways on Pensacola Street. Two of them are located between South King Street and the major Pensacola Driveway. These driveways serve only the DOE Maintenance Facility and have minimal traffic associated with them. The third driveway is located makai of the major Pensacola Driveway and is a supplemental driveway to the Community School for Adults parking lot. This driveway is often gated. The fourth driveway provides access to the football and track field. It is usually gated and not used for general traffic.

Another special event driveway is located on Kapiʻolani Boulevard near the Blaisdell Center driveway. Like the other special event driveway, it is gated except when in use and provides supplemental entrance or exit for the McKinley High School campus.

## 2.3 Pedestrian and Bicycle Conditions

### 2.3.1 Pedestrian Facilities

South King Street, Pensacola Street, Kapiʻolani Boulevard, and Ward Avenue all have sidewalks on both sides of the roadways.

There are crosswalks at the major signalized intersections. There is also a signalized crosswalk located on South King Street at the McKinley High School main driveway entrance.

### 2.3.2 Bicycle Facilities

As previously described, there are buffered two-way cycle tracks on South King Street and on Pensacola Street. Bicycles on Kapiʻolani Boulevard and Ward Avenue share the road with vehicles.

## 2.4 Public Transit Conditions

The City and County of Honolulu Department of Transportation Services (DTS) provides municipal bus service called TheBus, operated by Oahu Transit Service (OTS).

There are multiple bus routes on South King Street and on Kapiʻolani Boulevard. Route 15 provides service along Ward Avenue and Routes 17 and 18 provide service on Pensacola Street.

Transit service to McKinley High School is frequent and the span of service is form early morning to late evening.

There are two bus stops along South King Street that provide proximate access to McKinley High School: one adjacent to the Blaisdell Concert Hall and the other at the ʻEwa-makai corner of the South King Street/Pensacola Street intersection. There are bus stops on Kapiʻolani Boulevard at Kamakeʻe Street that provide convenient access to McKinley High School. Bus stops of Ward Avenue are located at South King Street and near Kapiʻolani Boulevard. There are two bus stops on Pensacola Street adjacent to McKinley High School in the vicinity of Elm Street and near the Pensacola driveway to.

## 2.5 Transportation Conditions

Intersection turning movement volumes for the base traffic condition were obtained from two previously conducted traffic studies: Complete Street Mobility Assessment Study conducted by Fehr & Peers dated December 19, 2017 and the TIAR for the Neal S. Blaisdell Center Redevelopment Project conducted by AECOM dated September 2018.

Figure 7 illustrates the base condition peak hour turning movement volumes.

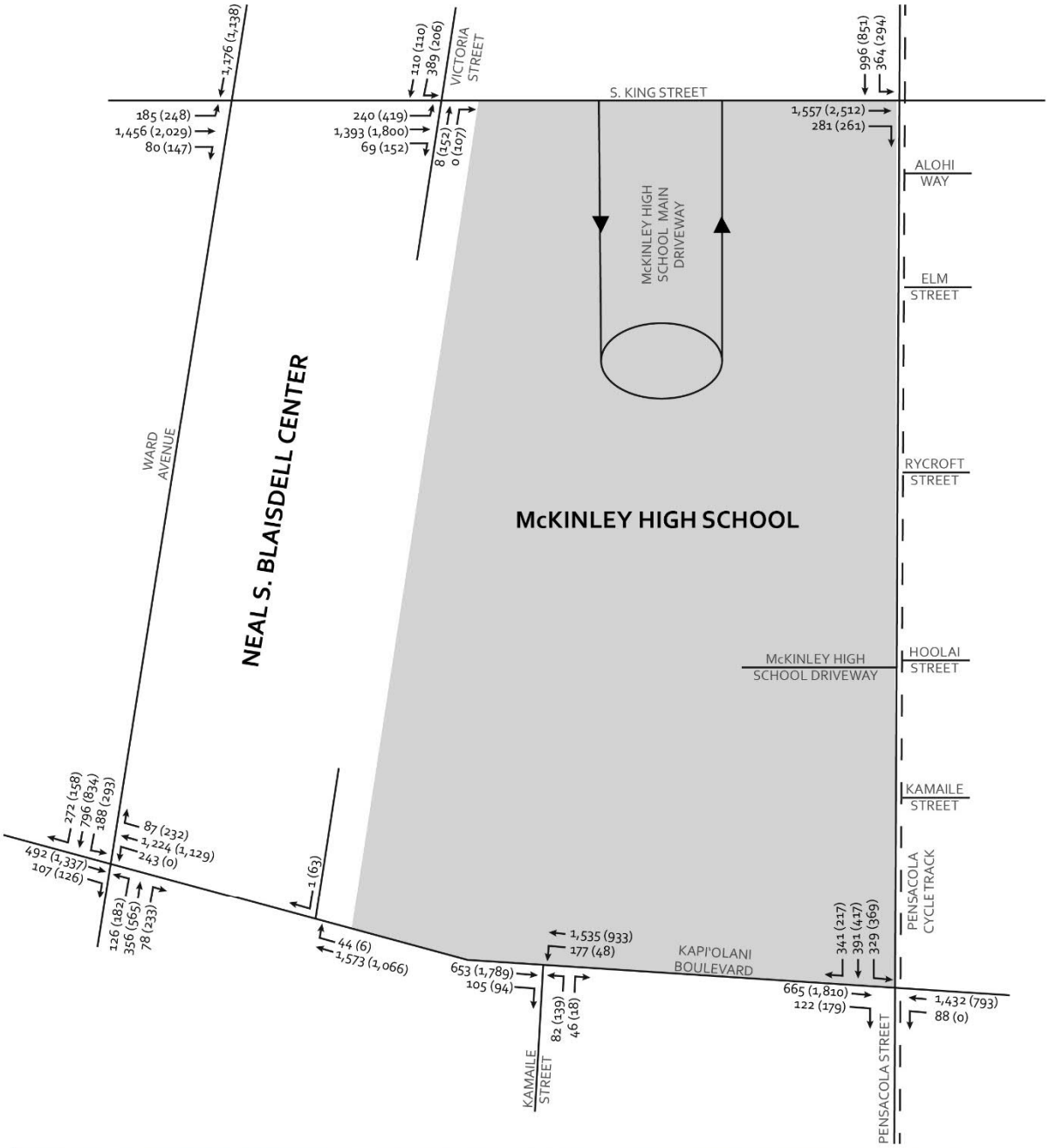


Figure 7 Existing Year 2017 Peak Hour Traffic Volumes

### 2.5.1 Existing Intersection Operations

Previous analyses for the major intersections adjacent to McKinley High School described in Section 2.2.2 are summarized in Table 1 for the AM and PM commuter

Definitions of LOS are included in Appendix B.

The intersections were analyzed using the signalized intersection capacity method described in the 2016 Highway Capacity Manual (HCM) through the Synchro/Sim Traffic software.

Table 1 Base Condition Intersection Operations

| Intersection | AM Peak Hour | | PM Peak Hour | |
|---|---|---|---|---|
| | Delay (sec/veh) | LOS | Delay (sec/veh) | LOS |
| South King St/Pensacola St | 66.2 | E | 56.9 | E |
| Kapiʻolani Blvd/Pensacola St | 23.9 | C | 21.9 | C |
| Kapiʻolani Blvd/Kamakeʻe St | 10.8 | B | 11.3 | B |
| Kapiʻolani Blvd/Ward Ave | 40.2 | D | 36.7 | D |
| South King St/Ward Ave | 20.5 | C | 28.2 | C |
| South King St/Victoria St | 21.4 | C | 13.5 | B |

Notes: Analyses conducted as part of the following previous studies:
Complete Streets Mobility Assessment Study,
Fehr & Peers, December 2017

Neal S. Blaisdell Center Redevelopment TIAR
AECOM, September 2018

sec/veh = seconds per vehicle, LOS = Level of Service

As shown in Table 1 the South King Street/Pensacola Street and the Kapiʻolani Boulevard/Ward Avenue intersections experience the most vehicular delay. Although the South King Street/Ward Avenue intersection evaluations indicate average delay, this intersection can experience constraint due to congestion at downstream intersections during the PM peak hour.

The other intersections operate with low to average delay.

# 3.0 FUTURE CONDITIONS

## 3.1 Proposed Development

McKinley High School is planning improvements to its athletic complex. Included in this improvement is the addition of stadium seating to the existing football/track field and the provision of new locker rooms.

These improvements are not anticipated to change the normal, daily operation of the McKinley High School athletic facilities. Therefore, normal traffic operations during both off peak and peak hour are expected to remain mostly unchanged from the current situation.

The potential transportation impacts attributable to the proposed McKinley High School Athletic Complex improvements would be caused by the additional of stadium seating for the existing football/track field. McKinley High School already accommodates major athletic events on its campus and the proposed athletic complex improvements will allow it to better serve these events. The major expected difference in operation would be the potential for larger attendance at football or track events due to the addition of the stadium seating.

The transportation evaluation addresses two aspects of the potentially increased attendance:

- increased travel demand;
- increased parking demand.

The following section of this report will address each aspect.

## 3.2 Increased Travel Demand

Traditional transportation impact analyses focus on weekday AM and PM commuter peak periods. These are usually the time periods during which transportation resources are most constrained. Additional transportation demands created by a proposed action would usually have the most impact during these time periods.

Travel demand generated by the McKinley High School Athletic Facilities improvements would not align with this type of evaluation. Athletic events typically do not occur during the weekday AM commuter peak period and would have very little impact on transportation resources during this time period. Athletic events typically occur during the afternoon after school is over and during the weekends. During the weekends, transportation resources are usually not as constrained as during the weekday peak periods. Therefore, the transportation impacts are evaluated for the PM commuter peak period, where there is the most potential to affect transportation resources.

### 3.2.1 Travel Demand Increases Due to Athletic Complex Improvements

As previously stated, McKinley High School already accommodates major athletic events on its campus.

Table 2 McKinley HS Historic Paid Attendance

| Event | Date | Paid Attendance |
|---|---|---|
| Boys' Baseball Finals | 2/7/18 | 694 |
| Girls' Softball Finals | 4/28/18 | 579 |
| Girls' Volleyball Playoffs | 10/18/17 | 686 |
| Girls' Basketball Finals | 1/24/18 | 752 |
| Boys' Basketball Finals | 2/12/20 | 667 |
| Judo-Eastern Conference Tournament | 4/20/19 | 242 |

Notes:

Add approximately 100 more to attendance to account for students, adults, and VIPs who are not counted in these totals.

Source: McKinley High School

According to McKinley High School staff, there are instances when athletic events occur simultaneously. However, it is unlikely that events such as Finals or Playoffs would occur simultaneously.

The proposed Athletic Complex improvements propose to add bleacher seating to the existing football/track field. There will be the main north bleachers with 2,860 seating and south bleachers with 584 seating for a total of 3,444 seats. A fully sold out event at the football/track field with the proposed seating could generate a person travel demand that equals this seating capacity.

This person travel demand is assumed to be distributed among the following modes based on anecdotal observations at shown in Table 3.

Table 3 Modal Distribution of Person Trips

| Mode | Percent | Trips |
|---|---|---|
| Vehicles | 88 | 3,014 |
| Transit | 5 | 175 |
| Bicycle | 1 | 40 |
| Pedestrian (External) | 1 | 40 |
| Pedestrian (Already on Campus) | 5 | 175 |
| Total | 100 | 3,444 |

The vehicle-person trips were converted to vehicle trips for purposes of intersection operational analysis. It was assumed that the average vehicle occupancy for a special event involving full attendance at the football/track field would be 2.66 persons per vehicle based on an average value from the Federal Highways Administration (FHWA) publication, Managing Travel for Planned Special Events. The total vehicle trips would then be 1,295 vehicles per event.

McKinley High School already hosts major athletic events at the baseball field, softball field, and gym. Based on the data shown in Table 2 of this report, an average major event paid attendance is approximately 675. To this add 100 for the unpaid attendance and average attendance at a major event is 775. Applying the same modal distribution and vehicle occupancy assumptions to this attendance as done with the estimated football/track field attendance results in the trips shown in Table 4. This provides a frame of reference on the increased travel demand generated by a major athletic event involving the football/track field.

Table 4 Potential Additional Event Trips

| Mode | Proposed Football/Track Field Bleachers | Historic Major Event | Additional Trips due to Increased Football/Track Field Seating |
|---|---|---|---|
| Vehicles (vehicle trips) | 1,295 | 254 | 1,041 |
| Transit | 175 | 34 | 141 |
| Bike | 40 | 7 | 33 |
| Pedestrian (External) | 40 | 7 | 33 |
| Pedestrian (Already on Campus) | 175 | 34 | 141 |

Note: Vehicle mode is in vehicle trips per event. All other modes are person trips per event.

Based on patterns summarized in Managing Travel for Planned Special Events, it was estimated that 80 percent of the trips shown in Table 4 would arrive in the hour before the start of the event. Table 5 summarizes the share of the total travel demand that could potentially arrive during the hour before the start of the event.

Table 5 Additional Peak Hour Trips

| Mode | Additional Trips due to Increased Football/Track Field Seating per Event | Additional Trips due to Increased Football/Track Field Seating per Peak Hour |
|---|---|---|
| Vehicles (vehicle trips) | 1,041 | 833 |
| Transit | 141 | 113 |
| Bike | 33 | 26 |
| Pedestrian (External) | 33 | 26 |
| Pedestrian (Already on Campus) | 411 | 113 |
| Note: Vehicle mode is in vehicle trips per event. All other modes are person trips per event. | | |

The worst-case scenario would be for the start of the major athletic event to occur at the end of the PM commuter peak hour. For evaluation of the transportation impacts, this was assumed along and the entire estimated transportation demand for a major event summarized in the highlighted column.

### 3.2.2 Effect of Additional Vehicular Trips on Public Transit

The effect of the additional transit trips on the public transit is judged to be minor.

Currently, South King Street and Kapiʻolani Boulevard are serviced by multiple bus routes with substantial service during the peak periods. South King Street is served by trunk Routes 1, 1L, 2, and 2L, while Kapiʻolani Boulevard is services by Routes 3, 9, 13, 40, 52, 53, 62, CityExpress A, and CountryExpress C. Additionally, Ward Avenue is serviced by Route 15 and Pensacola street is serviced by Routes 17 and 18. This is more than enough transit service to accommodate the estimated transit demand.

### 3.2.3 Effect of Additional Vehicular Trips on Intersection Operations

Currently, most traffic would access the McKinley High School Athletic Facility through the Pensacola Street driveway. This would tend to concentrate traffic inbound to the McKinley High School Athletic Facility through the South King Street/Pensacola Street intersection. This is because Pensacola Street is one-way makai-bound. Given turn restrictions, and the one-way couplets operating in the vicinity of McKinley High School,

traffic entering the Pensacola Street driveway would end up proceeding makai-bound on Pensacola Street through the South King Street/Pensacola Street intersection or turning right from Koko Head-bound South King Street to makai-bound Pensacola Street.

To intercept vehicular traffic and lessen the impact on the South King Street/Pensacola Street intersection, it is recommended that during major athletic events involving the football/track bleacher seating, the supplemental driveways on South King Street and on Kapiʻolani Boulevard be opened to entry into the McKinley High School campus. The opening of the driveways should be coupled with dissemination of information to attendees how to maximize usage to the supplemental driveways.

With these measures in place, the adjacent intersections were evaluated using the signalized Highway Capacity Manual method as implemented by the Synchro 10 analysis software. Synchro 10 uses the 2016 HCM algorithms. The Synchro analysis worksheets for this study can be found in Appendix C.

Table 6 compares PM peak hour intersection operations without and with a major athletic event. This condition is expected to occur infrequently, typically toward the end of the high school football season.

Table 6 Event Peak Hour Intersection Operations

| Intersection | No Event | | Major Event | |
|---|---|---|---|---|
| | Delay (sec/veh) | LOS | Delay (sec/veh) | LOS |
| South King St/Pensacola St | 27.3 | C | 28.3 | C |
| Kapiʻolani Blvd/Pensacola St | 23.0 | C | 23.7 | C |
| Kapiʻolani Blvd/Kamakeʻe St | 0.4 | A | 0.5 | A |
| Kapiʻolani Blvd/Ward Ave | 46.7 | D | 46.7 | D |
| South King St/Ward Ave | 23.3 | C | 23.7 | C |
| South King St/Victoria St | 20.1 | C | 21.6 | C |

Notes: Results assume that supplemental McKinley HS driveways are used.

Major Events expected to occur infrequently, typically toward the end of the high school football season.

sec/veh = seconds per vehicle, LOS = Level of Service

As shown in Table 6, the addition of major athletic event traffic at these intersections results in only minor increases in vehicle delay.

# 4.0 PARKING MANAGEMENT PLAN

The potential for increased parking demand translates into the need to accommodate this parking demand. Substantial on-street parking is generally unavailable during the PM peak hour time period when it is expected that most of the parking would be needed. Additionally, it would be undesirable to utilize on-street parking within residential areas, especially in areas located Koko Head of Pensacola Street.

Therefore, it is a goal to accommodate the increased parking demand within off-street parking, and preferably as much of it on the McKinley High School Campus as feasible. This parking management plan identifies areas within the McKinley High School Campus that may be used for event parking that fully utilizes the proposed bleacher seating for the football/track field.

It was estimated in section 3.1 of this report that an athletic event at the football/track field that occupied all the available bleacher seating would generate approximately 1,295 vehicles.

The existing main parking lot on the McKinley High School campus has 157 marked stalls. There is an additional 26 marked stall adjacent to the cafeteria. This provides a total of 183 marked stalls. Figure 8 and Figure 9 are photos of the main parking lot. Utilizing the main parking lot and cafeteria spaces leaves 1,112 vehicles to be parked on campus.

There other location on campus with marked parking stalls and areas that are suitable for overflow parking. Figure 10 illustrates the location and number of parking that could be accommodated within these areas. The overflow parking areas include marked parking at the McKinley Community School for Adults facility and the softball field. It also includes non-paved areas on campus adjacent to the Neal Blaisdell Center and other non-paved areas. Figures 11 through 14 are photographs of some of these areas. Totaling the number of indicated spaces yields 1,117 overflow parking spaces. This in addition to the 183 marked parking stalls in the main parking and cafeteria areas, provides more than enough spaces to accommodate a fully attended athletic event that fills the proposed football/track field bleachers.

Figure 8 MHS Main Parking Lot - Ewa-side

Figure 9 MHS Main Parking Lot-KKHD-side

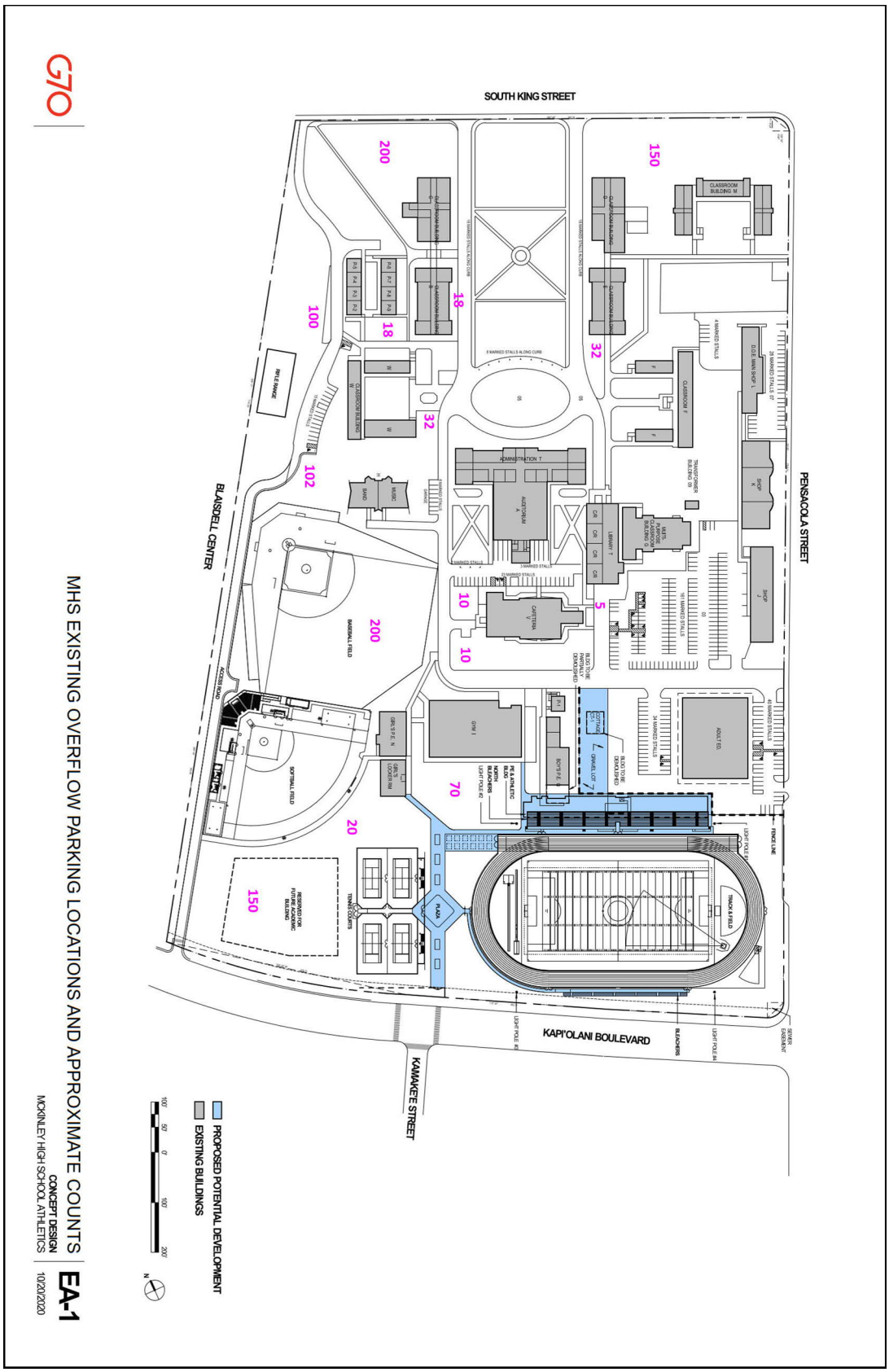


Figure 10 MHS Overflow Parking Locations

Figure 11 Overflow Parking-Community School for Adults-KKHD-side

Figure 12 Overflow Parking-Community School for Adults-Ewa-side

Figure 13 Overflow Parking Adjacent to Blaisdell Center

Figure 14 Overflow Parking Adjacent to Blaisdell Center-S. King Street End

Table 7 summarizes the parking available for major athletic events compared to the estimated vehicular demand for parking.
Based on this evaluation, it is determined that a major athletic event that completely fills the proposed football/track field bleacher seats could be accommodated entirely on the McKinley High School campus. The Neal Blaisdell Center parking could also be used as a backup if it is not having an event.

Table 7 Total Available Parking for Athletic Events

| Parking Area | Number of Parking Stalls |
|---|---|
| Main Parking Lot and Cafeteria Area Marked Parking Stalls | 183 |
| Overflow Marked and Unmarked Parking Areas | 1,117 |
| Total Parking Available on Campus for Major Athletic Event at Football/Track Field | 1,300 |
| Total Projected Vehicular Parking Demand Estimated for Major Athletic Event at Football/Track Field | 1,295 |

# 5.0 SUMMARY AND RECOMMENDATION

## 5.1 Summary

Proposed improvements to the existing McKinley High School Athletic Complex have the potential to increase travel and parking demand for major athletic events.

The McKinley High School Athletic facilities already accommodate major athletic events. According to staff familiar with these events, both traffic operations and parking are accommodated satisfactorily. The average attendance for these historic major events averages 775 attendees.

A major component of the proposed Athletic Complex improvements are bleachers for the existing football/track field. The total amount of seating proposed is 3,444 seats. A fully attended athletic event with this seating capacity could potentially generate appreciably more travel and parking demand for the event than is now experienced on site.

This transportation impact assessment report and parking management plan evaluated the PM peak hour intersection operational impacts of this increased demand and verified that increased parking demand could be accommodated on the McKinley High School campus.

It determined that with appropriate use of the supplemental driveways to distribute major athletic event traffic to the surrounding roadways, PM peak hour traffic impacts would be minor. It also found that this would be an infrequent event, occurring primarily during the end of the football season. Impacts would be primarily caused by increased traffic flowing through major intersections in the vicinity of McKinley High School prior to the event. Traffic leaving the event would do so during the off-peak time period and is estimated to have even less impact than traffic arriving during the PM peak hour.

The parking management plan verified that there is sufficient overflow parking areas on the McKinley High School campus to accommodate the estimated parking demand potentially-generated by a major athletic event that fills all the football/track field bleacher seats, thereby containing the parking impacts within the McKinley High School campus.

## 5.2 Recommendations

The following recommendations pertain to minimizing the impacts of major athletic events at the football/track field.

<u>Minimizing Traffic Impacts</u>

- To minimize the impacts of additional event traffic at intersections in the vicinity of McKinley High School, it is recommended to utilize the supplemental driveways to reduce the amount of traffic passing through the South King Street/Pensacola Street intersection. This can be accomplished by opening the supplemental driveway on

South King Street located near the Blaisdell Driveway/Victoria Street intersection. Allowing vehicle to access McKinley through this driveway provide Koko Head-bound vehicles on South King Street direct access to parking areas on the McKinley High School campus. Likewise, allowing ‘Ewa-bound vehicles on Kapi‘olani Boulevard use the supplemental driveway located near the Blaisdell Driveway on Kapi‘olani Boulevard also allows more direct access into the McKinley High School campus.

- For large athletic events that are expected to fill the bleachers at the football/track field, provide traffic control staff at the supplemental and Pensacola Street driveways to expedite traffic entering the McKinley High School campus. This would reduce vehicle queuing and impact to traffic on South King Street, Pensacola Street, and Kapi‘olani Boulevard.
- Disseminate information prior to a major athletic event that directs attendees to the appropriate entrance driveway for the various approaches to the McKinley High School campus.

<u>Increasing Parking Efficiency</u>:

- Provide enough staff to direct vehicles to the appropriate parking area.
- Monitor the parking areas and coordinate re-directing vehicles to the next parking area when initial areas are full.
- Provide pedestrian paths (through coning or other guidance devices) for attendees who have parked their vehicle and are walking to the event. This would reduce conflicts with vehicle entering the parking areas, increasing safety and efficiency.

# 5.0 REFERENCES

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United States Department of Transportation Federal Highway Administration. 2019. *Managing Travel for Planned Special Events*. Washington DC: Federal Highway Administration.

# Appendix A

**Previous Transportation Studies**

# Neal S. Blaisdell Center

## Transportation Impact Assessment Report

City and County of Honolulu
Department of Design and Construction

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September 2018

Project Reference: 60570680

AECOM

CITY AND COUNTY OF HONOLULU
STATE OF HAWAII

# Neal S. Blaisdell Center

## Transportation Impact Assessment Report

September 2018

Prepared for:

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# Acronyms and Abbreviations

| | |
|---|---|
| % | percent |
| Biki | Bikeshare Hawai'i |
| City | City and County of Honolulu |
| EA | Environmental Assessment |
| HART | Honolulu Authority for Rapid Transportation |
| HDOT | Hawai'i Department of Transportation |
| HRT | Honolulu Rail Transit |
| LOS | level of service |
| mph | miles per hour |
| NBC | Neal S. Blaisdell Center |
| sec/veh | seconds per vehicle |
| TIAR | Transportation Impact Assessment Report |
| VMS | variable message signs |
| vph | vehicles per hour |

# 1. Introduction

The Neal S. Blaisdell Center (NBC) was originally constructed by the City and County of Honolulu (the City) in 1964 as a major entertainment venue on a 22-acre site. The NBC has three major facilities: Concert Hall, Exhibition Hall, and Arena. Originally named the Honolulu International Center, it was later renamed the Neal S. Blaisdell Center in honor of Mayor Neal Blaisdell. In 1994, the NBC underwent renovations and expansions that added meeting rooms, a new box office, trade/warehouse buildings, and a parking garage. Figure 1 illustrates the NBC site location.

NBC is located near Downtown Honolulu and is surrounded by existing development. On the mauka side of the NBC are Thomas Square, the Honolulu Museum of Arts, and the Straub Clinic & Hospital. The area makai of NBC includes a mix of high-rise condominiums, shops, restaurants, and commercial businesses. This area includes the rapidly developing Villages of Victoria Ward and the future Honolulu Rail Transit station. The ʻEwa side along Ward Avenue is occupied by residential condominiums, an athletic club, Hawaiian Electric Company, and a luxury car and motorcycle dealership. On the Koko Head side of the NBC is McKinley High School.

The City is proposing a major renovation to the NBC. This renovation will update the facilities and enhance the site to provide more open space and other amenities to the community.

From a transportation perspective, the peak uses on the site will remain the same. The Concert Hall, Exhibition Hall, and Arena will continue to be the primary event venues. Additionally, a Sports Pavilion, a Performance Hall, an Arts Ensemble (Hula Hālau/community hall), and food and beverage are proposed to be added to the site. These added uses are expected to stimulate more consistent activity on the site, but are not expected to significantly increase the peak travel demand.

The existing parking garage is proposed to be replaced with a new garage with approximately 50 percent (%) more parking spaces. The larger amount of on-site parking is expected to increase the future traffic volumes generated for events. While increased parking on-site is assumed to increase the traffic volumes accessing NBC during events, proposed improvements are expected to reduce event congestion at the NBC access points, thereby benefitting the surrounding roadway system.

This Transportation Impact Assessment Report (TIAR) was conducted in support of the EA prepared for the NBC Master Plan. It documents the data collected and the analyses conducted and summarizes transportation issues identified and measures recommended to address transportation issues.

**Existing NBC Site**

**Figure 1: Existing NBC Site**

# 2. Existing Conditions

## 2.1 Site Description

The NBC Arena is a multi-purpose facility with a varying capacity depending on the stage set-up for the event. The Arena is a circular facility with a 190-foot diameter and unobstructed sight lines, which allows hosting of concerts, sporting events, large meetings, conventions, consumer and family shows, graduations, and other specialty events. The Arena has a capacity of 8,800 people for stage shows with seating in the round and 7,700 people for court-side events.

The NBC Exhibition Hall is a large indoor facility that provides 65,000 square feet of exhibition space, which can be expanded to 85,000 square feet when used in conjunction with the adjoining spaces. The Exhibition Hall is a popular venue in Honolulu, averaging 45 shows per year that include community trade shows, consumer trade shows, large parties, and fundraising events. There are three different public entrances to the venue as well as an exhibitor entrance and a large sliding truck door. The Exhibition Hall also hosts several meeting rooms and the Pikake Room within the facility.

The NBC Concert Hall is a performing arts theater that is home to the Hawai'i Symphony Orchestra and the Hawai'i Opera Theatre. The Concert Hall has a capacity of 2,158 people and hosts many different Broadway and local productions. The features of the Concert Hall include continental seating, a proscenium stage, modern acoustic and lighting systems, a large loading entrance, and grand lawns. Every Wednesday from 4 P.M. to 7 P.M., the Honolulu Farmer's Market is held on the lawns of the Concert Hall.

The parking at the NBC is comprised of at-grade surface and garage parking. There are 1,508 parking stalls on-site at the NBC. In addition to parking for events, weekday day-time parking is offered to employees of the City and surrounding businesses. Weekend parking is reserved for event attendees only. There is also a service parking lot located between the Concert Hall and Exhibition Hall that is used as a loading zone and performer and vendor parking. During events, Elite Parking, the company that manages parking at the NBC, operates valet parking, where currently approximately 120 to 140 vehicles utilize this service. Overflow parking is absorbed within the surrounding areas for large events.

## 2.2 Roadway Conditions

South King Street, Ward Avenue, and Kapi'olani Boulevard are roadways adjacent to the NBC. Victoria Street intersects with South King Street at the main access driveway into the NBC. Kamake ' e Street intersects Kapi'olani Boulevard Koko Head of the NBC and provides connects the Victoria Ward development area to the Kapi'olani Boulevard corridor.

The primary access driveway to NBC is located at the South King Street/Victoria Street intersection with a secondary access driveway located on Kapi ' olani Boulevard. Access to the Box Office, drop-off lane, and vendor and performer parking is provided from Ward Avenue.

### 2.2.1 Roadways

South King Street is an ' Ewa-Koko Head major arterial roadway in Honolulu. South King Street is a one-way street, with traffic flowing in the Koko Head direction. South King Street includes five traffic lanes and the King Street Cycle Track, which is a protected, two-way bicycle facility. In the vicinity of the NBC, South King Street has two signalized intersections, one at Victoria Street and the other at Ward Avenue. On-street parallel parking is allowed on the mauka side of the street, adjacent to the Cycle Track. The 1-hour parking is metered, and the meters are active between 7:00 A.M. and 3:30 P.M. on weekdays and between 7:00 A.M. and 6:00 P.M. on Saturdays. Parking is free on Sundays and designated holidays. Peak hour restrictions are in effect for on-street parking in this area with a tow-away zone enforced between 3:30 P.M. and 6:30 P.M. on weekdays. The roadway is under the City's jurisdiction. The posted speed limit in the vicinity of the NBC is 25 miles per hour (mph).

Kapi ʻ olani Boulevard is also a major arterial roadway. Kapi ʻ olani Boulevard is an undivided, ʻ Ewa-Koko Head roadway, with three lanes in each direction. During the A.M. and P.M. peak commuter periods, a contraflow lane is implemented in the peak traffic direction: ʻEwa-bound in the A.M. and Koko Head-bound in the P.M. When the contraflow lane is in operation, left turns in the off-peak direction are not allowed. In the vicinity of the NBC, there are signalized intersections at Ward Avenue and Kamake ʻ e Street. The unsignalized NBC access driveway is located between Ward Avenue and Kamakeʻe Street. Generally, Kapi ʻ olani Boulevard on-street parking is prohibited from 6:00 A.M. to 6:30 P.M., except on Sundays. The curb area adjacent to the NBC has a slightly different parking restriction, with the area designated a tow-away zone between 6:00 A.M. and 12:00 midnight. Kapi ʻ olani Boulevard is under the City's jurisdiction. The posted speed limit is 25 mph.

Ward Avenue is a roadway that provides mauka-makai circulation between the Punchbowl area and Ala Moana Boulevard. The roadway has two lanes in each direction with designated turn lanes at most intersections. There are two signalized intersections at South King Street and Kapi ʻ olani Boulevard along Ward Avenue in the vicinity of the NBC. The intersections are both signalized. Between South King Street and Kapi ʻ olani Boulevard, on-street parallel parking is allowed at selected locations. On the Diamond Head side of Ward Avenue, on-street parking is allowed in front of the Exhibition Hall and ends just before the South King Street and Ward Avenue intersection. On the ʻ Ewa side of the street, there are a few on-street parking stalls in front of the condominium on Ward Avenue. The parking stalls allow 2-hour parking from 9:00 A.M. to 3:30 P.M. on weekdays and from 7:00 A.M. to 6:00 P.M. on Saturdays. The parking areas become tow-away zones from 6:30 A.M. to 9:00 A.M. and from 3:30 P.M. to 5:30 P.M. on weekdays. Ward Avenue is under the City's jurisdiction. The posted speed limit is 25 mph.

Kamake ʻ e Street is a mauka-makai road that provides access and circulation in the Victoria-Ward area between Kapi ʻ olani Boulevard and Ala Moana Boulevard. Kamake ʻ e Street is an undivided roadway with two lanes of travel in each direction. Kamake ʻ e Street intersects Kapi ʻ olani Boulevard at a signalized intersection. At selected locations, 2-hour parking is allowed between 8:30 A.M. and 3:30 P.M. on Monday through Friday and between 7:00 A.M. and 6:00 P.M. on Saturday. These areas are tow-away zones from 6:30 A.M. to 8:30 A.M. and from 3:30 P.M. to 5:30 P.M. on weekdays. The City has shared ownership with the Hawaiʻi Community Development Authority over Kamake ʻ e Street. The posted speed limit on Kamake ʻ e Street is 25 mph.

Victoria Street is a mauka-makai roadway. The segment in the vicinity of the NBC begins just makai of the H-1 Freeway and terminates at South King Street opposite the main entrance of NBC. Victoria Street is an undivided roadway with two lanes of travel in each direction. In the vicinity of NBC, Victoria Street is signalized at its intersections with South King Street and South Beretania Street. On-street parking is allowed on both sides of the street, and when present, reduces Victoria Street to a two-lane roadway with one lane in each direction. On the ʻ Ewa-side of the street, metered 2-hour parking is allowed from 8:30 A.M. to 6:00 P.M. on weekdays and from 7:00 A.M. to 6:00 P.M. on Saturdays. On the Koko Head-side, metered 2-hour parking is allowed from 7:00 A.M. to 6:00 P.M. Monday through Saturday. In front of the Honolulu Museum of Art School, metered 2-hour parking is allowed on weekdays from 7:00 A.M. to 3:30 P.M. and on Saturdays from 7:00 A.M. to 6:00 P.M. On-street parking in this area has a tow-away zone restriction between the hours of 3:30 P.M. and 5:30 P.M. on weekdays. Outside of these time periods, parking is free with no duration limits. The street is under the jurisdiction of the City. The posted speed limit is 25 mph.

Pensacola Street is a major roadway providing mauka-makai circulation in conjunction with Piʻikoi Street where the two streets form a one-way couplet system. The traffic on Pensacola Street is makai bound. Between Lunalilo Street and Kapi ʻ olani Boulevard, the number of lanes varies but generally four lanes of travel are provided. This street is located Koko Head of the NBC, adjacent to McKinley High School. On-street parking is allowed on both sides of the street. Pensacola Street is under the City's jurisdiction. The posted speed limit is 30 mph.

### 2.2.2 Intersections

The following intersections were evaluated:

- South King Street and Victoria Street, which includes the main entrance to the NBC
- South King Street and Ward Avenue
- Kapi ʻ olani Boulevard and Ward Avenue

- Kapi ʻ olani Boulevard Blaisdell driveway
- Kapi ʻ olani Boulevard and Kamake ʻ e Street

At the signalized South King Street and Victoria Street intersection, the South King Street approach has three through lanes, one shared through/left-turn lane, and one shared through/right-turn lane. When turning right into the NBC, vehicles enter a channelized driveway that begins before the intersection. The approach on Victoria Street has an exclusive left-turn lane and a shared through/left-turn lane. The NBC driveway approach includes a right-turn lane and a through lane plus a channelized right-turn lane.

At the signalized South King Street and Ward Avenue intersection, the South King Street approach has three through lanes, one shared through/right-turn lane, and a shared through/left-turn lane. On the mauka-bound Ward Avenue approach, there are two through lanes and one exclusive right-turn lane. The makai-bound Ward Avenue approach has two through lanes. Left turns are prohibited from Ward Avenue to South King Street on this approach.

At the signalized Kapi ʻ olani Boulevard and Ward Avenue intersection, the Koko Head-bound Kapi ʻ olani Boulevard approach has three lanes. Two are through traffic lanes and the third lane is a shared through/right-turn lane. Left turns are prohibited from Kapiʻolani Boulevard to Ward Avenue on this approach. In the ʻ Ewa-bound direction, the approach includes an exclusive left-turn lane, a through lane, and a shared through/right-turn lane. Both mauka- and makai-bound Ward Avenue approaches include an exclusive left-turn lane, an exclusive right-turn lane, and two through lanes.

The unsignalized NBC driveway on Kapi ʻ olani Boulevard allows right turns into and out of the driveway for ʻ Ewa-bound traffic. Left-turn traffic movements are not allowed into or out of this driveway.

The signalized Kapi ʻ olani Boulevard and Kamake ʻ e Street intersection is a three-legged "T"-intersection. In the Koko Head-bound direction, the Kapi ʻ olani Boulevard approach includes two through lanes and one shared through/right-turn lane. For the ʻ Ewa-bound approach, there are two through lanes and one shared through/left-turn lane. The Kamake ʻ e Street approach has one lane for left turns and one lane for right turns.

## 2.3 Pedestrian & Bicycle Conditions

### 2.3.1 Pedestrian Facilities

Roadways in the vicinity of the NBC have sidewalks on both sides of the street. Crosswalks exist at all intersections evaluated in this TIAR. Crosswalks also exist across the NBC entrances and exits, except for the Kapi ʻ olani Boulevard driveway. There are also two mid-block, unsignalized crosswalks on Ward Avenue between Kapiʻolani Boulevard and South King Street.

During heavy pedestrian events, pedestrians traveling along the sidewalk located makai of South King Street and vehicles on South King Street turning into NBC at Victoria Street often come into conflict. Part of this issue is caused by the channelized right-turn lane into the NBC formed by a "pork chop" island. This channelized right-turn lane is accessed via a driveway as opposed to a curb cut like the rest of the NBC driveway at Victoria Street. Figure 2 is a photograph of this channelized right-turn lane.

### 2.3.2 Bicycle Facilities

The King Street Cycle Track was opened in December 2014 and passes by the NBC on its mauka side. This cycle track is a protected two-way bicycle facility located on the mauka side of South King Street. The King Street Cycle Track follows a ʻ Ewa-Koko Head route between Alapaʻi Street and Isenberg Street.

There are three Bikeshare Hawaiʻi (Biki) stations set up around the NBC: one on the ʻ Ewa side facing Ward Avenue, one on the makai side facing Kapi ʻ olani Boulevard, and one on the mauka side facing South King Street.

**Existing South King Street Channelized Right-Turn Lane into NBC**

**Figure 2: Existing South King Street Channelized Right-Turn Lane**

## 2.4 Public Transit Conditions

There is a robust transit service around the NBC. The bus stops at or near the NBC are served by Routes 1, 1L, 2, 2L, 3, 9, 13, 40, 52, 53, 62, A, C, E, 15, 17, and 18.

Routes 1, 1L, 2, and 2L serve the South King Street/South Beretania Street corridor in the NBC area. Route 1 (Kaimukī – Kalihi) runs from around 4:00 A.M. to 1:00 A.M. (span of 21 hours), Route 1L (School Street – Hawai'i Kai Limited) runs from around 5:30 A.M. to 7:30 P.M., Route 2 (Waikīkī – School – Middle) runs from around 5:00 A.M. to 1:00 A.M. (span of 20 hours), and Route 2L (Waikīkī – School – Middle Limited) runs from about 5:30 A.M. to 8:30 A.M. These routes serve the NBC primarily via the bus stop #135 on the makai side of South King Street directly in front of the Concert Hall.

Routes 3, 9, 13, 40, 52, 53, and 62 serve the Kapi'olani Boulevard corridor and utilize the stops near the Kapi'olani/Ward intersection. These routes serve the NBC primarily via two bus stops located near the Kapi'olani/Ward intersection: Stop #433 on mauka side of Kapi ' olani Boulevard for ' Ewa-bound buses and Stop #598 on the makai side that serves the Koko Head-bound buses. Route 3 (Kaimukī – Salt Lake) runs from approximately 4:00 A.M. to 1:00 A.M. (span of 21 hours), Route 9 (Kaimukī – Pearl Harbor) runs from around 6:00 A.M. to 11:00 P.M. (span of 17 hours), Route 13 (Liliha – Waikīkī – University) runs from about 4:00 A.M. to 12:00 A.M. (span of 20 hours), Route 40 (Honolulu – Mākaha) runs all day (span of 24 hours), Route 52/62 (Honolulu – Mililani – Hale ' iwa/Honolulu – Wahiawā) run from about 5:00 A.M. to 1:00 A.M. (span of 20 hours), and Route 53 (Honolulu – Pacific Palisades) runs from approximately 5:00 A.M. to 11:30 P.M. (span of 18.5 hours).

City Express Route A and Country Express Routes C and E also serve the Kapi'olani Boulevard corridor but utilize stops at the Kapi'olani/Kamake'e intersection located farther from the NBC instead of the Kapi'olani/Ward intersection. Stop #431 on the mauka side serves the ' Ewa-bound buses and Stop #600 on the makai side serves the Koko Head-bound buses. Route A (City Express! Waipahu – University of Hawai'i) runs from around 4:00 A.M. to 10:00 P.M., Route C (Country Express! Mākaha to Honolulu) runs from about 4:00 A.M. to 11:00 P.M. (span of 19 hours), and Route E (Country Express! ' Ewa – Waikīkī) runs from approximately 4:00 A.M. to 11:00 P.M. Service headways vary according to the time of day.

Route 15 provides access to the upper Makiki area and travels on Ward Avenue. There are two bus stops on the ' Ewa side of Ward Avenue (Stop #3909 and Stop #3910) between South King Street and Kapi'olani Boulevard. Route 15 (Makiki – Pacific Heights) runs from around 6:00 A.M. to 10:30 P.M. (span of 16.5 hours).

Routes 17 and 18 also provide access to the Makiki area but service bus stops located farther away from the NBC on Pensacola Street. There are three bus stops on the ' Ewa side of Pensacola Street between South King Street and Kapi'olani Boulevard (Stop #1375, Stop #1376, and Stop #2099). Route 17 (Makiki – Ala Moana) runs from approximately 6:00 A.M. to 10:00 P.M. (span of 16 hours), Route 18/24 (University – Ala Moana/Kapahulu – 'Aina Haina) runs from about 6:00 A.M. to 10:00 P.M.

## 2.5 Traffic Conditions

### 2.5.1 Existing Traffic Volumes

Vehicular traffic turning movement counts were conducted on Sunday, October 15, 2017, and Wednesday, October 18, 2017. The movement counts were conducted at five different locations during each count:

- South King Street and Victoria Street intersection, which is the main entrance to the NBC
- South King Street and Ward Avenue intersection
- Kapi ' olani Boulevard and Ward Avenue intersection
- Kapi ' olani Boulevard and the NBC access point
- Kapi ' olani Boulevard and Kamake ' e Street intersection

Pedestrian counts were conducted at the South King Street/Victoria Street intersection only. The NBC driveway located opposite of Victoria Street functions as the main entrance to the NBC, which is where the greatest amount of vehicular-pedestrian interaction occurred.

The traffic and pedestrian count summary sheets are included in Appendix A.

Elite Parking, the company that manages parking at the NBC, provided its counts for vehicles entering the NBC on Sunday, October 15, 2017, and Wednesday, October 18, 2017. These counts are also included in Appendix A. These counts reflect only vehicles that were allowed to pass the parking kiosk. There were times when the parking facilities were full and vehicles that had turned into the NBC driveway were turned around before entering the kiosk.

#### 2.5.1.1 Weekday Data Collection

**Vehicular Counts**

The A.M. and P.M. peak traffic periods were counted on Wednesday, October 18, 2017. The study periods were 6:30 A.M. to 8:30 A.M. and 4:30 P.M. to 7:00 P.M., with the A.M. peak hour identified to occur between 7:15 A.M. and 8:15 A.M. and the P.M. peak hour identified to occur between 4:45 P.M. and 5:45 P.M. There was a major event at the arena scheduled at 7:00 P.M. Figure 3 summarizes the vehicular counts for the weekday A.M. and P.M. peak hour time periods. Figure 3 summarizes the vehicular counts for the weekday event peak hour time period.

**Pedestrian Counts**

On Wednesday, October 18, 2017, at the South King Street/Victoria Street intersection, the heaviest pedestrian volumes were observed to be those crossing Victoria Street and the entrance to the NBC. During the A.M. peak hour, pedestrian volumes crossing Victoria Street and the entrance are more than double the volume crossing South King Street. The pedestrian volumes were 82 pedestrians per hour in the ʻEwa to Koko Head direction, and 28 pedestrians per hour in the Koko Head to ʻEwa direction. The pedestrian volumes crossing South King Street were 25 pedestrians per hour in the makai to mauka direction, and 22 pedestrians per hour in the mauka to makai direction. The bias toward the Koko Head direction reflects the proximity to the start of school at neighboring McKinley High School. Much of this pedestrian activity originated from those alighting at the bus stop #135 located on South King Street in front of the Concert Hall.

During the P.M. peak hour, the pedestrian volumes crossing Victoria Street and the entrance to the NBC were still found to be larger than the volume crossing South King Street. The pedestrian volumes were 54 pedestrians per hour in the ʻEwa to Koko Head direction, and 41 pedestrians per hour in the Koko Head to ʻEwa direction. Crossing South King Street, the pedestrian volumes were 36 pedestrians per hour in the makai to mauka direction, and 28 pedestrians per hour in the mauka to makai direction.

#### 2.5.1.2 Weekend Event Count

**Vehicular Counts**

Weekend event counts were taken on Sunday, October 15, 2017. All three of the NBC's major facilities had events that were either starting or ending around the time of the data collection. On Sunday, October 15, 2017, the data collection period was from 3:00 P.M. to 6:00 P.M. with the event P.M. peak hour identified to occur between 3:00 P.M. and 4:00 P.M. Figure 5 summarizes the vehicular counts for the weekend event peak hour time period.

**Pedestrian Counts**

On Sunday, October 15, 2017, at the South King Street/Victoria Street intersection, the heaviest pedestrian volumes were those crossing South King Street. The pedestrian volumes were 284 pedestrians per hour in the ʻEwa-side crosswalk, and 29 pedestrians per hour in the Koko Head-side crosswalk in the mauka to makai direction during the event peak hour. The total pedestrian volume crossing South King Street in both crosswalks in the makai to mauka direction was 35 pedestrians per hour. The total pedestrian volumes crossing Victoria Street and the entrance to NBC were 135 pedestrians per hour in the Koko Head to ʻEwa direction, and 28 pedestrians per hour in the ʻEwa to Koko

Head direction. This particular pattern of pedestrian volumes is indicative that the peak count occurred at the time that most events were starting, reflecting an orientation of pedestrian traffic toward NBC. The large magnitude of pedestrian traffic on the weekend event peak hour versus the weekday P.M. peak hour correlates with the event activity at NBC during those time periods. The weekend time period surveyed a condition with all three major venues active, while the weekday time period surveyed a condition with only one of the major venues active. The former condition resulted in a full parking situation, with attendees using alternative parking areas off-site, hence leading to greater pedestrian traffic.

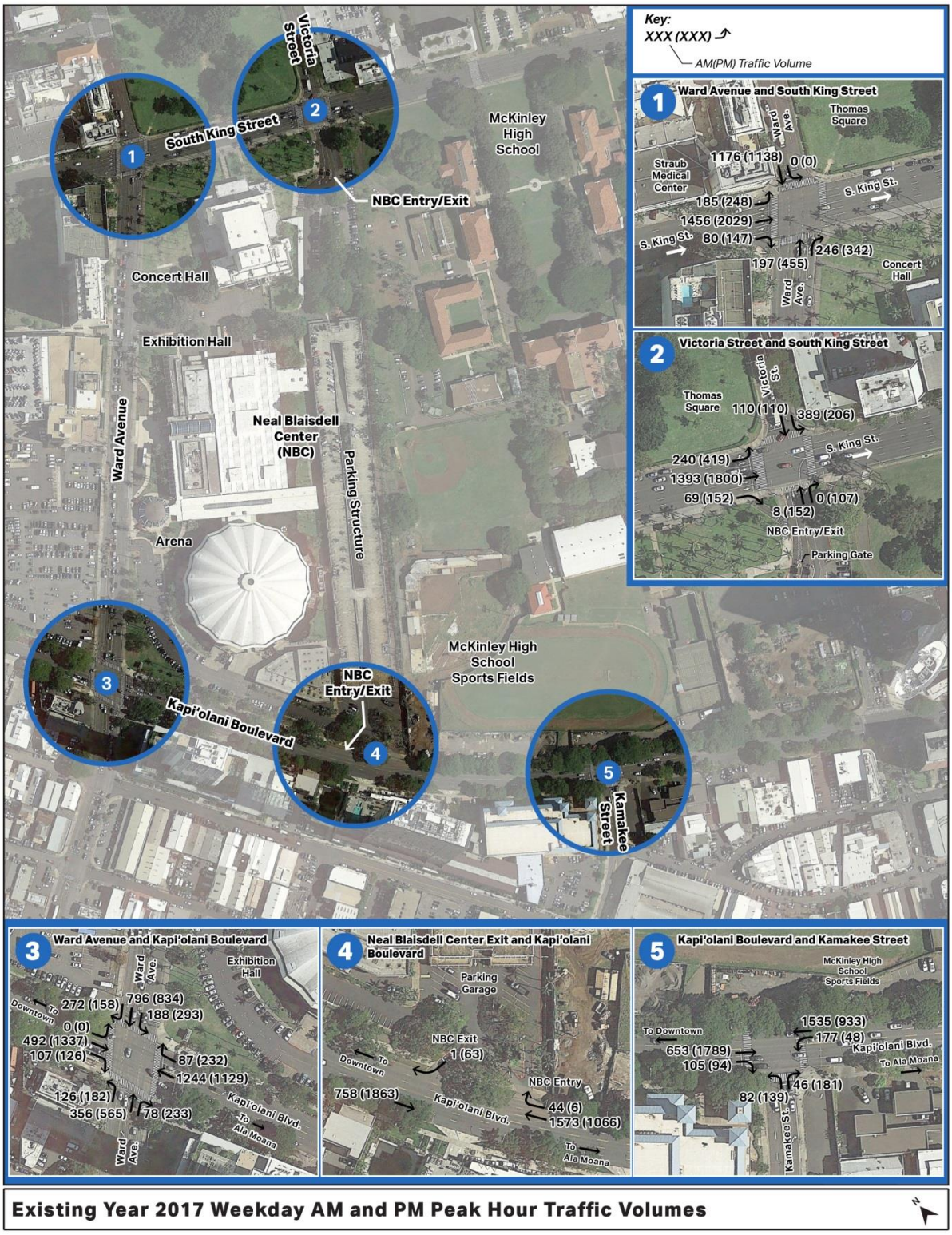



**Figure 3: Existing Year 2017 Weekday A.M. and P.M. Peak Hour Traffic Volumes**

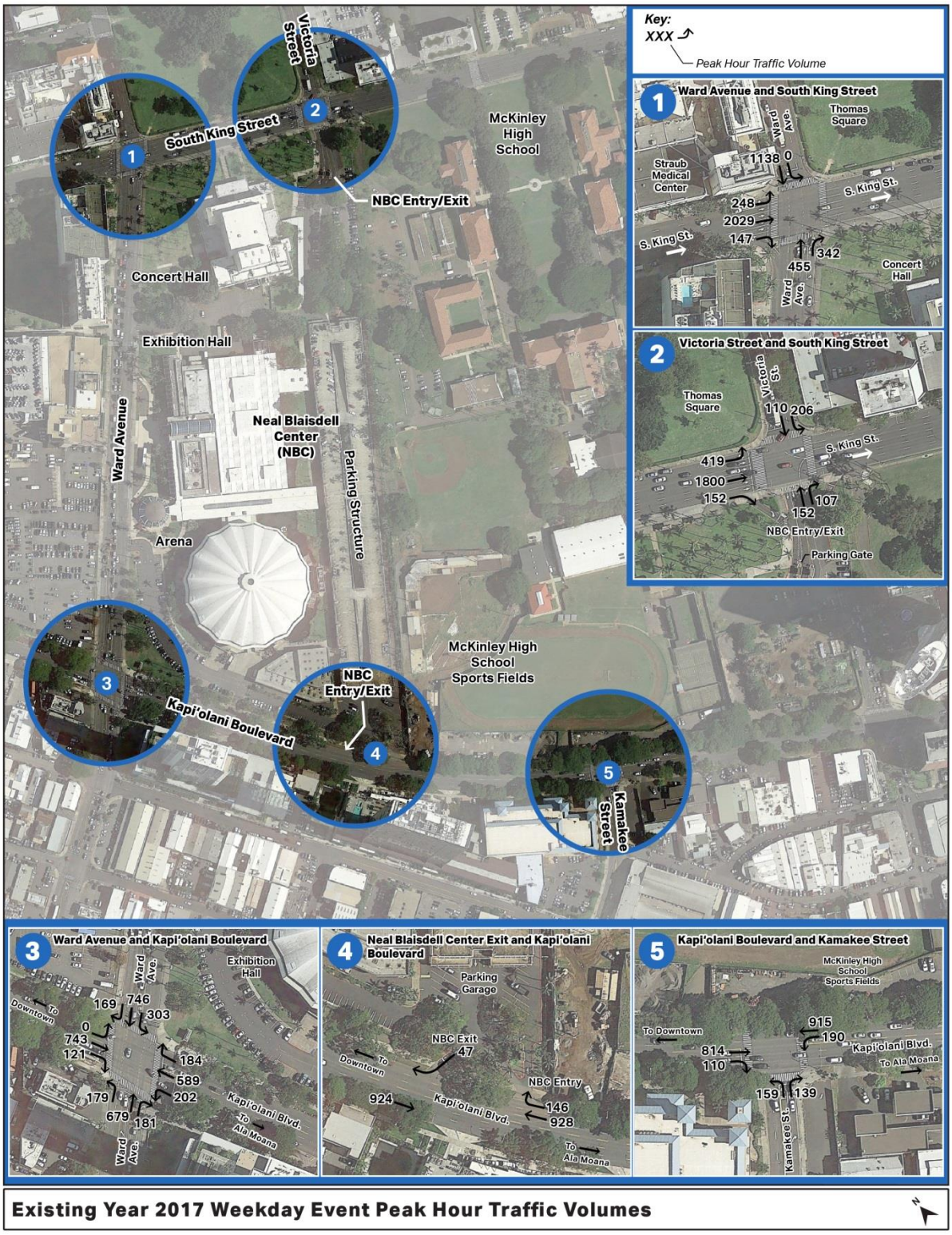



**Figure 4 Existing Year 2017 Weekday Event Peak Hour Traffic Volumes**

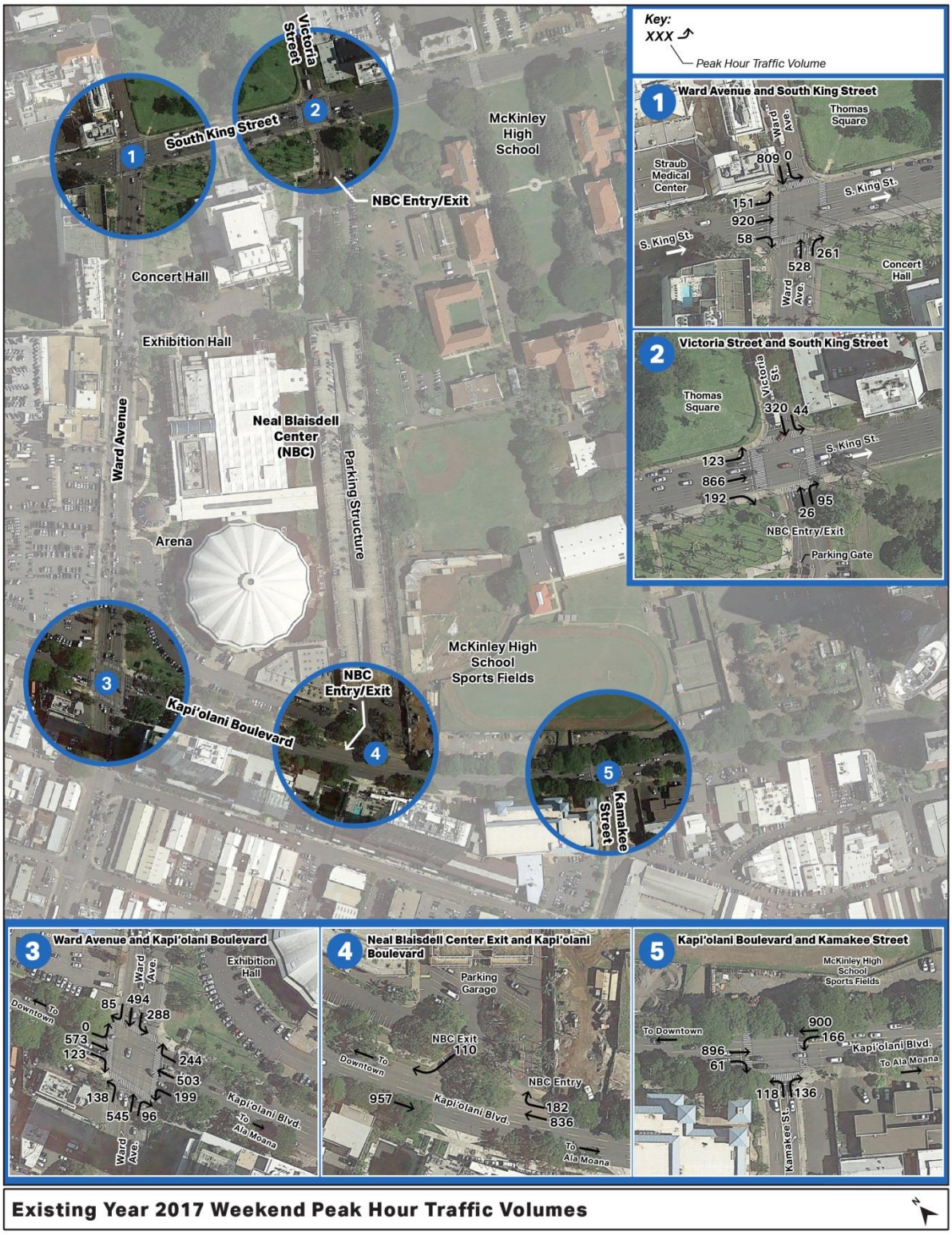



**Figure 5: Existing Year 2017 Weekend Peak Hour Traffic Volumes**

## 2.5.2 Existing Intersection Operations

### 2.5.2.1 Weekday Operations

Table 1 summarizes weekday A.M. and P.M. commuter peak hour operations at the four signalized intersections at South King Street/Victoria Street, South King Street/Ward Avenue, Kapi ʻ olani Boulevard/Ward Avenue, and Kapi ʻ olani Boulevard/Kamake ʻ e Street on Wednesday, October 18, 2017.

The signalized intersections were analyzed using the method described in Chapter 16 of the *Highway Capacity Manual* (Transportation Research Board of the National Academies 2010) through the Highway Capacity Software 2010. The analysis worksheets are included in Appendix C.

**Table 1: Existing Weekday Commuter Peak Hour Intersection Operations**

| Intersection | A.M. Peak Hour | | P.M. Peak Hour | |
|---|---|---|---|---|
| | Delay (sec/veh) | LOS | Delay (sec/veh) | LOS |
| South King Street/Victoria Street | 21.4 | C | 13.5 | B |
| South King Street/Ward Avenue | 20.5 | C | 28.2 | C |
| Kapi ʻ olani Boulevard/Ward Avenue | 40.2 | D | 36.7 | D |
| Kapi ʻ olani Boulevard/Kamake ʻ e Street | 10.8 | B | 11.3 | B |

Notes: Based on counts conducted on: Wednesday, 10/18/17
A.M. Peak Hour: 7:15 A.M. – 8:15 A.M.
P.M. Peak Hour: 4:45 P.M. – 5:45 P.M.
LOS = level of service
sec/veh = seconds per vehicle

As shown in Table 1, overall intersection operations are acceptable for urban peak hour conditions. All intersections operate at Level of Service (LOS) C or better during both peak hours with the exception of the Kapi ʻ olani Boulevard/Ward Avenue intersection, which is considered relatively low delay for urban peak hour conditions. The Kapi ʻ olani Boulevard/Ward Avenue operates at LOS D during both peak hours, indicating heavy but acceptable operations.

LOS for signalized intersections is a qualitative index that references a performance measure such as intersection delay to express the quality of traffic service. Definitions for LOS are included in Appendix B.

Although overall intersection operations are shown to be acceptable for peak hour conditions, specific traffic movements were observed to operate at congested LOS. Some of these congested LOS movements were caused by vehicles queues that originated at the NBC entrances.

Pedestrian-vehicle conflicts were observed at the main entrance to NBC on South King Street, but at a less intense level than during the weekend high-event peak hour.

Table 2 summarizes the weekday event peak hour operations at the four signalized intersections at South King Street/Victoria Street, South King Street/Ward Avenue, Kapi ʻ olani Boulevard/Ward Avenue, and Kapi ʻ olani Boulevard/Kamake ʻ e Street on Wednesday, October 18, 2017.

**Table 2: Existing Weekday Event Peak Hour Intersection Operations**

| Intersection | P.M. Peak Hour | |
|---|---|---|
| | Delay (sec/veh) | LOS |
| South King Street/Victoria Street | 13.5 | B |
| South King Street/Ward Avenue | 21.1 | C |
| Kapi ʻ olani Boulevard/Ward Avenue | 56.1 | E |
| Kapi ʻ olani Boulevard/Kamakeʻ e Street | 13.4 | B |

Notes: Based on counts conducted on: Wednesday, 10/18/17
Weekday P.M. Event Peak Hour: 6:00 P.M. – 7:00 P.M.
LOS = level of service
sec/veh = seconds per vehicle

As shown in Table 2, the South King/Victoria Street, South King Street/Ward Avenue, and Kapiʻolani Boulevard/Kamakeʻ e Street intersections operate at LOS C or better. The Kapi ʻ olani Boulevard/Ward Avenue operates with an overall intersection LOS E, which is undesirable, but can be common occurrence in large urban settings where there is traffic congestion.

#### 2.5.2.2 Weekend Operations

Table 3 summarizes the intersection operations on Sunday, October 15, 2017, for the weekend event peak hour.

**Table 3: Existing Weekend Event Peak Hour Intersection Operations**

| Intersection | Event P.M. Peak Hour | |
|---|---|---|
| | Delay (sec/veh) | LOS |
| South King Street/Victoria Street | 14.7 | B |
| South King Street/Ward Avenue | 18.9 | B |
| Kapi ʻ olani Boulevard/Ward Avenue | 40.1 | D |
| Kapi ʻ olani Boulevard/Kamakeʻ e Street | 10.9 | B |

Notes: Based on counts conducted on: Sunday, 10/15/17
Weekend Event Peak Hour: 3:00 P.M. – 4:00 P.M.
LOS = level of service
sec/veh = seconds per vehicle

As shown in Table 3, the South King Street/Victoria Street, South King Street/Ward Avenue, and Kapi ʻ olani Boulevard/Kamakeʻ e Street intersections operate at LOS B. The Kapi ʻ olani Boulevard/Ward Avenue intersection operates with an overall intersection LOS D, which is acceptable given peak hour urban conditions.

Although overall intersection operations are shown to be acceptable for peak hour conditions, specific traffic movements were observed to operate at congested LOS. Some of these congested LOS movements were caused by vehicles queues that originated at the NBC entrances. During the P.M. commuter peak hour, vehicles desiring to turn right into the NBC from South King Street were observed to queue along South King Street, interfering with bus stop #135 in front of the Concert Hall. Vehicle queues were also observed to impede traffic entering the NBC from Victoria Street. Most times, these queues were due to delays at the parking kiosks or vehicle-pedestrian conflicts with pedestrians on the makai sidewalk of South King Street.

During the Sunday event peak hour timeframe, there were significant pedestrian volumes entering and exiting the NBC. At the NBC main entrance on South King Street, these significant pedestrian volumes conflicted with vehicles turning right into the NBC from South King Street. In the existing intersection configuration, pedestrians walking along the

makai sidewalk of South King Street must cross a right-turn lane formed by a "pork chop" island. On several occasions, the pedestrians and/or the drivers did not notice each other, creating several close-call incidents at this location.

### 2.5.3 Existing Traffic Patterns

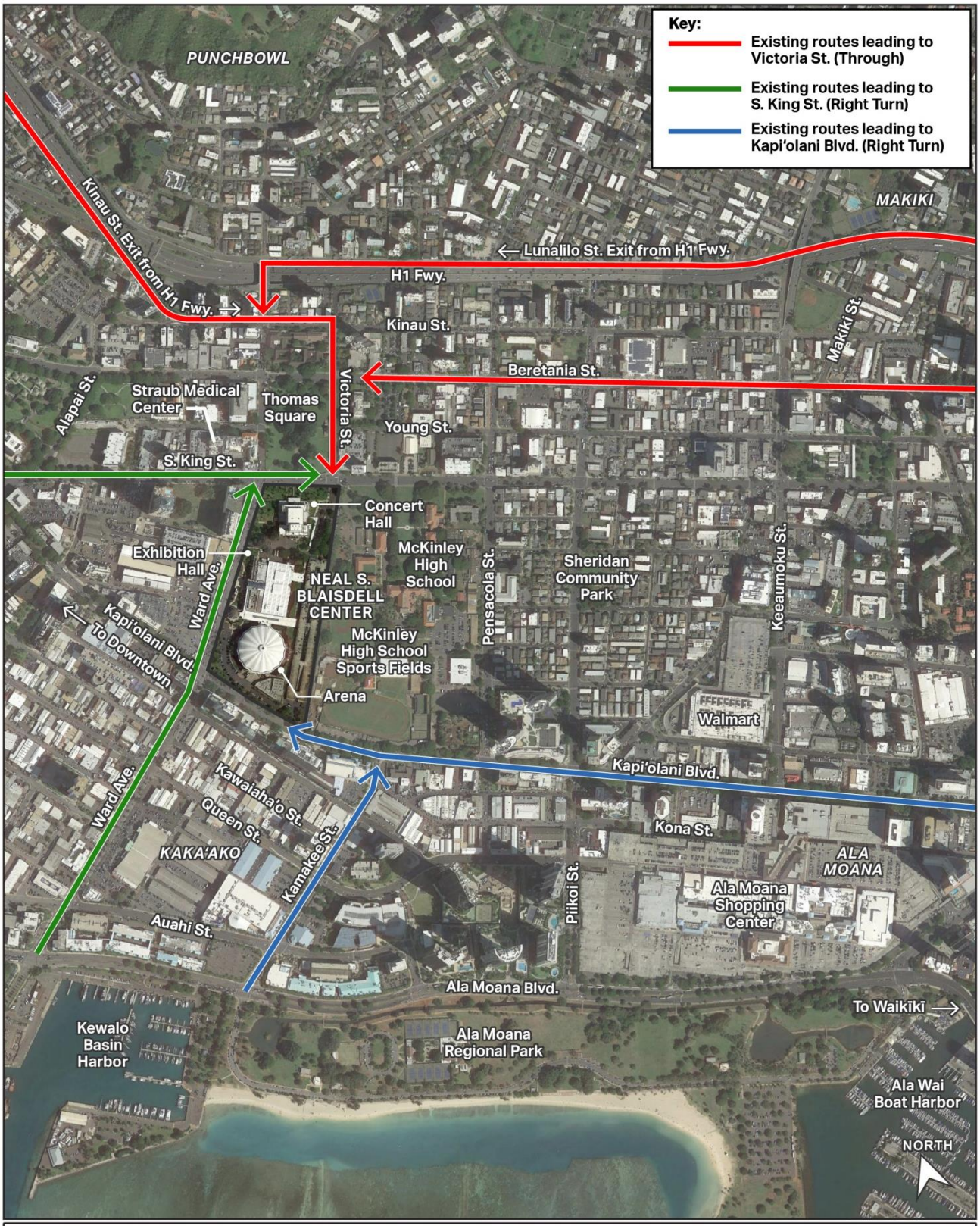
As illustrated in Figure 6, current roadway configurations tend to focus on the NBC access point at the South King Street/Victoria Street intersection.

As shown in red, Koko Head-bound H-1 Freeway drivers tend to use Exit 22, placing them onto Kinau Street, which logically leads to turning right onto Victoria Street and proceeding into the NBC. 'Ewa-bound H-1 Freeway drivers tend to use Exit 23, placing them onto Lunalilo Street with a large proportion following Lunalilo Street to Ward Avenue. After turning left onto Ward Avenue, this traffic turns onto Kinau Street (left-turns are not allowed at South King Street) and then turns right into Victoria Street to access the NBC. Victoria Street is also used by drivers approaching from South Beretania Street.

The green paths illustrate Koko Head-bound, non-freeway routes. Traffic on South King Street would naturally enter via the access at the South King Street/Victoria Street intersection. Traffic utilizing the Nimitz Highway/Ala Moana Boulevard corridor tends to utilize Ward Avenue to approach the NBC, turning onto South King Street and entering via the South King Street/Victoria Street intersection.

The blue paths illustrate 'Ewa-bound traffic on Kapi'olani Boulevard and traffic utilizing Kamake'e Street, accessing the NBC using the driveway on Kapi'olani Boulevard. Currently, this access point cannot be utilized by traffic traveling Koko Head-bound on Kapi'olani Boulevard because left-turn movements are not allowed.

The result of these patterns is that the predominant access point to the NBC is through the South King Street/Victoria Street intersection. During the weekday event, it was observed that approximately 98% of the traffic accessing the NBC did so through this driveway. During the major weekend event, it was observed that approximately 75% of the traffic accessing the NBC did so through this driveway.




**Existing NBC Access Traffic Patterns**

Figure 6: Existing NBC Access Traffic Patterns

# 5. References

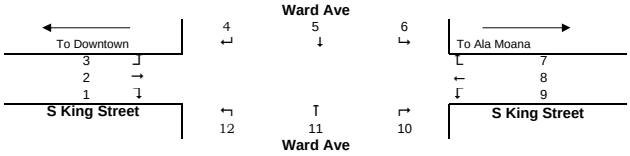
Hawaii Department of Transportation (HDOT). 2012. "Traffic Count Worksheets." In *Traffic Station Mapbook Island of O'ahu*.

Transportation Research Board of the National Academies. 2010. "Urban Street Facilities." In *Highway Capacity Manual 2010*, 3:16-1-16–47. Washington, DC: Transportation Research Board.

# Appendix A: Traffic Count Worksheets

## NEAL BLAISDELL TRANSPORTATION ANALYSIS TURNING MOVEMENT FORM

**LOCATION:** Ward Avenue and S King Street
**DATE:** 10/18/17 (Wednesday)
**TIME:** 6:30a-8:30a
**WEATHER:** Cloudy/Rain
**RECORDER:** RS

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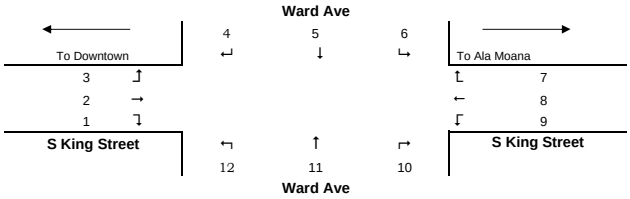
| TIME PERIOD | MOVEMENT NUMBER 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6:30-6:45a | 18 | 184 | 34 | 0 | 187 | 0 | 0 | 0 | 0 | 34 | 31 | 0 |
| 6:45-7:00a | 27 | 235 | 33 | 0 | 194 | 0 | 0 | 0 | 0 | 38 | 44 | 0 |
| 7:00-7:15a | 24 | 359 | 38 | 0 | 174 | 0 | 0 | 0 | 0 | 41 | 53 | 0 |
| 7:15-7:30a | 22 | 363 | 55 | 0 | 180 | 0 | 0 | 0 | 0 | 59 | 57 | 0 |
| 7:30-7:45a | 15 | 368 | 52 | 0 | 203 | 0 | 0 | 0 | 0 | 79 | 46 | 0 |
| 7:45-8:00a | 22 | 345 | 43 | 0 | 219 | 0 | 0 | 0 | 0 | 58 | 48 | 0 |
| 8:00-8:15a | 21 | 380 | 35 | 0 | 259 | 0 | 0 | 0 | 0 | 50 | 31 | 0 |
| 8:15-8:30a | 23 | 313 | 45 | 0 | 219 | 0 | 0 | 0 | 0 | 51 | 60 | 0 |
| Peak Hour 7:15 - 8:15 AM | 80 | 1456 | 185 | 0 | 861 | 0 | 0 | 0 | 0 | 246 | 182 | 0 |

Notes:

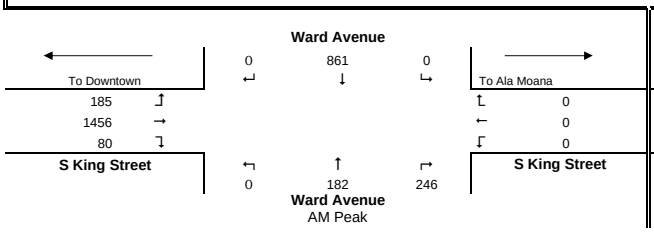
## NEAL BLAISDELL TRANSPORTATION ANALYSIS TURNING MOVEMENT FORM

**LOCATION:** Ward Avenue and S King Street
**DATE:** 10/18/17 (Wednesday)
**TIME:** 4:30p-7:00p
**WEATHER:** Cloudy
**RECORDER:** RS

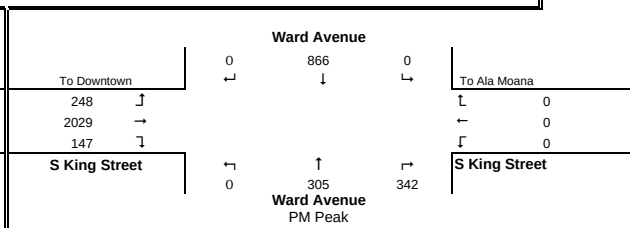



| TIME PERIOD | MOVEMENT NUMBER 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4:30-4:45p | 36 | 393 | 56 | 0 | 212 | 0 | 0 | 0 | 1 | 73 | 104 | 0 |
| 4:45-5:00p | 35 | 521 | 60 | 0 | 198 | 0 | 0 | 0 | 0 | 79 | 61 | 0 |
| 5:00-5:15p | 44 | 531 | 71 | 0 | 218 | 0 | 0 | 0 | 0 | 94 | 78 | 0 |
| 5:15-5:30p | 36 | 460 | 52 | 0 | 203 | 0 | 0 | 0 | 0 | 83 | 78 | 0 |
| 5:30-5:45p | 32 | 517 | 65 | 0 | 247 | 0 | 0 | 0 | 0 | 86 | 88 | 0 |
| 5:45-6:00p | 19 | 405 | 66 | 0 | 222 | 0 | 0 | 0 | 0 | 74 | 80 | 0 |
| 6:00-6:15p | 24 | 420 | 77 | 0 | 239 | 0 | 0 | 0 | 0 | 89 | 108 | 0 |
| 6:15-6:30p | 19 | 324 | 100 | 0 | 220 | 0 | 0 | 0 | 2 | 68 | 114 | 0 |
| 6:30-6:45p | 23 | 314 | 80 | 0 | 256 | 0 | 0 | 0 | 0 | 72 | 115 | 0 |
| 6:45-7:00p | | | | | | | | | | | | |
| Peak Hour 4:45 - 5:45 PM | 147 | 2029 | 248 | 0 | 866 | 0 | 0 | 0 | 0 | 342 | 305 | 0 |

Notes: Stopped count a bit early and had to restart. Counter did not register last interval due to timing.



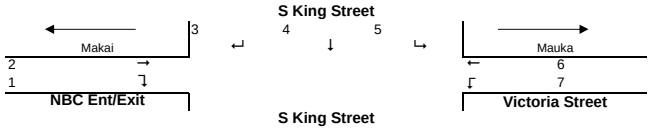

AM Peak




PM Peak

## NEAL BLAISDELL TRANSPORTATION ANALYSIS TURNING MOVEMENT FORM

**LOCATION:** Victoria Street and S King Street
**DATE:** 10/18/17 (Wednesday)
**TIME:** 6:30a-8:30a
**WEATHER:** Cloudy/Rain
**RECORDER:** WYY

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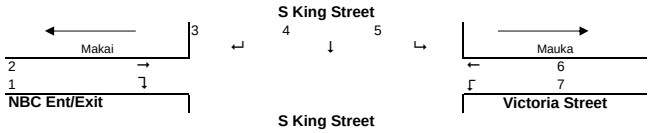
| TIME PERIOD | MOVEMENT NUMBER 1 | 2 | 3 | 4 | 5 | 6 | 7 | Pedestrian Movement ↓ | ↑ | → | ← (DH) | ← (Ewa) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6:30-6:45a | 0 | 1 | 33 | 176 | 23 | 86 | 30 | 5 | 11 | 4 | 0 | 4 |
| 6:45-7:00a | 0 | 2 | 19 | 259 | 39 | 41 | 47 | 10 | 8 | 4 | 0 | 2 |
| 7:00-7:15a | 1 | 1 | 19 | 378 | 35 | 33 | 45 | 23 | 14 | 11 | 0 | 2 |
| 7:15-7:30a | 0 | 5 | 29 | 460 | 55 | 39 | 84 | 17 | 6 | 9 | 0 | 1 |
| 7:30-7:45a | 0 | 2 | 18 | 396 | 80 | 27 | 92 | 29 | 5 | 6 | 4 | 1 |
| 7:45-8:00a | 0 | 0 | 7 | 403 | 51 | 27 | 106 | 19 | 8 | 8 | 6 | 1 |
| 8:00-8:15a | 0 | 1 | 15 | 414 | 54 | 17 | 107 | 17 | 9 | 2 | 4 | 5 |
| 8:15-8:30a | 0 | 3 | 7 | 343 | 45 | 24 | 81 | 7 | 3 | 3 | 2 | 5 |
| Peak Hour 7:15 - 8:15 AM | 0 | 8 | 69 | 1673 | 240 | 110 | 389 | 82 | 28 | 25 | 14 | 8 |

Notes: 7:40 Queue back into S King

## NEAL BLAISDELL TRANSPORTATION ANALYSIS TURNING MOVEMENT FORM

**LOCATION:** Victoria Street and S King Street
**DATE:** 10/18/17 (Wednesday)
**TIME:** 4:30p-7:00p
**WEATHER:** Cloudy
**RECORDER:** WYY

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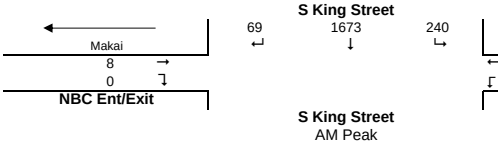
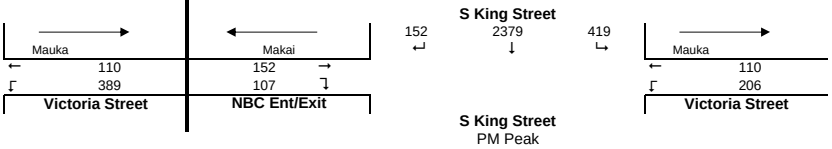
| TIME PERIOD | MOVEMENT NUMBER 1 | 2 | 3 | 4 | 5 | 6 | 7 | Pedestrian Movement ↓ | ↑ | → | ← (DH) | ← (Ewa) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4:30-4:45p | 37 | 58 | 18 | 517 | 97 | 25 | 44 | 16 | 9 | 7 | 6 | 8 |
| 4:45-5:00p | 30 | 47 | 19 | 606 | 103 | 17 | 47 | 13 | 4 | 8 | 2 | 3 |
| 5:00-5:15p | 31 | 32 | 28 | 581 | 92 | 25 | 49 | 12 | 13 | 5 | 5 | 3 |
| 5:15-5:30p | 25 | 25 | 69 | 559 | 82 | 25 | 50 | 17 | 11 | 12 | 3 | 2 |
| 5:30-5:45p | 21 | 48 | 36 | 633 | 142 | 43 | 60 | 12 | 13 | 11 | 3 | 7 |
| 5:45-6:00p | 9 | 29 | 25 | 384 | 44 | 24 | 36 | 4 | 8 | 6 | 5 | 7 |
| 6:00-6:15p | 13 | 16 | 43 | 487 | 63 | 33 | 39 | 18 | 14 | 11 | 5 | 4 |
| 6:15-6:30p | 11 | 8 | 22 | 327 | 45 | 33 | 41 | 5 | 12 | 5 | 0 | 5 |
| 6:30-6:45p | 13 | 6 | 52 | 393 | 42 | 43 | 36 | 13 | 2 | 3 | 3 | 6 |
| 6:45-7:00p | 10 | 6 | 38 | 317 | 26 | 59 | 33 | 1 | 8 | 6 | 0 | 9 |
| Peak Hour 4:45 - 5:45 PM | 107 | 152 | 152 | 2379 | 419 | 110 | 206 | 54 | 41 | 36 | 13 | 15 |

Notes: Camera start 4:25
6:55 queue block bus stop, interfere with Victoria traffic



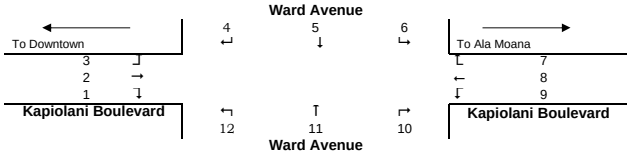

AM Peak




PM Peak

## NEAL BLAISDELL TRANSPORTATION ANALYSIS TURNING MOVEMENT FORM

**LOCATION:** Ward Avenue and Kapiolani Boulevard
**DATE:** 10/18/17 (Wednesday)
**TIME:** 6:30a-8:30a
**WEATHER:** Cloudy/Rain
**RECORDER:** JY

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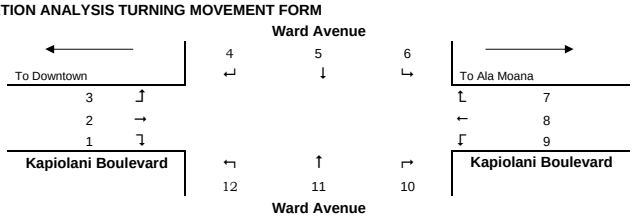
| TIME PERIOD | MOVEMENT NUMBER 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6:30-6:45a | 16 | 71 | 0 | 33 | 168 | 25 | 25 | 157 | 47 | 4 | 55 | 18 |
| 6:45-7:00a | 18 | 83 | 0 | 56 | 174 | 36 | 23 | 223 | 73 | 10 | 65 | 24 |
| 7:00-7:15a | 19 | 82 | 0 | 57 | 168 | 23 | 22 | 244 | 45 | 11 | 88 | 17 |
| 7:15-7:30a | 33 | 118 | 0 | 71 | 156 | 36 | 21 | 319 | 70 | 9 | 102 | 35 |
| 7:30-7:45a | 23 | 119 | 0 | 67 | 212 | 55 | 19 | 317 | 62 | 16 | 113 | 39 |
| 7:45-8:00a | 19 | 140 | 0 | 62 | 189 | 46 | 19 | 322 | 57 | 24 | 77 | 31 |
| 8:00-8:15a | 32 | 115 | 0 | 72 | 239 | 51 | 28 | 286 | 54 | 29 | 64 | 21 |
| 8:15-8:30a | 28 | 144 | 0 | 48 | 178 | 56 | 19 | 228 | 63 | 29 | 78 | 30 |
| Peak Hour 7:15 - 8:15 AM | 107 | 492 | 0 | 272 | 796 | 188 | 87 | 1244 | 243 | 78 | 356 | 126 |

Notes: Cycle length measured to be about 120 sec (around 7:30)

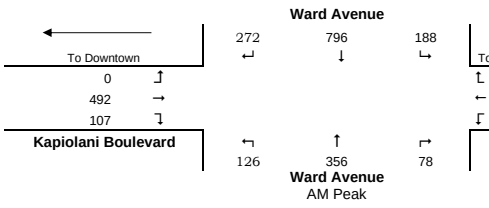
## NEAL BLAISDELL TRANSPORTATION ANALYSIS TURNING MOVEMENT FORM

**LOCATION:** Ward Avenue and Kapiolani Boulevard
**DATE:** 10/18/17 (Wednesday)
**TIME:** 4:30p-7:00p
**WEATHER:** Cloudy
**RECORDER:** JY

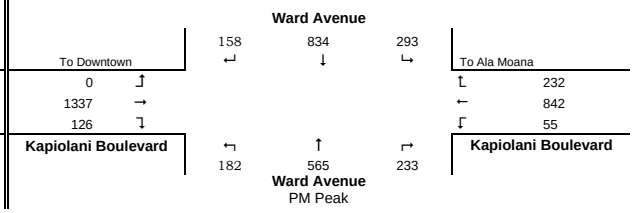



| TIME PERIOD | MOVEMENT NUMBER 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4:30-4:45p | 29 | 237 | 0 | 37 | 195 | 74 | 39 | 210 | 0 | 46 | 138 | 27 |
| 4:45-5:00p | 32 | 387 | 0 | 44 | 193 | 68 | 48 | 241 | 0 | 48 | 143 | 39 |
| 5:00-5:15p | 32 | 322 | 0 | 40 | 225 | 75 | 83 | 168 | 0 | 63 | 164 | 56 |
| 5:15-5:30p | 37 | 361 | 0 | 31 | 184 | 64 | 49 | 263 | 11 | 50 | 125 | 39 |
| 5:30-5:45p | 25 | 267 | 0 | 43 | 232 | 86 | 52 | 170 | 44 | 72 | 133 | 48 |
| 5:45-6:00p | 32 | 272 | 0 | 46 | 172 | 76 | 48 | 201 | 53 | 41 | 137 | 35 |
| 6:00-6:15p | 34 | 190 | 0 | 24 | 187 | 73 | 41 | 141 | 45 | 48 | 187 | 47 |
| 6:15-6:30p | 28 | 191 | 0 | 44 | 186 | 63 | 51 | 162 | 56 | 48 | 161 | 60 |
| 6:30-6:45p | 31 | 173 | 0 | 58 | 188 | 84 | 44 | 152 | 59 | 43 | 169 | 37 |
| 6:45-7:00p | 28 | 189 | 1 | 43 | 185 | 83 | 48 | 134 | 42 | 42 | 162 | 35 |
| Peak Hour 4:45 - 5:45 PM | 126 | 1337 | 0 | 158 | 834 | 293 | 232 | 842 | 55 | 233 | 565 | 182 |

Notes: 5:20 Ambulance came
6:24 Ambulance came again
Cycle times measured to be 120 sec (at 4:30) and 160 sec (at 7)
Cars queued around corner of Blaisdell on Ward and it spilled over onto Kapiolani
Also queue along Ward heading makai, which blocked the intersection at several instances

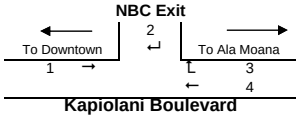



AM Peak




PM Peak

## NEAL BLAISDELL TRANSPORTATION ANALYSIS TURNING MOVEMENT FORM



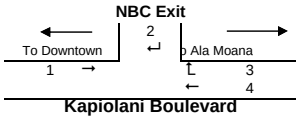

**LOCATION:** Kapiolani Boulevard and NBC Exit
**DATE:** 10/18/17 (Wednesday)
**TIME:** 6:30a-8:30a
**WEATHER:** Cloudy/Rain
**RECORDER:** TW

`

| TIME PERIOD | MOVEMENT NUMBER 1 | 2 | 3 | 4 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6:30-6:45a | 122 | 2 | 29 | 242 | | | | | | | | |
| 6:45-7:00a | 136 | 0 | 17 | 298 | | | | | | | | |
| 7:00-7:15a | 131 | 0 | 13 | 306 | | | | | | | | |
| 7:15-7:30a | 170 | 0 | 8 | 353 | | | | | | | | |
| 7:30-7:45a | 234 | 0 | 22 | 440 | | | | | | | | |
| 7:45-8:00a | 189 | 0 | 7 | 386 | | | | | | | | |
| 8:00-8:15a | 197 | 1 | 7 | 370 | | | | | | | | |
| 8:15-8:30a | 242 | 0 | 4 | 304 | | | | | | | | |
| Peak Hour 7:15 - 8:15 AM | 790 | 1 | 44 | 1549 | | | | | | | | |

Notes:

## NEAL BLAISDELL TRANSPORTATION ANALYSIS TURNING MOVEMENT FORM

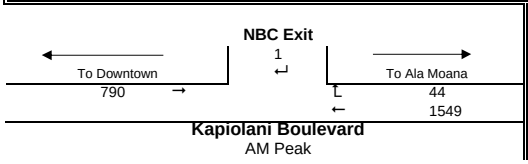


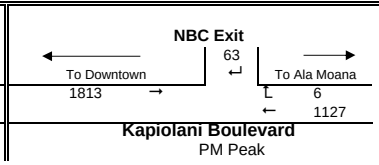

**LOCATION:** Kapiolani Boulevard and NBC Exit
**DATE:** 10/18/17 (Wednesday)
**TIME:** 4:30p-7:00p
**WEATHER:** Cloudy
**RECORDER:** CN

`

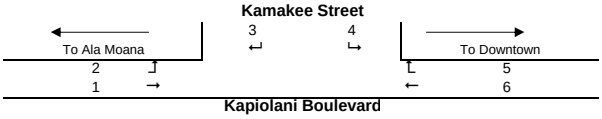
| TIME PERIOD | MOVEMENT NUMBER 1 | 2 | 3 | 4 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4:30-4:45p | 421 | 18 | 1 | 289 | | | | | | | | |
| 4:45-5:00p | 485 | 16 | 4 | 275 | | | | | | | | |
| 5:00-5:15p | 469 | 18 | 2 | 281 | | | | | | | | |
| 5:15-5:30p | 462 | 15 | 0 | 312 | | | | | | | | |
| 5:30-5:45p | 397 | 14 | 0 | 259 | | | | | | | | |
| 5:45-6:00p | 333 | 11 | 1 | 252 | | | | | | | | |
| 6:00-6:15p | 296 | 12 | 10 | 220 | | | | | | | | |
| 6:15-6:30p | 309 | 24 | 30 | 230 | | | | | | | | |
| 6:30-6:45p | 297 | 8 | 46 | 227 | | | | | | | | |
| 6:45-7:00p | 237 | 3 | 60 | 174 | | | | | | | | |
| Peak Hour 4:45 - 5:45 PM | 1813 | 63 | 6 | 1127 | | | | | | | | |

Notes:



## NEAL BLAISDELL TRANSPORTATION ANALYSIS TURNING MOVEMENT FORM



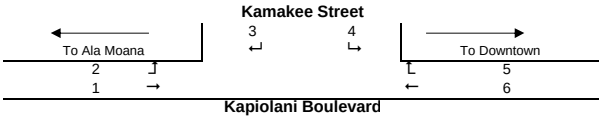

**LOCATION:** Kapiolani Boulevard and Kamakee Street
**DATE:** 10/18/17 (Wednesday)
**TIME:** 6:30a-8:30a
**WEATHER:** Cloudy/Rain
**RECORDER:** AMF

`

| TIME PERIOD | MOVEMENT NUMBER 1 | 2 | 3 | 4 | 5 | 6 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6:30-6:45a | 231 | 30 | 9 | 12 | 27 | 90 | | | | | | |
| 6:45-7:00a | 252 | 19 | 13 | 24 | 27 | 104 | | | | | | |
| 7:00-7:15a | 289 | 24 | 13 | 10 | 22 | 120 | | | | | | |
| 7:15-7:30a | 330 | 41 | 15 | 27 | 33 | 142 | | | | | | |
| 7:30-7:45a | 362 | 52 | 14 | 15 | 33 | 185 | | | | | | |
| 7:45-8:00a | 331 | 42 | 6 | 18 | 19 | 185 | | | | | | |
| 8:00-8:15a | 286 | 42 | 11 | 22 | 20 | 192 | | | | | | |
| 8:15-8:30a | 185 | 31 | 13 | 19 | 20 | 179 | | | | | | |
| Peak Hour 7:15 - 8:15 AM | 1309 | 177 | 46 | 82 | 105 | 704 | | | | | | |

Notes:

## NEAL BLAISDELL TRANSPORTATION ANALYSIS TURNING MOVEMENT FORM

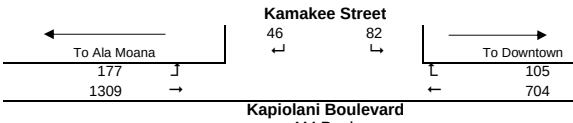



**LOCATION:** Kapiolani Boulevard and Kamakee Street
**DATE:** 10/18/17 (Wednesday)
**TIME:** 4:30p-7:00p
**WEATHER:** Cloudy/Rain
**RECORDER:** AMF

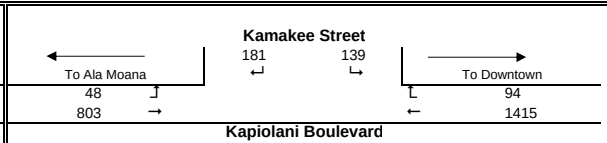
`

| TIME PERIOD | MOVEMENT NUMBER 1 | 2 | 3 | 4 | 5 | 6 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4:30-4:45p | 214 | 1 | 41 | 36 | 25 | 364 | | | | | | |
| 4:45-5:00p | 209 | 1 | 47 | 35 | 26 | 408 | | | | | | |
| 5:00-5:15p | 187 | 2 | 51 | 41 | 18 | 339 | | | | | | |
| 5:15-5:30p | 249 | 8 | 44 | 27 | 20 | 406 | | | | | | |
| 5:30-5:45p | 158 | 37 | 39 | 36 | 30 | 262 | | | | | | |
| 5:45-6:00p | 189 | 47 | 25 | 39 | 29 | 286 | | | | | | |
| 6:00-6:15p | 153 | 43 | 32 | 48 | 35 | 202 | | | | | | |
| 6:15-6:30p | 128 | 42 | 37 | 49 | 24 | 186 | | | | | | |
| 6:30-6:45p | 153 | 48 | 31 | 30 | 23 | 178 | | | | | | |
| 6:45-7:00p | 174 | 57 | 38 | 32 | 28 | 195 | | | | | | |
| Peak Hour 4:45 - 5:45 PM | 803 | 48 | 181 | 139 | 94 | 1415 | | | | | | |

Notes:




AM Peak




PM Peak

| Time Period | Sunday 10/15/17 | | Wednesday 10/18/17 | |
|---|---|---|---|---|
| | S King | Kapiolani | S King | Kapiolani |
| 12:00 - 1:00 AM | | | | |
| 1:00 - 2:00 AM | | | | |
| 2:00 - 3:00 AM | | | | |
| 3:00 - 4:00 AM | | | | |
| 4:00 - 5:00 AM | | | | |
| 5:00 - 6:00 AM | | | | 26 |
| 6:00 - 7:00 AM | | | | 65 |
| 7:00 - 8:00 AM | 88 | | 88 | 31 |
| 8:00 - 9:00 AM | 75 | | 75 | 2 |
| 9:00 - 10:00 AM | 260 | 18 | 278 | |
| 10:00 - 11:00 AM | 271 | 36 | 307 | |
| 11:00 AM - 12:00 PM | 214 | 34 | 248 | |
| 12:00 - 1:00 PM | 230 | 31 | 261 | |
| 1:00 - 2:00 PM | 243 | 35 | 278 | |
| 2:00 - 3:00 PM | 326 | 81 | 407 | |
| 3:00 - 4:00 PM | 346 | 139 | 485 | |
| 4:00 - 5:00 PM | 52 | 1 | 53 | |
| 5:00 - 6:00 PM | 10 | | 10 | 1 |
| 6:00 - 7:00 PM | | | | 126 |
| 7:00 - 8:00 PM | | | | 163 |
| 8:00 - 9:00 PM | | | | 18 |
| 9:00 - 10:00 PM | | | | |
| 10:00 - 11:00 PM | | | | |
| 11:00 PM - 12:00 AM | | | | |

Notes: Counts from Elite Parking.
Counts are taken when the gate arm opens (taken as 1 count)
Exits were not counted
From the data, we cannot identify whether vehicles coming in from the S. King Street entrance came in from Victoria St or S. King St

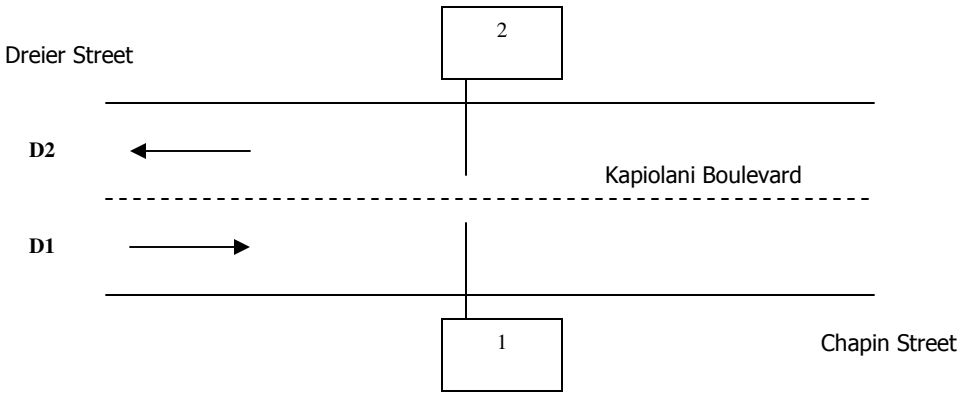
# Traffic Data Service

Traffic Station Sketch

N

| Island: Oahu |
|---|
| Area: Honolulu |

Section ID/Station #: B72750300000




| Meter # | File Name | GPS |
|---|---|---|
| 1. bt27 | D0221005_B72750300000 | 21.30052, -157.85394 |
| 2. y217 | D0221006_B72750300000 | 21.30052, -157.85394 |

| | | | |
|---|---|---|---|
| Station Description: Kapiolani Boulevard: Dreier Street to Chapin Street | | | |
| Survey Beginning Date/Time: 2/21/2012 @ 0000 | | | Survey Ending Date/Time: 2/22/2012 @ 2400 |
| Survey Method: | Road Tube | Data Type: | Volume |
| Survey Crew: | LM | | V5 |
| Sketch Updated: | | By: | SR |
| Remarks: | | | |

| FACILITY NAME | JURI | FUNC CLASS | AREA TYPE | ROUTE NO. | ROUTE MILE |
|---|---|---|---|---|---|
| Kapiolani Boulevard | | 14 | | 7503 | |

D1= Direction to End
D2= Direction to Begin

D1: Chapin Street / Waialae Avenue
D2: Dreier Street / South Street

**Run Date:** 2013/02/28

# Hawaii Department of Transportation
## Highways Division — Highways Planning Survey Section
## 2012 Program Count - Summary

**Site ID:** B72750300000 **Town:** Oahu **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 32000
**Functional Class:** URBAN:PRINCIPAL ARTERIAL - OTHER **Count Type:** VOLUME **Counter Type:** Tube **Route No:** 7503
**Location:** Kapiolani Blvd b/t South St and Ward A

| TIME-AM | DIR 1 | DIR 2 | TOTAL | TIME-AM | DIR 1 | DIR 2 | TOTAL | TIME-PM | DIR 1 | DIR 2 | TOTAL | TIME-PM | DIR 1 | DIR 2 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DATE : 02/21/2012** | | | | | | | | | | | | | | | |
| 12:00-12:15 | 11 | 29 | 40 | 06:00-06:15 | 99 | 111 | 210 | 12:00-12:15 | 243 | 241 | 484 | 06:00-06:15 | 339 | 197 | 536 |
| 12:15-12:30 | 13 | 35 | 48 | 06:15-06:30 | 126 | 149 | 275 | 12:15-12:30 | 271 | 256 | 527 | 06:15-06:30 | 263 | 219 | 482 |
| 12:30-12:45 | 30 | 24 | 54 | 06:30-06:45 | 151 | 204 | 355 | 12:30-12:45 | 300 | 292 | 592 | 06:30-06:45 | 276 | 197 | 473 |
| 12:45-01:00 | 12 | 25 | 37 | 06:45-07:00 | 223 | 311 | 534 | 12:45-01:00 | 265 | 251 | 516 | 06:45-07:00 | 194 | 200 | 394 |
| 01:00-01:15 | 12 | 19 | 31 | 07:00-07:15 | 245 | 356 | 601 | 01:00-01:15 | 277 | 230 | 507 | 07:00-07:15 | 159 | 193 | 352 |
| 01:15-01:30 | 10 | 13 | 23 | 07:15-07:30 | 280 | 399 | 679 | 01:15-01:30 | 283 | 278 | 561 | 07:15-07:30 | 135 | 208 | 343 |
| 01:30-01:45 | 13 | 10 | 23 | 07:30-07:45 | 342 | 432 | 774 | 01:30-01:45 | 262 | 293 | 555 | 07:30-07:45 | 133 | 181 | 314 |
| 01:45-02:00 | 7 | 14 | 21 | 07:45-08:00 | 357 | 468 | 825 | 01:45-02:00 | 304 | 253 | 557 | 07:45-08:00 | 145 | 170 | 315 |
| 02:00-02:15 | 14 | 17 | 31 | 08:00-08:15 | 268 | 347 | 615 | 02:00-02:15 | 297 | 247 | 544 | 08:00-08:15 | 146 | 170 | 316 |
| 02:15-02:30 | 17 | 13 | 30 | 08:15-08:30 | 327 | 334 | 661 | 02:15-02:30 | 313 | 256 | 569 | 08:15-08:30 | 151 | 140 | 291 |
| 02:30-02:45 | 13 | 19 | 32 | 08:30-08:45 | 269 | 287 | 556 | 02:30-02:45 | 287 | 278 | 565 | 08:30-08:45 | 117 | 148 | 265 |
| 02:45-03:00 | 10 | 12 | 22 | 08:45-09:00 | 231 | 248 | 479 | 02:45-03:00 | 338 | 286 | 624 | 08:45-09:00 | 102 | 126 | 228 |
| 03:00-03:15 | 10 | 15 | 25 | 09:00-09:15 | 230 | 251 | 481 | 03:00-03:15 | 365 | 263 | 628 | 09:00-09:15 | 113 | 140 | 253 |
| 03:15-03:30 | 11 | 9 | 20 | 09:15-09:30 | 193 | 228 | 421 | 03:15-03:30 | 322 | 312 | 634 | 09:15-09:30 | 82 | 140 | 222 |
| 03:30-03:45 | 13 | 20 | 33 | 09:30-09:45 | 213 | 235 | 448 | 03:30-03:45 | 371 | 348 | 719 | 09:30-09:45 | 99 | 137 | 236 |
| 03:45-04:00 | 3 | 10 | 13 | 09:45-10:00 | 286 | 238 | 524 | 03:45-04:00 | 359 | 304 | 663 | 09:45-10:00 | 101 | 101 | 202 |
| 04:00-04:15 | 5 | 14 | 19 | 10:00-10:15 | 246 | 213 | 459 | 04:00-04:15 | 357 | 327 | 684 | 10:00-10:15 | 98 | 90 | 188 |
| 04:15-04:30 | 12 | 13 | 25 | 10:15-10:30 | 254 | 255 | 509 | 04:15-04:30 | 392 | 348 | 740 | 10:15-10:30 | 66 | 86 | 152 |
| 04:30-04:45 | 11 | 19 | 30 | 10:30-10:45 | 252 | 238 | 490 | 04:30-04:45 | 411 | 385 | 796 | 10:30-10:45 | 52 | 86 | 138 |
| 04:45-05:00 | 13 | 25 | 38 | 10:45-11:00 | 293 | 226 | 519 | 04:45-05:00 | 415 | 363 | 778 | 10:45-11:00 | 61 | 78 | 139 |
| 05:00-05:15 | 34 | 24 | 58 | 11:00-11:15 | 271 | 237 | 508 | 05:00-05:15 | 406 | 335 | 741 | 11:00-11:15 | 56 | 71 | 127 |
| 05:15-05:30 | 28 | 50 | 78 | 11:15-11:30 | 302 | 239 | 541 | 05:15-05:30 | 436 | 316 | 752 | 11:15-11:30 | 37 | 50 | 87 |
| 05:30-05:45 | 51 | 51 | 102 | 11:30-11:45 | 281 | 268 | 549 | 05:30-05:45 | 388 | 239 | 627 | 11:30-11:45 | 56 | 65 | 121 |
| 05:45-06:00 | 58 | 90 | 148 | 11:45-12:00 | 305 | 224 | 529 | 05:45-06:00 | 380 | 206 | 586 | 11:45-12:00 | 42 | 55 | 97 |

| AM COMMUTER PERIOD (05:00-09:00) | DIR 1 | DIR 2 | |
|---|---|---|---|
| TWO DIRECTIONAL PEAK | | | |
| AM - PEAK HR TIME | 07:15 AM to 08:15 AM | | |
| AM - PEAK HR VOLUME | 1247 | 1646 | 2893 |
| AM - K FACTOR (%) | | | 8.33 |
| AM - D (%) | 43.10 | 56.90 | 100.00 |
| DIRECTIONAL PEAK | | | |
| AM - PEAK HR TIME | 07:30 AM to 08:30 AM | 07:00 AM to 08:00 AM | |
| AM - PEAK HR VOLUME | 1294 | 1655 | |

| PM COMMUTER PERIOD (15:00-19:00) | DIR 1 | DIR 2 | |
|---|---|---|---|
| TWO DIRECTIONAL PEAK | | | |
| PM - PEAK HR TIME | 04:30 PM to 05:30 PM | | |
| PM - PEAK HR VOLUME | 1668 | 1399 | 3067 |
| PM - K FACTOR (%) | | | 8.83 |
| PM - D (%) | 54.39 | 45.61 | 100.00 |
| DIRECTIONAL PEAK | | | |
| PM - PEAK HR TIME | 04:30 PM to 05:30 PM | 04:15 PM to 05:15 PM | |
| PM - PEAK HR VOLUME | 1668 | 1431 | |

| AM PERIOD (00:00-12:00) | | | |
|---|---|---|---|
| TWO DIRECTIONAL PEAK | | | |
| AM - PEAK HR TIME | 07:15 AM to 08:15 AM | | |
| AM - PEAK HR VOLUME | 1247 | 1646 | 2893 |
| AM - K FACTOR (%) | | | 8.33 |
| AM - D (%) | 43.10 | 56.90 | 100.00 |

| PM PERIOD (12:00-24:00) | | | |
|---|---|---|---|
| TWO DIRECTIONAL PEAK | | | |
| PM - PEAK HR TIME | 04:30 PM to 05:30 PM | | |
| PM - PEAK HR VOLUME | 1668 | 1399 | 3067 |
| PM - K FACTOR (%) | | | 8.83 |
| PM - D (%) | 54.39 | 45.61 | 100.00 |

| NON-COMMUTER PERIOD (09:00-15:00) | | | |
|---|---|---|---|
| TWO DIRECTIONAL PEAK | | | |
| PEAK HR TIME | 02:00 PM to 03:00 PM | | |
| PEAK HR VOLUME | 1235 | 1067 | 2302 |
| DIRECTIONAL PEAK | | | |
| PEAK HR TIME | 02:00 PM to 03:00 PM | 01:15 PM to 02:15 PM | |
| PEAK HR VOLUME | 1235 | 1071 | |

| 6-HR, 12-HR, 24-HR PERIODS | DIR 1 | DIR 2 | Total |
|---|---|---|---|
| AM 6-HR PERIOD (06:00-12:00) | 6,044 | 6,498 | 12,542 |
| AM 12-HR PERIOD (00:00-12:00) | 6,455 | 7,068 | 13,523 |
| PM 6-HR PERIOD (12:00-18:00) | 8,042 | 6,907 | 14,949 |
| PM 12-HR PERIOD (12:00-24:00) | 11,065 | 10,155 | 21,220 |
| 24 HOUR PERIOD | 17,520 | 17,223 | 34,743 |
| D (%) | 50.43 | 49.57 | 100.00 |

**Run Date:** 2013/02/28

# Hawaii Department of Transportation
## Highways Division — Highways Planning Survey Section
## 2012 Program Count - Summary

**Site ID:** B72750300000 **Town:** Oahu **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 32000
**Functional Class:** URBAN:PRINCIPAL ARTERIAL - OTHER **Count Type:** VOLUME **Counter Type:** Tube **Route No:** 7503
**Location:** Kapiolani Blvd b/t South St and Ward A

| TIME-AM | DIR 1 | DIR 2 | TOTAL | TIME-AM | DIR 1 | DIR 2 | TOTAL | TIME-PM | DIR 1 | DIR 2 | TOTAL | TIME-PM | DIR 1 | DIR 2 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DATE : 02/22/2012** | | | | | | | | | | | | | | | |
| 12:00-12:15 | 44 | 49 | 93 | 06:00-06:15 | 87 | 111 | 198 | 12:00-12:15 | 296 | 253 | 549 | 06:00-06:15 | 313 | 218 | 531 |
| 12:15-12:30 | 41 | 42 | 83 | 06:15-06:30 | 112 | 146 | 258 | 12:15-12:30 | 283 | 266 | 549 | 06:15-06:30 | 269 | 231 | 500 |
| 12:30-12:45 | 38 | 35 | 73 | 06:30-06:45 | 161 | 248 | 409 | 12:30-12:45 | 241 | 272 | 513 | 06:30-06:45 | 278 | 236 | 514 |
| 12:45-01:00 | 27 | 29 | 56 | 06:45-07:00 | 247 | 288 | 535 | 12:45-01:00 | 291 | 298 | 589 | 06:45-07:00 | 271 | 193 | 464 |
| 01:00-01:15 | 31 | 27 | 58 | 07:00-07:15 | 286 | 338 | 624 | 01:00-01:15 | 248 | 253 | 501 | 07:00-07:15 | 201 | 177 | 378 |
| 01:15-01:30 | 47 | 30 | 77 | 07:15-07:30 | 262 | 395 | 657 | 01:15-01:30 | 224 | 233 | 457 | 07:15-07:30 | 184 | 162 | 346 |
| 01:30-01:45 | 37 | 21 | 58 | 07:30-07:45 | 311 | 360 | 671 | 01:30-01:45 | 294 | 257 | 551 | 07:30-07:45 | 160 | 175 | 335 |
| 01:45-02:00 | 40 | 24 | 64 | 07:45-08:00 | 289 | 333 | 622 | 01:45-02:00 | 278 | 264 | 542 | 07:45-08:00 | 127 | 139 | 266 |
| 02:00-02:15 | 31 | 21 | 52 | 08:00-08:15 | 275 | 345 | 620 | 02:00-02:15 | 243 | 276 | 519 | 08:00-08:15 | 140 | 126 | 266 |
| 02:15-02:30 | 25 | 19 | 44 | 08:15-08:30 | 278 | 331 | 609 | 02:15-02:30 | 292 | 266 | 558 | 08:15-08:30 | 88 | 154 | 242 |
| 02:30-02:45 | 21 | 19 | 40 | 08:30-08:45 | 277 | 295 | 572 | 02:30-02:45 | 301 | 276 | 577 | 08:30-08:45 | 109 | 152 | 261 |
| 02:45-03:00 | 15 | 17 | 32 | 08:45-09:00 | 218 | 232 | 450 | 02:45-03:00 | 322 | 288 | 610 | 08:45-09:00 | 99 | 143 | 242 |
| 03:00-03:15 | 13 | 16 | 29 | 09:00-09:15 | 203 | 276 | 479 | 03:00-03:15 | 302 | 273 | 575 | 09:00-09:15 | 106 | 151 | 257 |
| 03:15-03:30 | 17 | 13 | 30 | 09:15-09:30 | 193 | 223 | 416 | 03:15-03:30 | 327 | 319 | 646 | 09:15-09:30 | 87 | 115 | 202 |
| 03:30-03:45 | 14 | 20 | 34 | 09:30-09:45 | 239 | 200 | 439 | 03:30-03:45 | 357 | 323 | 680 | 09:30-09:45 | 94 | 119 | 213 |
| 03:45-04:00 | 16 | 17 | 33 | 09:45-10:00 | 207 | 219 | 426 | 03:45-04:00 | 331 | 349 | 680 | 09:45-10:00 | 80 | 142 | 222 |
| 04:00-04:15 | 13 | 13 | 26 | 10:00-10:15 | 224 | 198 | 422 | 04:00-04:15 | 338 | 327 | 665 | 10:00-10:15 | 85 | 126 | 211 |
| 04:15-04:30 | 18 | 27 | 45 | 10:15-10:30 | 251 | 189 | 440 | 04:15-04:30 | 340 | 346 | 686 | 10:15-10:30 | 55 | 87 | 142 |
| 04:30-04:45 | 14 | 20 | 34 | 10:30-10:45 | 263 | 222 | 485 | 04:30-04:45 | 438 | 342 | 780 | 10:30-10:45 | 39 | 87 | 126 |
| 04:45-05:00 | 27 | 16 | 43 | 10:45-11:00 | 307 | 230 | 537 | 04:45-05:00 | 463 | 334 | 797 | 10:45-11:00 | 39 | 57 | 96 |
| 05:00-05:15 | 30 | 34 | 64 | 11:00-11:15 | 274 | 254 | 528 | 05:00-05:15 | 455 | 337 | 792 | 11:00-11:15 | 29 | 56 | 85 |
| 05:15-05:30 | 41 | 39 | 80 | 11:15-11:30 | 269 | 240 | 509 | 05:15-05:30 | 439 | 319 | 758 | 11:15-11:30 | 28 | 55 | 83 |
| 05:30-05:45 | 51 | 60 | 111 | 11:30-11:45 | 271 | 265 | 536 | 05:30-05:45 | 362 | 230 | 592 | 11:30-11:45 | 35 | 55 | 90 |
| 05:45-06:00 | 59 | 78 | 137 | 11:45-12:00 | 300 | 264 | 564 | 05:45-06:00 | 384 | 224 | 608 | 11:45-12:00 | 30 | 44 | 74 |

| AM COMMUTER PERIOD (05:00-09:00) | DIR 1 | DIR 2 | |
|---|---|---|---|
| TWO DIRECTIONAL PEAK | | | |
| AM - PEAK HR TIME | 07:00 AM to 08:00 AM | | |
| AM - PEAK HR VOLUME | 1148 | 1426 | 2574 |
| AM - K FACTOR (%) | | | 7.50 |
| AM - D (%) | 44.60 | 55.40 | 100.00 |
| DIRECTIONAL PEAK | | | |
| AM - PEAK HR TIME | 07:30 AM to 08:30 AM | 07:15 AM to 08:15 AM | |
| AM - PEAK HR VOLUME | 1153 | 1433 | |

| PM COMMUTER PERIOD (15:00-19:00) | DIR 1 | DIR 2 | |
|---|---|---|---|
| TWO DIRECTIONAL PEAK | | | |
| PM - PEAK HR TIME | 04:30 PM to 05:30 PM | | |
| PM - PEAK HR VOLUME | 1795 | 1332 | 3127 |
| PM - K FACTOR (%) | | | 9.11 |
| PM - D (%) | 57.40 | 42.60 | 100.00 |
| DIRECTIONAL PEAK | | | |
| PM - PEAK HR TIME | 04:30 PM to 05:30 PM | 03:45 PM to 04:45 PM | |
| PM - PEAK HR VOLUME | 1795 | 1364 | |

| AM PERIOD (00:00-12:00) | | | |
|---|---|---|---|
| TWO DIRECTIONAL PEAK | | | |
| AM - PEAK HR TIME | 07:00 AM to 08:00 AM | | |
| AM - PEAK HR VOLUME | 1148 | 1426 | 2574 |
| AM - K FACTOR (%) | | | 7.50 |
| AM - D (%) | 44.60 | 55.40 | 100.00 |

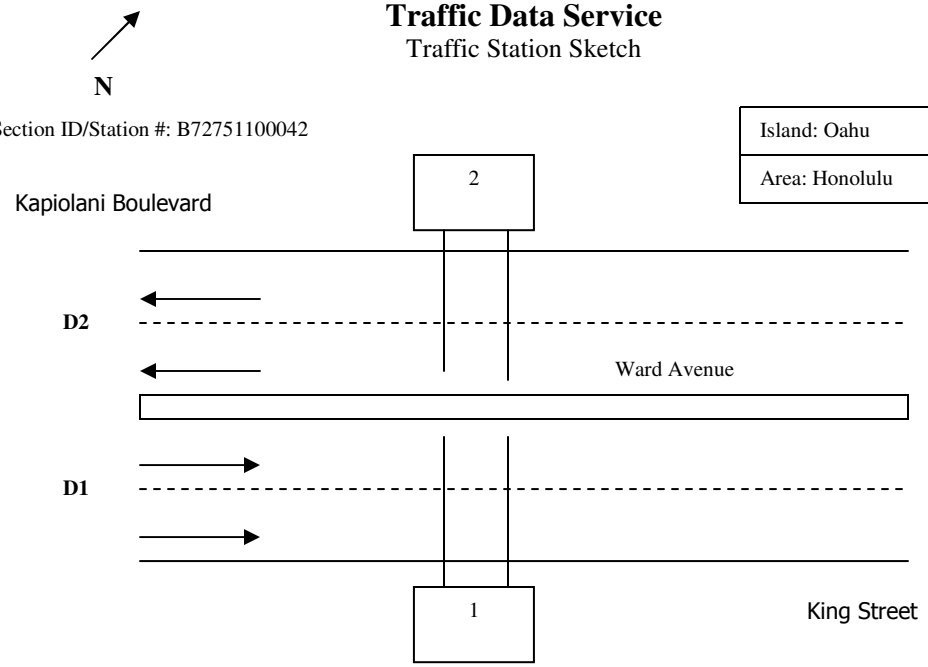
| PM PERIOD (12:00-24:00) | | | |
|---|---|---|---|
| TWO DIRECTIONAL PEAK | | | |
| PM - PEAK HR TIME | 04:30 PM to 05:30 PM | | |
| PM - PEAK HR VOLUME | 1795 | 1332 | 3127 |
| PM - K FACTOR (%) | | | 9.11 |
| PM - D (%) | 57.40 | 42.60 | 100.00 |

| NON-COMMUTER PERIOD (09:00-15:00) | | | |
|---|---|---|---|
| TWO DIRECTIONAL PEAK | | | |
| PEAK HR TIME | 02:00 PM to 03:00 PM | | |
| PEAK HR VOLUME | 1158 | 1106 | 2264 |
| DIRECTIONAL PEAK | | | |
| PEAK HR TIME | 02:00 PM to 03:00 PM | 02:00 PM to 03:00 PM | |
| PEAK HR VOLUME | 1158 | 1106 | |

| 6-HR, 12-HR, 24-HR PERIODS | DIR 1 | DIR 2 | Total |
|---|---|---|---|
| AM 6-HR PERIOD (06:00-12:00) | 5,804 | 6,202 | 12,006 |
| AM 12-HR PERIOD (00:00-12:00) | 6,514 | 6,888 | 13,402 |
| PM 6-HR PERIOD (12:00-18:00) | 7,849 | 6,925 | 14,774 |
| PM 12-HR PERIOD (12:00-24:00) | 10,795 | 10,125 | 20,920 |
| 24 HOUR PERIOD | 17,309 | 17,013 | 34,322 |
| D (%) | 50.43 | 49.57 | 100.00 |

# Traffic Data Service

Traffic Station Sketch




Section ID/Station #: B72751100042

| | |
|---|---|
| Island: Oahu | |
| Area: Honolulu | |

| Meter # | File Name | GPS |
|---|---|---|
| 1. s172 | D0229003_B72751100042 | 21.2994, -157.85233 |
| 2. bw60 | D0229004_B72751100042 | |

| | | | |
|---|---|---|---|
| Station Description: Ward Avenue: Kapiolani Boulevard to King Street | | | |
| Survey Beginning Date/Time: 2/29/2012 @ 0000 | | | Survey Ending Date/Time: 3/1/2012 @ 2400 |
| Survey Method: | Road Tube | Data Type: | Class |
| Survey Crew: | LM | | C1 |
| Sketch Updated: | | By: | SR |
| Remarks: | | | |

| FACILITY NAME | JURI | FUNC CLASS | AREA TYPE | ROUTE NO. | ROUTE MILE |
|---|---|---|---|---|---|
| Ward Avenue | | 16 | | 7511 | |

| | |
|---|---|
| D1= Direction to End | D1: King Street / Prospect Street |
| D2= Direction to Begin | D2: Kapiolani Boulevard. / Ala Moana Boulevard |

**Run Date:** 2013/02/28

# Hawaii Department of Transportation
## Highways Division — Highways Planning Survey Section
## 2012 Program Count - Summary

**Site ID:** B72751100042 **Town:** Oahu **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 21800
**Functional Class:** URBAN:MINOR ARTERIAL **Count Type:** CLASS **Counter Type:** Tube **Route No:** 7511
**Location:**

| TIME-AM | DIR 1 | DIR 2 | TOTAL | TIME-AM | DIR 1 | DIR 2 | TOTAL | TIME-PM | DIR 1 | DIR 2 | TOTAL | TIME-PM | DIR 1 | DIR 2 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DATE : 02/29/2012** | | | | | | | | | | | | | | | |
| 12:00-12:15 | 28 | 14 | 42 | 06:00-06:15 | 36 | 136 | 172 | 12:00-12:15 | 161 | 207 | 368 | 06:00-06:15 | 180 | 226 | 406 |
| 12:15-12:30 | 24 | 20 | 44 | 06:15-06:30 | 48 | 153 | 201 | 12:15-12:30 | 148 | 239 | 387 | 06:15-06:30 | 162 | 196 | 358 |
| 12:30-12:45 | 33 | 17 | 50 | 06:30-06:45 | 71 | 152 | 223 | 12:30-12:45 | 180 | 228 | 408 | 06:30-06:45 | 171 | 201 | 372 |
| 12:45-01:00 | 20 | 13 | 33 | 06:45-07:00 | 105 | 207 | 312 | 12:45-01:00 | 158 | 233 | 391 | 06:45-07:00 | 140 | 175 | 315 |
| 01:00-01:15 | 20 | 16 | 36 | 07:00-07:15 | 111 | 160 | 271 | 01:00-01:15 | 179 | 224 | 403 | 07:00-07:15 | 175 | 158 | 333 |
| 01:15-01:30 | 13 | 17 | 30 | 07:15-07:30 | 115 | 218 | 333 | 01:15-01:30 | 192 | 232 | 424 | 07:15-07:30 | 166 | 126 | 292 |
| 01:30-01:45 | 19 | 14 | 33 | 07:30-07:45 | 125 | 238 | 363 | 01:30-01:45 | 178 | 177 | 355 | 07:30-07:45 | 127 | 163 | 290 |
| 01:45-02:00 | 9 | 18 | 27 | 07:45-08:00 | 126 | 249 | 375 | 01:45-02:00 | 170 | 193 | 363 | 07:45-08:00 | 128 | 147 | 275 |
| 02:00-02:15 | 19 | 17 | 36 | 08:00-08:15 | 93 | 259 | 352 | 02:00-02:15 | 176 | 156 | 332 | 08:00-08:15 | 143 | 102 | 245 |
| 02:15-02:30 | 20 | 12 | 32 | 08:15-08:30 | 129 | 179 | 308 | 02:15-02:30 | 174 | 202 | 376 | 08:15-08:30 | 131 | 122 | 253 |
| 02:30-02:45 | 6 | 9 | 15 | 08:30-08:45 | 98 | 191 | 289 | 02:30-02:45 | 165 | 187 | 352 | 08:30-08:45 | 128 | 101 | 229 |
| 02:45-03:00 | 8 | 9 | 17 | 08:45-09:00 | 89 | 243 | 332 | 02:45-03:00 | 166 | 235 | 401 | 08:45-09:00 | 132 | 82 | 214 |
| 03:00-03:15 | 3 | 9 | 12 | 09:00-09:15 | 92 | 201 | 293 | 03:00-03:15 | 161 | 192 | 353 | 09:00-09:15 | 143 | 88 | 231 |
| 03:15-03:30 | 9 | 10 | 19 | 09:15-09:30 | 98 | 205 | 303 | 03:15-03:30 | 182 | 188 | 370 | 09:15-09:30 | 126 | 94 | 220 |
| 03:30-03:45 | 11 | 9 | 20 | 09:30-09:45 | 132 | 205 | 337 | 03:30-03:45 | 206 | 212 | 418 | 09:30-09:45 | 112 | 86 | 198 |
| 03:45-04:00 | 12 | 14 | 26 | 09:45-10:00 | 120 | 235 | 355 | 03:45-04:00 | 179 | 232 | 411 | 09:45-10:00 | 101 | 94 | 195 |
| 04:00-04:15 | 10 | 23 | 33 | 10:00-10:15 | 109 | 215 | 324 | 04:00-04:15 | 181 | 232 | 413 | 10:00-10:15 | 89 | 98 | 187 |
| 04:15-04:30 | 12 | 27 | 39 | 10:15-10:30 | 117 | 232 | 349 | 04:15-04:30 | 137 | 240 | 377 | 10:15-10:30 | 71 | 66 | 137 |
| 04:30-04:45 | 7 | 35 | 42 | 10:30-10:45 | 157 | 210 | 367 | 04:30-04:45 | 157 | 247 | 404 | 10:30-10:45 | 61 | 73 | 134 |
| 04:45-05:00 | 13 | 35 | 48 | 10:45-11:00 | 120 | 237 | 357 | 04:45-05:00 | 137 | 253 | 390 | 10:45-11:00 | 55 | 55 | 110 |
| 05:00-05:15 | 12 | 55 | 67 | 11:00-11:15 | 170 | 251 | 421 | 05:00-05:15 | 132 | 238 | 370 | 11:00-11:15 | 49 | 52 | 101 |
| 05:15-05:30 | 13 | 72 | 85 | 11:15-11:30 | 149 | 227 | 376 | 05:15-05:30 | 121 | 207 | 328 | 11:15-11:30 | 54 | 47 | 101 |
| 05:30-05:45 | 24 | 76 | 100 | 11:30-11:45 | 138 | 230 | 368 | 05:30-05:45 | 176 | 213 | 389 | 11:30-11:45 | 39 | 44 | 83 |
| 05:45-06:00 | 29 | 118 | 147 | 11:45-12:00 | 165 | 242 | 407 | 05:45-06:00 | 168 | 203 | 371 | 11:45-12:00 | 44 | 48 | 92 |

| AM COMMUTER PERIOD (05:00-09:00) | DIR 1 | DIR 2 | |
|---|---|---|---|
| TWO DIRECTIONAL PEAK | | | |
| AM - PEAK HR TIME | 07:15 AM to 08:15 AM | | |
| AM - PEAK HR VOLUME | 459 | 964 | 1423 |
| AM - K FACTOR (%) | | | 6.10 |
| AM - D (%) | 32.26 | 67.74 | 100.00 |
| DIRECTIONAL PEAK | | | |
| AM - PEAK HR TIME | 07:00 AM to 08:00 AM | 07:15 AM to 08:15 AM | |
| AM - PEAK HR VOLUME | 477 | 964 | |

| PM COMMUTER PERIOD (15:00-19:00) | DIR 1 | DIR 2 | |
|---|---|---|---|
| TWO DIRECTIONAL PEAK | | | |
| PM - PEAK HR TIME | 03:30 PM to 04:30 PM | | |
| PM - PEAK HR VOLUME | 703 | 916 | 1619 |
| PM - K FACTOR (%) | | | 6.93 |
| PM - D (%) | 43.42 | 56.58 | 100.00 |
| DIRECTIONAL PEAK | | | |
| PM - PEAK HR TIME | 03:15 PM to 04:15 PM | 04:15 PM to 05:15 PM | |
| PM - PEAK HR VOLUME | 748 | 978 | |

| AM PERIOD (00:00-12:00) | | | |
|---|---|---|---|
| TWO DIRECTIONAL PEAK | | | |
| AM - PEAK HR TIME | 11:00 AM to 12:00 PM | | |
| AM - PEAK HR VOLUME | 622 | 950 | 1572 |
| AM - K FACTOR (%) | | | 6.73 |
| AM - D (%) | 39.57 | 60.43 | 100.00 |

| PM PERIOD (12:00-24:00) | | | |
|---|---|---|---|
| TWO DIRECTIONAL PEAK | | | |
| PM - PEAK HR TIME | 12:30 PM to 01:30 PM | | |
| PM - PEAK HR VOLUME | 709 | 917 | 1626 |
| PM - K FACTOR (%) | | | 6.96 |
| PM - D (%) | 43.60 | 56.40 | 100.00 |

| NON-COMMUTER PERIOD (09:00-15:00) | | | |
|---|---|---|---|
| TWO DIRECTIONAL PEAK | | | |
| PEAK HR TIME | 12:30 PM to 01:30 PM | | |
| PEAK HR VOLUME | 709 | 917 | 1626 |
| DIRECTIONAL PEAK | | | |
| PEAK HR TIME | 01:00 PM to 02:00 PM | 11:00 AM to 12:00 PM | |
| PEAK HR VOLUME | 719 | 950 | |

| 6-HR, 12-HR, 24-HR PERIODS | DIR 1 | DIR 2 | Total |
|---|---|---|---|
| AM 6-HR PERIOD (06:00-12:00) | 2,713 | 5,075 | 7,788 |
| AM 12-HR PERIOD (00:00-12:00) | 3,087 | 5,734 | 8,821 |
| PM 6-HR PERIOD (12:00-18:00) | 3,984 | 5,170 | 9,154 |
| PM 12-HR PERIOD (12:00-24:00) | 6,711 | 7,814 | 14,525 |
| 24 HOUR PERIOD | 9,798 | 13,548 | 23,346 |
| D (%) | 41.97 | 58.03 | 100.00 |

**Run Date:** 2013/02/28

# Hawaii Department of Transportation
## Highways Division — Highways Planning Survey Section
## 2012 Program Count - Summary

**Site ID:** B72751100042 **Town:** Oahu **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 21800
**Functional Class:** URBAN:MINOR ARTERIAL **Count Type:** CLASS **Counter Type:** Tube **Route No:** 7511
**Location:**

| TIME-AM | DIR 1 | DIR 2 | TOTAL | TIME-AM | DIR 1 | DIR 2 | TOTAL | TIME-PM | DIR 1 | DIR 2 | TOTAL | TIME-PM | DIR 1 | DIR 2 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DATE : 03/01/2012** | | | | | | | | | | | | | | | |
| 12:00-12:15 | 44 | 23 | 67 | 06:00-06:15 | 41 | 130 | 171 | 12:00-12:15 | 169 | 260 | 429 | 06:00-06:15 | 194 | 174 | 368 |
| 12:15-12:30 | 27 | 17 | 44 | 06:15-06:30 | 44 | 168 | 212 | 12:15-12:30 | 159 | 181 | 340 | 06:15-06:30 | 166 | 187 | 353 |
| 12:30-12:45 | 39 | 20 | 59 | 06:30-06:45 | 53 | 160 | 213 | 12:30-12:45 | 163 | 220 | 383 | 06:30-06:45 | 167 | 165 | 332 |
| 12:45-01:00 | 35 | 15 | 50 | 06:45-07:00 | 74 | 192 | 266 | 12:45-01:00 | 167 | 223 | 390 | 06:45-07:00 | 171 | 174 | 345 |
| 01:00-01:15 | 25 | 10 | 35 | 07:00-07:15 | 105 | 191 | 296 | 01:00-01:15 | 152 | 193 | 345 | 07:00-07:15 | 151 | 164 | 315 |
| 01:15-01:30 | 26 | 10 | 36 | 07:15-07:30 | 113 | 226 | 339 | 01:15-01:30 | 176 | 205 | 381 | 07:15-07:30 | 137 | 157 | 294 |
| 01:30-01:45 | 27 | 12 | 39 | 07:30-07:45 | 121 | 240 | 361 | 01:30-01:45 | 165 | 183 | 348 | 07:30-07:45 | 147 | 177 | 324 |
| 01:45-02:00 | 42 | 21 | 63 | 07:45-08:00 | 121 | 252 | 373 | 01:45-02:00 | 166 | 204 | 370 | 07:45-08:00 | 122 | 137 | 259 |
| 02:00-02:15 | 41 | 2 | 43 | 08:00-08:15 | 102 | 221 | 323 | 02:00-02:15 | 143 | 182 | 325 | 08:00-08:15 | 122 | 136 | 258 |
| 02:15-02:30 | 31 | 15 | 46 | 08:15-08:30 | 88 | 200 | 288 | 02:15-02:30 | 193 | 168 | 361 | 08:15-08:30 | 120 | 121 | 241 |
| 02:30-02:45 | 18 | 7 | 25 | 08:30-08:45 | 102 | 215 | 317 | 02:30-02:45 | 191 | 228 | 419 | 08:30-08:45 | 135 | 126 | 261 |
| 02:45-03:00 | 19 | 15 | 34 | 08:45-09:00 | 94 | 217 | 311 | 02:45-03:00 | 163 | 185 | 348 | 08:45-09:00 | 105 | 97 | 202 |
| 03:00-03:15 | 9 | 13 | 22 | 09:00-09:15 | 104 | 225 | 329 | 03:00-03:15 | 142 | 201 | 343 | 09:00-09:15 | 146 | 88 | 234 |
| 03:15-03:30 | 10 | 14 | 24 | 09:15-09:30 | 92 | 230 | 322 | 03:15-03:30 | 188 | 191 | 379 | 09:15-09:30 | 139 | 95 | 234 |
| 03:30-03:45 | 7 | 15 | 22 | 09:30-09:45 | 115 | 229 | 344 | 03:30-03:45 | 167 | 224 | 391 | 09:30-09:45 | 97 | 90 | 187 |
| 03:45-04:00 | 14 | 24 | 38 | 09:45-10:00 | 123 | 210 | 333 | 03:45-04:00 | 201 | 216 | 417 | 09:45-10:00 | 90 | 80 | 170 |
| 04:00-04:15 | 16 | 19 | 35 | 10:00-10:15 | 141 | 227 | 368 | 04:00-04:15 | 192 | 207 | 399 | 10:00-10:15 | 88 | 64 | 152 |
| 04:15-04:30 | 16 | 31 | 47 | 10:15-10:30 | 109 | 232 | 341 | 04:15-04:30 | 168 | 216 | 384 | 10:15-10:30 | 58 | 77 | 135 |
| 04:30-04:45 | 12 | 38 | 50 | 10:30-10:45 | 128 | 206 | 334 | 04:30-04:45 | 191 | 232 | 423 | 10:30-10:45 | 73 | 65 | 138 |
| 04:45-05:00 | 11 | 40 | 51 | 10:45-11:00 | 123 | 238 | 361 | 04:45-05:00 | 154 | 220 | 374 | 10:45-11:00 | 50 | 39 | 89 |
| 05:00-05:15 | 12 | 50 | 62 | 11:00-11:15 | 121 | 242 | 363 | 05:00-05:15 | 165 | 198 | 363 | 11:00-11:15 | 45 | 49 | 94 |
| 05:15-05:30 | 14 | 87 | 101 | 11:15-11:30 | 152 | 239 | 391 | 05:15-05:30 | 168 | 230 | 398 | 11:15-11:30 | 54 | 41 | 95 |
| 05:30-05:45 | 22 | 70 | 92 | 11:30-11:45 | 141 | 233 | 374 | 05:30-05:45 | 194 | 180 | 374 | 11:30-11:45 | 43 | 36 | 79 |
| 05:45-06:00 | 22 | 89 | 111 | 11:45-12:00 | 156 | 226 | 382 | 05:45-06:00 | 177 | 211 | 388 | 11:45-12:00 | 50 | 41 | 91 |

| AM COMMUTER PERIOD (05:00-09:00) | DIR 1 | DIR 2 | |
|---|---|---|---|
| TWO DIRECTIONAL PEAK | | | |
| AM - PEAK HR TIME | 07:15 AM to 08:15 AM | | |
| AM - PEAK HR VOLUME | 457 | 939 | 1396 |
| AM - K FACTOR (%) | | | 6.01 |
| AM - D (%) | 32.74 | 67.26 | 100.00 |
| DIRECTIONAL PEAK | | | |
| AM - PEAK HR TIME | 07:00 AM to 08:00 AM | 07:15 AM to 08:15 AM | |
| AM - PEAK HR VOLUME | 460 | 939 | |

| PM COMMUTER PERIOD (15:00-19:00) | DIR 1 | DIR 2 | |
|---|---|---|---|
| TWO DIRECTIONAL PEAK | | | |
| PM - PEAK HR TIME | 03:45 PM to 04:45 PM | | |
| PM - PEAK HR VOLUME | 752 | 871 | 1623 |
| PM - K FACTOR (%) | | | 6.99 |
| PM - D (%) | 46.33 | 53.67 | 100.00 |
| DIRECTIONAL PEAK | | | |
| PM - PEAK HR TIME | 03:45 PM to 04:45 PM | 04:30 PM to 05:30 PM | |
| PM - PEAK HR VOLUME | 752 | 880 | |

| AM PERIOD (00:00-12:00) | | | |
|---|---|---|---|
| TWO DIRECTIONAL PEAK | | | |
| AM - PEAK HR TIME | 11:00 AM to 12:00 PM | | |
| AM - PEAK HR VOLUME | 570 | 940 | 1510 |
| AM - K FACTOR (%) | | | 6.50 |
| AM - D (%) | 37.75 | 62.25 | 100.00 |

| PM PERIOD (12:00-24:00) | | | |
|---|---|---|---|
| TWO DIRECTIONAL PEAK | | | |
| PM - PEAK HR TIME | 03:45 PM to 04:45 PM | | |
| PM - PEAK HR VOLUME | 752 | 871 | 1623 |
| PM - K FACTOR (%) | | | 6.99 |
| PM - D (%) | 46.33 | 53.67 | 100.00 |

| NON-COMMUTER PERIOD (09:00-15:00) | | | |
|---|---|---|---|
| TWO DIRECTIONAL PEAK | | | |
| PEAK HR TIME | 11:15 AM to 12:15 PM | | |
| PEAK HR VOLUME | 618 | 958 | 1576 |
| DIRECTIONAL PEAK | | | |
| PEAK HR TIME | 01:45 PM to 02:45 PM | 11:15 AM to 12:15 PM | |
| PEAK HR VOLUME | 693 | 958 | |

| 6-HR, 12-HR, 24-HR PERIODS | DIR 1 | DIR 2 | Total |
|---|---|---|---|
| AM 6-HR PERIOD (06:00-12:00) | 2,563 | 5,149 | 7,712 |
| AM 12-HR PERIOD (00:00-12:00) | 3,102 | 5,806 | 8,908 |
| PM 6-HR PERIOD (12:00-18:00) | 4,114 | 4,958 | 9,072 |
| PM 12-HR PERIOD (12:00-24:00) | 6,784 | 7,538 | 14,322 |
| 24 HOUR PERIOD | 9,886 | 13,344 | 23,230 |
| D (%) | 42.56 | 57.44 | 100.00 |

**Run Date:** 2013/02/28

# Hawaii Department of Transportation
## Highways Division
## Highways Planning Survey Section

## Vehicle Classification Data Summary
## 2012

| | | | | | |
|---|---|---|---|---|---|
| **Site ID:** | **B72751100042** | **Route No:** | **7511** | **Date From:** | 2012/02/29 0:00 |
| **Town:** | **Oahu** | **Direction:** | +MP | **Date To:** | 2012/03/01 23:45 |
| **Location:** | | | | | |

**Functional Classification: 16 URBAN:MINOR ARTERIAL**

**REPORT TOTALS - 48 HOURS RECORDED**

| | VOLUME | % | NUMBER OF AXLES |
|---|---|---|---|
| **Cycles** | 442 | 0.95% | 885 |
| **PC** | 20574 | 44.17% | 41148 |
| **2A-4T** | 22711 | 48.76% | 45422 |
| **LIGHT VEHICLE TOTALS** | 43728 | 93.88% | 87455 |
| | **HEAVY VEHICLES** | | |
| **Bus** | 156 | 0.33% | 390 |
| **SINGLE UNIT TRUCK** | | | |
| **2A-6T** | 405 | 0.87% | 810 |
| **3A-SU** | 525 | 1.13% | 1575 |
| **4A-SU** | 564 | 1.21% | 2256 |
| **SINGLE-TRAILER TRUCKS** | | | |
| **4A-ST** | 962 | 2.07% | 3848 |
| **5A-ST** | 23 | 0.05% | 115 |
| **6A-ST** | 54 | 0.12% | 324 |
| **MULTI-TRAILER TRUCKS** | | | |
| **5A-MT** | 62 | 0.13% | 310 |
| **6A-MT** | 41 | 0.09% | 246 |
| **7A-MT** | 55 | 0.12% | 385 |
| **HEAVY VEHICLE TOTALS** | 2847 | 6.11% | 10259 |
| **CLASSIFIED VEHICLES TOTALS** | 46574 (A) | 100.00% | 97714 (B) |
| **UNCLASSIFIED VEHICLES TOTALS** | 2 | 0.00% | |

**AXLE CORRECTION FACTOR (A/C) =** 0.953

**ROADTUBE EQUIVALENT(B/2) =** 48857 (C)

| **PEAK HOUR VOLUME :** 1584<br>2012/02/29 16:00 | **PEAK HOUR TRUCK VOLUME** | **% TOTAL PEAK HOUR VOLUME** | **24 HOUR TRUCK VOLUME** | **AADT** | **% OF AADT** | **HPMS K-FACTOR (PEAK/AADT) (ITEM 66)** |
|---|---|---|---|---|---|---|
| **SINGLE UNIT TRUCKS (TYPE 4-7)** | **44** | **(65A-1) 2.78%** | **825** | **21800** | **(65A-2) 3.78%** | **7.27%** |
| **COMBINATION (TYPE 8-13)** | **44** | **(65B-1) 2.78%** | **598** | | **(65B-2) 2.74%** | **7.27%** |

# Appendix B: Intersection Level of Service Definitions

## Highway Capacity Manual 2010

**Signalized intersection** level of service (LOS) is defined in terms of a weighted average control delay for the entire intersection. Control delay quantifies the increase in travel time that a vehicle experiences due to the traffic signal control as well as provides a surrogate measure for driver discomfort and fuel consumption. Signalized intersection LOS is stated in terms of average control delay per vehicle (in seconds) during a specified time period (e.g., weekday PM peak hour). Control delay is a complex measure based on many variables, including signal phasing and coordination (i.e., progression of movements through the intersection and along the corridor), signal cycle length, and traffic volumes with respect to intersection capacity and resulting queues. Table 1 summarizes the LOS criteria for signalized intersections, as described in the *Highway Capacity Manual 2010* (Transportation Research Board, 2010).

**Table 1. Level of Service Criteria for Signalized Intersections**

| Level of Service | Average Control Delay (seconds/vehicle) | General Description |
|---|---|---|
| A | ≤10 | Free Flow |
| B | >10 – 20 | Stable Flow (slight delays) |
| C | >20 – 35 | Stable flow (acceptable delays) |
| D | >35 – 55 | Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding) |
| E | >55 – 80 | Unstable flow (intolerable delay) |
| F[1] | >80 | Forced flow (congested and queues fail to clear) |

Source: *Highway Capacity Manual 2010*, Transportation Research Board, 2010.

1. If the volume-to-capacity (v/c) ratio for a lane group exceeds 1.0 LOS F is assigned to the individual lane group. LOS for overall approach or intersection is determined solely by the control delay.

**Unsignalized intersection** LOS criteria can be further reduced into three intersection types: all-way stop, two-way stop, and roundabout control. All-way stop and roundabout control intersection LOS is expressed in terms of the weighted average control delay of the overall intersection or by approach. Two-way stop-controlled intersection LOS is defined in terms of the average control delay for each minor-street movement (or shared movement) as well as major-street left-turns. This approach is because major-street through vehicles are assumed to experience zero delay, a weighted average of all movements results in very low overall average delay, and this calculated low delay could mask deficiencies of minor movements. Table 2 shows LOS criteria for unsignalized intersections.

**Table 2. Level of Service Criteria for Unsignalized Intersections**

| Level of Service | Average Control Delay (seconds/vehicle) |
|---|---|
| A | 0 – 10 |
| B | >10 – 15 |
| C | >15 – 25 |
| D | >25 – 35 |
| E | >35 – 50 |
| F[1] | >50 |

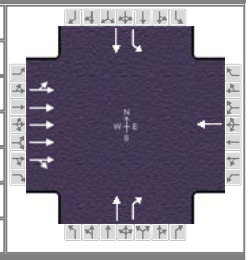
Source: *Highway Capacity Manual 2010*, Transportation Research Board, 2010.

1. If the volume-to-capacity (v/c) ratio exceeds 1.0, LOS F is assigned an individual lane group for all unsignalized intersections, or minor street approach at two-way stop-controlled intersections. Overall intersection LOS is determined solely by control delay.

# Appendix C: Highway Capacity Software 2010 Worksheets

# HCS 2010 Signalized Intersection Results Summary

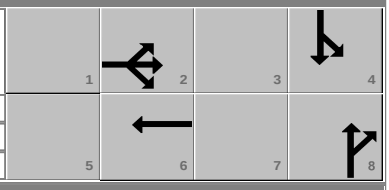
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/25/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | South King Street | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | South King and Victoria… | File Name | King_Victoria_10.18_AM_ALL.xus | | |
| Project Description | AM Peak Hour Wednesday 10/18/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | 240 | 1393 | 69 | | 0 | | | 8 | 0 | 389 | 110 | |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 90.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | No | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 58.0 | 22.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | 8 | | 4 |
| Case Number | | 8.0 | | 8.0 | | 7.0 | | 6.0 |
| Phase Duration, s | | 63.0 | | 63.0 | | 27.0 | | 27.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 0.0 | | 0.0 | | 3.2 | | 3.2 |
| Queue Clearance Time ( $g_s$ ), s | | | | | | 2.3 | | 24.0 |
| Green Extension Time ( $g_e$ ), s | | 0.0 | | 0.0 | | 1.1 | | 0.0 |
| Phase Call Probability | | | | | | 1.00 | | 1.00 |
| Max Out Probability | | | | | | 0.00 | | 1.00 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | 5 | 2 | 12 | | 6 | | | 8 | 18 | 7 | 4 | |
| Adjusted Flow Rate ( *v* ), veh/h | 356 | 1130 | 364 | | 0 | | | 9 | 0 | 423 | 120 | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | 1540 | 1729 | 1667 | | 1900 | | | 1900 | 1610 | 1429 | 1900 | |
| Queue Service Time ( $g_s$ ), s | 9.6 | 8.9 | 8.9 | | 0.0 | | | 0.3 | 0.0 | 21.7 | 4.6 | |
| Cycle Queue Clearance Time ( $g_c$ ), s | 9.6 | 8.9 | 8.9 | | 0.0 | | | 0.3 | 0.0 | 22.0 | 4.6 | |
| Green Ratio ( *g/C* ) | 0.64 | 0.64 | 0.64 | | 0.64 | | | 0.24 | 0.24 | 0.24 | 0.24 | |
| Capacity ( *c* ), veh/h | 1062 | 3343 | 1074 | | 1224 | | | 464 | 394 | 424 | 464 | |
| Volume-to-Capacity Ratio ( *X* ) | 0.336 | 0.338 | 0.339 | | 0.000 | | | 0.019 | 0.000 | 0.997 | 0.257 | |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | 78.5 | 76.9 | 78.7 | | 0 | | | 3.6 | 0 | 361.6 | 52.1 | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | 3.1 | 3.1 | 3.1 | | 0.0 | | | 0.1 | 0.0 | 14.5 | 2.1 | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | 0.00 | 0.00 | 0.00 | | 0.00 | | | 0.00 | 0.00 | 1.38 | 0.00 | |
| Uniform Delay ( $d_1$ ), s/veh | 7.4 | 7.3 | 7.3 | | 0.0 | | | 25.8 | 0.0 | 36.2 | 27.4 | |
| Incremental Delay ( $d_2$ ), s/veh | 0.9 | 0.3 | 0.9 | | 0.0 | | | 0.0 | 0.0 | 42.7 | 0.1 | |
| Initial Queue Delay ( $d_3$ ), s/veh | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.0 | |
| Control Delay ( *d* ), s/veh | 8.3 | 7.5 | 8.1 | | 0.0 | | | 25.8 | 0.0 | 78.9 | 27.5 | |
| Level of Service (LOS) | A | A | A | | | | | C | | E | C | |
| Approach Delay, s/veh / LOS | 7.8 | A | | 0.0 | | | 25.8 | C | | 67.6 | E | |
| Intersection Delay, s/veh / LOS | 21.4 | | | | | | C | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 2.4 | B | 2.6 | B | 3.6 | D | 2.8 | C |
| Bicycle LOS Score / LOS | 1.1 | A | 0.5 | A | 0.5 | A | 1.4 | A |

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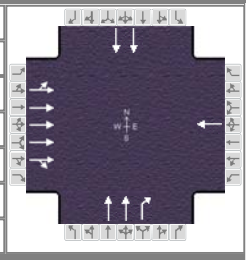
# HCS 2010 Signalized Intersection Results Summary

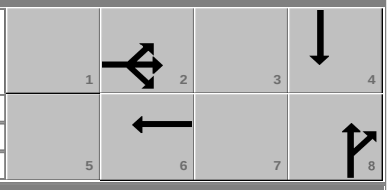
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/24/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | South King Street | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | South King Street and… | File Name | King_Ward_10.15_Sunday_ALL.xus | | |
| Project Description | AM Peak on Wednesday 10/18/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | 185 | 1456 | 80 | | 0 | | | 197 | 246 | | 1176 | |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 90.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | No | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 40.0 | 40.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | 8 | | 4 |
| Case Number | | 8.0 | | 8.0 | | 7.0 | | 8.0 |
| Phase Duration, s | | 45.0 | | 45.0 | | 45.0 | | 45.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 0.0 | | 0.0 | | 3.2 | | 3.2 |
| Queue Clearance Time ( $g_s$ ), s | | | | | | 12.0 | | 29.3 |
| Green Extension Time ( $g_e$ ), s | | 0.0 | | 0.0 | | 5.6 | | 4.2 |
| Phase Call Probability | | | | | | 1.00 | | 1.00 |
| Max Out Probability | | | | | | 0.02 | | 0.29 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | 5 | 2 | 12 | | 6 | | | 8 | 18 | | 4 | |
| Adjusted Flow Rate ( *v* ), veh/h | 374 | 1134 | 363 | | 0 | | | 214 | 267 | | 1278 | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | 1624 | 1729 | 1658 | | 1900 | | | 1809 | 1610 | | 1809 | |
| Queue Service Time ( $g_s$ ), s | 14.5 | 14.0 | 14.0 | | 0.0 | | | 3.1 | 10.0 | | 27.3 | |
| Cycle Queue Clearance Time ( $g_c$ ), s | 14.9 | 14.0 | 14.0 | | 0.0 | | | 3.1 | 10.0 | | 27.3 | |
| Green Ratio ( *g/C* ) | 0.44 | 0.44 | 0.44 | | 0.44 | | | 0.44 | 0.44 | | 0.44 | |
| Capacity ( *c* ), veh/h | 783 | 2305 | 737 | | 844 | | | 1608 | 716 | | 1608 | |
| Volume-to-Capacity Ratio ( *X* ) | 0.477 | 0.492 | 0.493 | | 0.000 | | | 0.133 | 0.374 | | 0.795 | |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | 147.4 | 139.4 | 142.4 | | 0 | | | 32 | 90.5 | | 291.6 | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | 5.9 | 5.6 | 5.7 | | 0.0 | | | 1.3 | 3.6 | | 11.7 | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | 0.00 | 0.00 | 0.00 | | 0.00 | | | 0.00 | 0.00 | | 0.00 | |
| Uniform Delay ( $d_1$ ), s/veh | 18.0 | 17.8 | 17.8 | | 0.0 | | | 14.8 | 16.7 | | 21.5 | |
| Incremental Delay ( $d_2$ ), s/veh | 2.1 | 0.8 | 2.3 | | 0.0 | | | 0.0 | 0.1 | | 2.6 | |
| Initial Queue Delay ( $d_3$ ), s/veh | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.0 | 0.0 | | 0.0 | |
| Control Delay ( *d* ), s/veh | 20.1 | 18.5 | 20.1 | | 0.0 | | | 14.8 | 16.8 | | 24.1 | |
| Level of Service (LOS) | C | B | C | | | | | B | B | | C | |
| Approach Delay, s/veh / LOS | 19.1 | B | | 0.0 | | | 15.9 | B | | 24.1 | C | |
| Intersection Delay, s/veh / LOS | 20.5 | | | | | | C | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 2.8 | C | 2.7 | B | 3.5 | D | 2.7 | B |
| Bicycle LOS Score / LOS | 1.1 | A | 0.5 | A | 0.9 | A | 1.5 | A |

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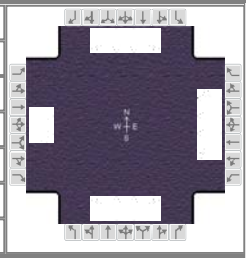
# HCS 2010 Signalized Intersection Results Summary

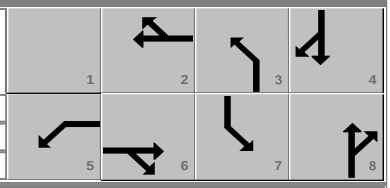
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/25/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | Kapiolani Boulevard | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | Kapiolani and Ward Ave… | File Name | Kapiolani_Ward_10.18_AM_ALL.xus | | |
| Project Description | AM Peak Hour Wednesday 10/18/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | | 492 | 107 | 243 | 1244 | 87 | 126 | 356 | 78 | 188 | 796 | 272 |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 120.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | No | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 20.0 | 27.0 | 13.0 | 3.0 | 32.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 0.0 |
| Red | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 6 | 5 | 2 | 3 | 8 | 7 | 4 |
| Case Number | | 8.3 | 2.0 | 4.0 | 2.0 | 3.0 | 2.0 | 3.0 |
| Phase Duration, s | | 32.0 | 25.0 | 57.0 | 18.0 | 37.0 | 26.0 | 45.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 0.0 | 3.3 | 0.0 | 3.3 | 3.2 | 3.3 | 3.2 |
| Queue Clearance Time ( $g_s$ ), s | | | 19.1 | | 10.8 | 12.5 | 14.6 | 27.1 |
| Green Extension Time ( $g_e$ ), s | | 0.0 | 0.1 | 0.0 | 0.0 | 4.5 | 0.2 | 4.0 |
| Phase Call Probability | | | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 |
| Max Out Probability | | | 1.00 | | 1.00 | 0.04 | 0.05 | 0.16 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | | 6 | 16 | 5 | 2 | 12 | 3 | 8 | 18 | 7 | 4 | 14 |
| Adjusted Flow Rate ( *v* ), veh/h | | 335 | 316 | 264 | 976 | 471 | 137 | 387 | 85 | 204 | 865 | 296 |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | | 1900 | 1782 | 1810 | 1900 | 1834 | 1810 | 1809 | 1610 | 1810 | 1809 | 1610 |
| Queue Service Time ( $g_s$ ), s | | 19.8 | 20.1 | 17.1 | 23.5 | 23.5 | 8.8 | 10.5 | 4.9 | 12.6 | 25.1 | 18.0 |
| Cycle Queue Clearance Time ( $g_c$ ), s | | 19.8 | 20.1 | 17.1 | 23.5 | 23.5 | 8.8 | 10.5 | 4.9 | 12.6 | 25.1 | 18.0 |
| Green Ratio ( *g/C* ) | | 0.22 | 0.22 | 0.17 | 0.43 | 0.43 | 0.11 | 0.27 | 0.27 | 0.18 | 0.33 | 0.33 |
| Capacity ( *c* ), veh/h | | 428 | 401 | 302 | 1647 | 795 | 196 | 965 | 429 | 317 | 1206 | 537 |
| Volume-to-Capacity Ratio ( *X* ) | | 0.783 | 0.789 | 0.876 | 0.593 | 0.593 | 0.699 | 0.401 | 0.197 | 0.645 | 0.718 | 0.551 |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | | 275.1 | 262.9 | 242.2 | 275 | 274.6 | 112.3 | 118.2 | 48.9 | 150.6 | 285.4 | 179.6 |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | | 11.0 | 10.5 | 9.7 | 11.0 | 11.0 | 4.5 | 4.7 | 2.0 | 6.0 | 11.4 | 7.2 |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.80 | 0.00 | 0.27 | 0.61 | 0.00 | 0.00 |
| Uniform Delay ( $d_1$ ), s/veh | | 43.7 | 43.8 | 48.8 | 25.9 | 25.9 | 51.6 | 36.1 | 34.1 | 46.0 | 35.0 | 32.7 |
| Incremental Delay ( $d_2$ ), s/veh | | 13.4 | 14.5 | 23.0 | 1.6 | 3.2 | 8.9 | 0.1 | 0.1 | 3.5 | 1.8 | 0.7 |
| Initial Queue Delay ( $d_3$ ), s/veh | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Control Delay ( *d* ), s/veh | | 57.1 | 58.3 | 71.8 | 27.5 | 29.2 | 60.5 | 36.2 | 34.1 | 49.6 | 36.8 | 33.4 |
| Level of Service (LOS) | | E | E | E | C | C | E | D | C | D | D | C |
| Approach Delay, s/veh / LOS | 57.7 | E | | 34.8 | C | | 41.4 | D | | 38.0 | D | |
| Intersection Delay, s/veh / LOS | 40.2 | | | | | | D | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 3.0 | C | 2.9 | C | 3.0 | C | 3.1 | C |
| Bicycle LOS Score / LOS | 1.0 | A | 1.4 | A | 1.0 | A | 1.6 | A |

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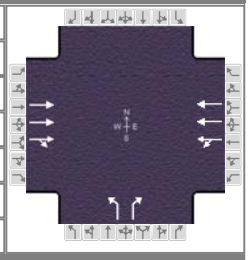
# HCS 2010 Signalized Intersection Results Summary

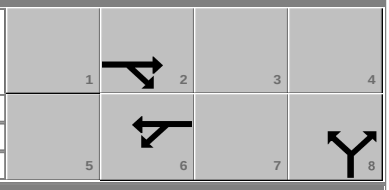
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/24/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | Kapiolani Boulevard | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | Kapiolani and Kamakee | File Name | Kapiolani_Kamakee_10.18_AM_ALL.xus | | |
| Project Description | AM Peak on Wednesday 10/18/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | | 653 | 105 | 177 | 1535 | | 82 | | 46 | | | |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 120.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | No | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 85.0 | 25.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | 8 | | |
| Case Number | | 8.0 | | 8.0 | | 9.0 | | |
| Phase Duration, s | | 90.0 | | 90.0 | | 30.0 | | |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | 5.0 | | |
| Max Allow Headway ( *MAH* ), s | | 0.0 | | 0.0 | | 3.3 | | |
| Queue Clearance Time ( $g_s$ ), s | | | | | | 6.9 | | |
| Green Extension Time ( $g_e$ ), s | | 0.0 | | 0.0 | | 0.2 | | |
| Phase Call Probability | | | | | | 1.00 | | |
| Max Out Probability | | | | | | 0.00 | | |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | | 2 | 12 | 1 | 6 | | 3 | | 18 | | | |
| Adjusted Flow Rate ( *v* ), veh/h | | 560 | 264 | 438 | 1423 | | 89 | | 50 | | | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | | 1900 | 1763 | 1003 | 1729 | | 1810 | | 1610 | | | |
| Queue Service Time ( $g_s$ ), s | | 6.0 | 6.2 | 26.0 | 19.7 | | 4.9 | | 3.0 | | | |
| Cycle Queue Clearance Time ( $g_c$ ), s | | 6.0 | 6.2 | 32.2 | 19.7 | | 4.9 | | 3.0 | | | |
| Green Ratio ( *g/C* ) | | 0.71 | 0.71 | 0.71 | 0.71 | | 0.21 | | 0.21 | | | |
| Capacity ( *c* ), veh/h | | 2692 | 1249 | 754 | 2449 | | 377 | | 335 | | | |
| Volume-to-Capacity Ratio ( *X* ) | | 0.208 | 0.211 | 0.581 | 0.581 | | 0.236 | | 0.149 | | | |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | | 59.4 | 57.9 | 170.6 | 221.6 | | 55.9 | | 30.8 | | | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | | 2.4 | 2.3 | 6.8 | 8.9 | | 2.2 | | 1.2 | | | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | | 0.00 | 0.00 | 0.00 | 0.00 | | 0.40 | | 0.22 | | | |
| Uniform Delay ( $d_1$ ), s/veh | | 6.0 | 6.0 | 10.8 | 8.7 | | 39.6 | | 38.8 | | | |
| Incremental Delay ( $d_2$ ), s/veh | | 0.2 | 0.4 | 3.3 | 1.0 | | 0.1 | | 0.1 | | | |
| Initial Queue Delay ( $d_3$ ), s/veh | | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | | 0.0 | | | |
| Control Delay ( *d* ), s/veh | | 6.2 | 6.4 | 14.1 | 9.7 | | 39.7 | | 38.9 | | | |
| Level of Service (LOS) | | A | A | B | A | | D | | D | | | |
| Approach Delay, s/veh / LOS | 6.2 | A | | 10.7 | B | | 39.4 | D | | 0.0 | | |
| Intersection Delay, s/veh / LOS | 10.8 | | | | | | B | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 1.6 | A | 0.7 | A | 3.2 | C | 3.2 | C |
| Bicycle LOS Score / LOS | 0.9 | A | 1.5 | A | | F | | |

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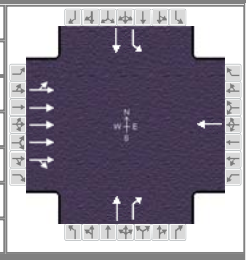
# HCS 2010 Signalized Intersection Results Summary

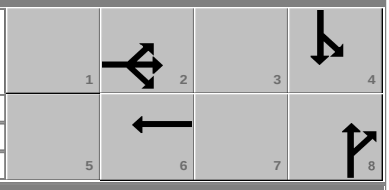
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/25/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | South King Street | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | South King and Victoria… | File Name | King_Victoria_10.18_PM_ALL.xus | | |
| Project Description | PM Peak Hour Wednesday 10/18/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | 419 | 1800 | 152 | | 0 | | | 152 | 107 | 206 | 110 | |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 90.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 58.0 | 22.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | 8 | | 4 |
| Case Number | | 8.0 | | 8.0 | | 7.0 | | 6.0 |
| Phase Duration, s | | 63.0 | | 63.0 | | 27.0 | | 27.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 3.2 | | 0.0 | | 3.4 | | 3.4 |
| Queue Clearance Time ( $g_s$ ), s | | 17.4 | | | | 8.5 | | 24.0 |
| Green Extension Time ( $g_e$ ), s | | 9.4 | | 0.0 | | 1.2 | | 0.0 |
| Phase Call Probability | | 1.00 | | | | 1.00 | | 1.00 |
| Max Out Probability | | 0.04 | | | | 0.01 | | 1.00 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | 5 | 2 | 12 | | 6 | | | 8 | 18 | 7 | 4 | |
| Adjusted Flow Rate ( *v* ), veh/h | 473 | 1562 | 499 | | 0 | | | 165 | 100 | 224 | 120 | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | 1453 | 1729 | 1656 | | 1900 | | | 1900 | 1610 | 1240 | 1900 | |
| Queue Service Time ( $g_s$ ), s | 15.4 | 13.8 | 13.8 | | 0.0 | | | 6.5 | 4.5 | 15.5 | 4.6 | |
| Cycle Queue Clearance Time ( $g_c$ ), s | 15.4 | 13.8 | 13.8 | | 0.0 | | | 6.5 | 4.5 | 22.0 | 4.6 | |
| Green Ratio ( *g/C* ) | 0.64 | 0.64 | 0.64 | | 0.64 | | | 0.24 | 0.24 | 0.24 | 0.24 | |
| Capacity ( *c* ), veh/h | 1015 | 3343 | 1067 | | 1224 | | | 464 | 394 | 294 | 464 | |
| Volume-to-Capacity Ratio ( *X* ) | 0.466 | 0.467 | 0.467 | | 0.000 | | | 0.356 | 0.254 | 0.762 | 0.257 | |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | 110.3 | 116 | 111.7 | | 0 | | | 73.9 | 43.5 | 143.7 | 52.1 | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | 4.4 | 4.6 | 4.5 | | 0.0 | | | 3.0 | 1.7 | 5.7 | 2.1 | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | 0.00 | 0.00 | 0.00 | | 0.00 | | | 0.00 | 0.32 | 0.55 | 0.00 | |
| Uniform Delay ( $d_1$ ), s/veh | 8.4 | 8.1 | 8.1 | | 0.0 | | | 28.1 | 27.4 | 37.6 | 27.4 | |
| Incremental Delay ( $d_2$ ), s/veh | 0.1 | 0.0 | 0.1 | | 0.0 | | | 0.2 | 0.1 | 10.1 | 0.1 | |
| Initial Queue Delay ( $d_3$ ), s/veh | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.0 | |
| Control Delay ( *d* ), s/veh | 8.6 | 8.2 | 8.3 | | 0.0 | | | 28.3 | 27.5 | 47.7 | 27.5 | |
| Level of Service (LOS) | A | A | A | | | | | C | C | D | C | |
| Approach Delay, s/veh / LOS | 8.3 | A | | 0.0 | | | 28.0 | C | | 40.7 | D | |
| Intersection Delay, s/veh / LOS | 13.5 | | | | | | B | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 2.4 | B | 2.8 | C | 3.6 | D | 2.7 | B |
| Bicycle LOS Score / LOS | 1.3 | A | 0.5 | A | 0.9 | A | 1.1 | A |

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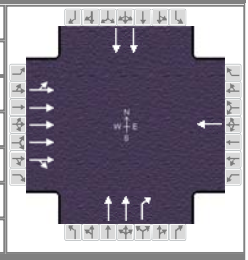
# HCS 2010 Signalized Intersection Results Summary

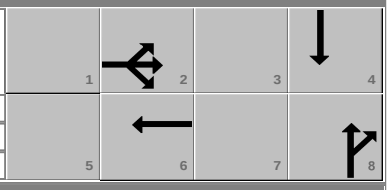
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/25/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | South King Street | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | South King and Ward Av… | File Name | King_Ward_10.18_PM_ALL.xus | | |
| Project Description | PM Peak Wednesday 10/18/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | 248 | 2049 | 147 | | 0 | | | 455 | 342 | | 1138 | |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 90.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 50.0 | 30.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | 8 | | 4 |
| Case Number | | 8.0 | | 8.0 | | 7.0 | | 8.0 |
| Phase Duration, s | | 55.0 | | 55.0 | | 35.0 | | 35.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 3.2 | | 0.0 | | 3.2 | | 3.2 |
| Queue Clearance Time ( $g_s$ ), s | | 20.6 | | | | 17.4 | | 32.0 |
| Green Extension Time ( $g_e$ ), s | | 9.3 | | 0.0 | | 5.3 | | 0.0 |
| Phase Call Probability | | 1.00 | | | | 1.00 | | 1.00 |
| Max Out Probability | | 0.12 | | | | 0.29 | | 1.00 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | 5 | 2 | 12 | | 6 | | | 8 | 18 | | 4 | |
| Adjusted Flow Rate ( *v* ), veh/h | 516 | 1588 | 509 | | 0 | | | 495 | 328 | | 1237 | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | 1628 | 1729 | 1661 | | 1900 | | | 1809 | 1610 | | 1809 | |
| Queue Service Time ( $g_s$ ), s | 18.6 | 17.7 | 17.7 | | 0.0 | | | 9.5 | 15.4 | | 30.0 | |
| Cycle Queue Clearance Time ( $g_c$ ), s | 18.6 | 17.7 | 17.7 | | 0.0 | | | 9.5 | 15.4 | | 30.0 | |
| Green Ratio ( *g/C* ) | 0.56 | 0.56 | 0.56 | | 0.56 | | | 0.33 | 0.33 | | 0.33 | |
| Capacity ( *c* ), veh/h | 966 | 2882 | 923 | | 1056 | | | 1206 | 537 | | 1206 | |
| Volume-to-Capacity Ratio ( *X* ) | 0.535 | 0.551 | 0.551 | | 0.000 | | | 0.410 | 0.612 | | 1.026 | |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | 162 | 161.9 | 157.4 | | 0 | | | 100.5 | 149.9 | | 453.4 | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | 6.5 | 6.5 | 6.3 | | 0.0 | | | 4.0 | 6.0 | | 18.1 | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | 0.00 | 0.00 | 0.00 | | 0.00 | | | 0.00 | 0.00 | | 0.00 | |
| Uniform Delay ( $d_1$ ), s/veh | 13.0 | 12.8 | 12.8 | | 0.0 | | | 23.2 | 25.1 | | 30.0 | |
| Incremental Delay ( $d_2$ ), s/veh | 0.3 | 0.1 | 0.4 | | 0.0 | | | 0.1 | 1.5 | | 32.7 | |
| Initial Queue Delay ( $d_3$ ), s/veh | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.0 | 0.0 | | 0.0 | |
| Control Delay ( *d* ), s/veh | 13.3 | 12.9 | 13.2 | | 0.0 | | | 23.3 | 26.6 | | 62.7 | |
| Level of Service (LOS) | B | B | B | | | | | C | C | | F | |
| Approach Delay, s/veh / LOS | 13.1 | B | | 0.0 | | | 24.6 | C | | 62.7 | E | |
| Intersection Delay, s/veh / LOS | 28.2 | | | | | | C | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 2.9 | C | 2.7 | B | 3.6 | D | 2.8 | C |
| Bicycle LOS Score / LOS | 1.3 | A | 0.5 | A | 1.2 | A | 1.5 | A |

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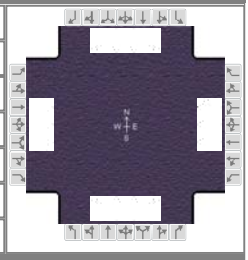
# HCS 2010 Signalized Intersection Results Summary

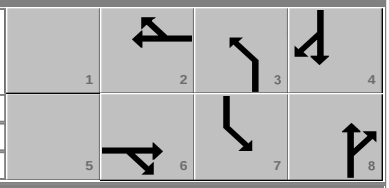
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/25/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | Kapiolani Boulevard | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | Kapiolani and Ward Ave… | File Name | Kapiolani_Ward_10.18_PM_ALL.xus | | |
| Project Description | PM Peak Wednesday 10/18/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | | 1337 | 126 | | 1263 | 232 | 182 | 565 | 233 | 293 | 834 | 158 |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 120.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 55.0 | 15.0 | 5.0 | 25.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 4.0 | 4.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 1.0 | 1.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 6 | | 2 | 3 | 8 | 7 | 4 |
| Case Number | | 8.0 | | 8.0 | 2.0 | 3.0 | 2.0 | 3.0 |
| Phase Duration, s | | 60.0 | | 60.0 | 20.0 | 30.0 | 30.0 | 40.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 3.2 | | 3.2 | 3.3 | 3.2 | 3.3 | 3.2 |
| Queue Clearance Time ( $g_s$ ), s | | 26.9 | | 27.2 | 14.9 | 21.4 | 22.3 | 30.4 |
| Green Extension Time ( $g_e$ ), s | | 11.7 | | 11.6 | 0.0 | 2.1 | 0.2 | 2.5 |
| Phase Call Probability | | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Max Out Probability | | 0.25 | | 0.25 | 1.00 | 0.95 | 1.00 | 0.81 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | | 6 | 16 | | 2 | 12 | 3 | 8 | 18 | 7 | 4 | 14 |
| Adjusted Flow Rate ( *v* ), veh/h | | 1051 | 507 | | 1062 | 498 | 198 | 614 | 221 | 318 | 907 | 139 |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | | 1900 | 1832 | | 1900 | 1780 | 1810 | 1809 | 1610 | 1810 | 1809 | 1610 |
| Queue Service Time ( $g_s$ ), s | | 24.8 | 24.9 | | 25.0 | 25.2 | 12.9 | 19.4 | 15.1 | 20.3 | 28.4 | 8.0 |
| Cycle Queue Clearance Time ( $g_c$ ), s | | 24.8 | 24.9 | | 25.0 | 25.2 | 12.9 | 19.4 | 15.1 | 20.3 | 28.4 | 8.0 |
| Green Ratio ( *g/C* ) | | 0.46 | 0.46 | | 0.46 | 0.46 | 0.12 | 0.21 | 0.21 | 0.21 | 0.29 | 0.29 |
| Capacity ( *c* ), veh/h | | 1742 | 840 | | 1742 | 816 | 226 | 754 | 335 | 377 | 1055 | 470 |
| Volume-to-Capacity Ratio ( *X* ) | | 0.603 | 0.603 | | 0.610 | 0.610 | 0.875 | 0.815 | 0.658 | 0.845 | 0.859 | 0.296 |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | | 281.7 | 274.3 | | 286 | 271.2 | 191.7 | 236 | 160.2 | 269 | 342.1 | 80.1 |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | | 11.3 | 11.0 | | 11.4 | 10.8 | 7.7 | 9.4 | 6.4 | 10.8 | 13.7 | 3.2 |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | | 0.00 | 0.00 | | 0.00 | 0.00 | 1.37 | 0.00 | 0.89 | 1.09 | 0.00 | 0.00 |
| Uniform Delay ( $d_1$ ), s/veh | | 24.3 | 24.3 | | 24.4 | 24.4 | 51.6 | 45.3 | 43.6 | 45.6 | 40.2 | 33.0 |
| Incremental Delay ( $d_2$ ), s/veh | | 0.4 | 0.9 | | 0.5 | 1.0 | 28.4 | 6.4 | 3.7 | 15.2 | 6.9 | 0.1 |
| Initial Queue Delay ( $d_3$ ), s/veh | | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Control Delay ( *d* ), s/veh | | 24.8 | 25.2 | | 24.9 | 25.4 | 80.0 | 51.7 | 47.3 | 60.9 | 47.1 | 33.1 |
| Level of Service (LOS) | | C | C | | C | C | E | D | D | E | D | C |
| Approach Delay, s/veh / LOS | 24.9 | C | | 25.1 | C | | 56.2 | E | | 48.9 | D | |
| Intersection Delay, s/veh / LOS | 36.7 | | | | | | D | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 3.0 | C | 3.0 | C | 3.3 | C | 3.2 | C |
| Bicycle LOS Score / LOS | 1.3 | A | 1.3 | A | 1.3 | A | 1.6 | A |

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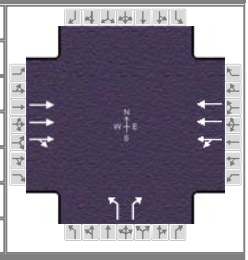
# HCS 2010 Signalized Intersection Results Summary

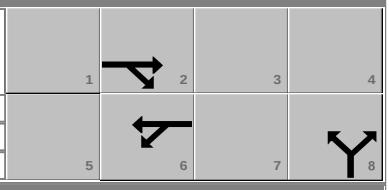
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/24/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | Kapiolani Boulevard | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | Kapiolani and Kamakee | File Name | Kapiolani_Kamakee_10.18_PM_ALL.xus | | |
| Project Description | PM Peak on Wednesday 10/18/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | | 1769 | 94 | 48 | 933 | | 139 | | 181 | | | |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 120.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 85.0 | 25.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | 8 | | |
| Case Number | | 8.0 | | 8.0 | | 9.0 | | |
| Phase Duration, s | | 90.0 | | 90.0 | | 30.0 | | |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | 5.0 | | |
| Max Allow Headway ( *MAH* ), s | | 3.4 | | 3.4 | | 3.4 | | |
| Queue Clearance Time ( $g_s$ ), s | | 21.4 | | 27.9 | | 15.2 | | |
| Green Extension Time ( $g_e$ ), s | | 17.4 | | 17.1 | | 0.6 | | |
| Phase Call Probability | | 1.00 | | 1.00 | | 1.00 | | |
| Max Out Probability | | 0.07 | | 0.09 | | 0.01 | | |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | | 2 | 12 | 1 | 6 | | 3 | | 18 | | | |
| Adjusted Flow Rate ( *v* ), veh/h | | 1352 | 662 | 119 | 947 | | 151 | | 197 | | | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | | 1900 | 1854 | 390 | 1729 | | 1810 | | 1610 | | | |
| Queue Service Time ( $g_s$ ), s | | 19.3 | 19.4 | 6.5 | 10.0 | | 8.7 | | 13.2 | | | |
| Cycle Queue Clearance Time ( $g_c$ ), s | | 19.3 | 19.4 | 25.9 | 10.0 | | 8.7 | | 13.2 | | | |
| Green Ratio ( *g/C* ) | | 0.71 | 0.71 | 0.71 | 0.71 | | 0.21 | | 0.21 | | | |
| Capacity ( *c* ), veh/h | | 2692 | 1313 | 319 | 2449 | | 377 | | 335 | | | |
| Volume-to-Capacity Ratio ( *X* ) | | 0.502 | 0.504 | 0.374 | 0.387 | | 0.401 | | 0.586 | | | |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | | 185.5 | 182.7 | 23.1 | 115.1 | | 98.4 | | 137 | | | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | | 7.4 | 7.3 | 0.9 | 4.6 | | 3.9 | | 5.5 | | | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | | 0.00 | 0.00 | 0.00 | 0.00 | | 0.70 | | 0.98 | | | |
| Uniform Delay ( $d_1$ ), s/veh | | 7.9 | 7.9 | 7.1 | 7.0 | | 41.0 | | 42.8 | | | |
| Incremental Delay ( $d_2$ ), s/veh | | 0.1 | 0.1 | 0.3 | 0.0 | | 0.3 | | 1.8 | | | |
| Initial Queue Delay ( $d_3$ ), s/veh | | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | | 0.0 | | | |
| Control Delay ( *d* ), s/veh | | 8.0 | 8.1 | 7.4 | 7.1 | | 41.3 | | 44.6 | | | |
| Level of Service (LOS) | | A | A | A | A | | D | | D | | | |
| Approach Delay, s/veh / LOS | 8.0 | A | | 7.1 | A | | 43.2 | D | | 0.0 | | |
| Intersection Delay, s/veh / LOS | 11.3 | | | | | | B | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 1.6 | A | 0.7 | A | 3.2 | C | 3.2 | C |
| Bicycle LOS Score / LOS | 1.6 | A | 1.1 | A | | F | | |

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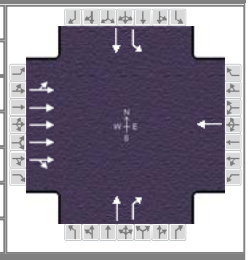
# HCS 2010 Signalized Intersection Results Summary

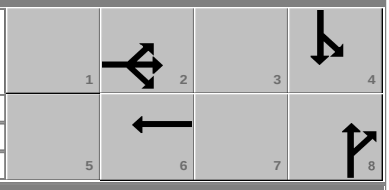
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/25/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | South King Street | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | South King and Victoria… | File Name | King_Victoria_10.18_EVENT.xus | | |
| Project Description | Event Peak Hour Wednesday 10/18/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | 176 | 1342 | 155 | | 0 | | | 36 | 47 | 149 | 168 | |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 90.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 50.0 | 30.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | 8 | | 4 |
| Case Number | | 8.0 | | 8.0 | | 7.0 | | 6.0 |
| Phase Duration, s | | 55.0 | | 55.0 | | 35.0 | | 35.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 3.2 | | 0.0 | | 3.2 | | 3.2 |
| Queue Clearance Time ( $g_s$ ), s | | 13.2 | | | | 3.8 | | 11.3 |
| Green Extension Time ( $g_e$ ), s | | 5.4 | | 0.0 | | 0.8 | | 0.8 |
| Phase Call Probability | | 1.00 | | | | 1.00 | | 1.00 |
| Max Out Probability | | 0.00 | | | | 0.00 | | 0.00 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | 5 | 2 | 12 | | 6 | | | 8 | 18 | 7 | 4 | |
| Adjusted Flow Rate ( *v* ), veh/h | 363 | 1103 | 341 | | 0 | | | 39 | 47 | 162 | 183 | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | 1634 | 1729 | 1596 | | 1900 | | | 1900 | 1610 | 1390 | 1900 | |
| Queue Service Time ( $g_s$ ), s | 9.9 | 10.8 | 10.9 | | 0.0 | | | 1.3 | 1.8 | 8.1 | 6.4 | |
| Cycle Queue Clearance Time ( $g_c$ ), s | 11.2 | 10.8 | 10.9 | | 0.0 | | | 1.3 | 1.8 | 9.3 | 6.4 | |
| Green Ratio ( *g/C* ) | 0.56 | 0.56 | 0.56 | | 0.56 | | | 0.33 | 0.33 | 0.33 | 0.33 | |
| Capacity ( *c* ), veh/h | 969 | 2882 | 887 | | 1056 | | | 633 | 537 | 524 | 633 | |
| Volume-to-Capacity Ratio ( *X* ) | 0.375 | 0.383 | 0.385 | | 0.000 | | | 0.062 | 0.087 | 0.309 | 0.288 | |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | 98.4 | 98.8 | 92.1 | | 0 | | | 14 | 16.9 | 66.2 | 71 | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | 3.9 | 4.0 | 3.7 | | 0.0 | | | 0.6 | 0.7 | 2.6 | 2.8 | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | 0.00 | 0.00 | 0.00 | | 0.00 | | | 0.00 | 0.12 | 0.25 | 0.00 | |
| Uniform Delay ( $d_1$ ), s/veh | 11.3 | 11.3 | 11.3 | | 0.0 | | | 20.4 | 20.6 | 23.6 | 22.1 | |
| Incremental Delay ( $d_2$ ), s/veh | 0.1 | 0.0 | 0.1 | | 0.0 | | | 0.0 | 0.0 | 0.1 | 0.1 | |
| Initial Queue Delay ( $d_3$ ), s/veh | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.0 | |
| Control Delay ( *d* ), s/veh | 11.4 | 11.3 | 11.4 | | 0.0 | | | 20.4 | 20.6 | 23.7 | 22.2 | |
| Level of Service (LOS) | B | B | B | | | | | C | C | C | C | |
| Approach Delay, s/veh / LOS | 11.4 | B | | 0.0 | | | 20.5 | C | | 22.9 | C | |
| Intersection Delay, s/veh / LOS | 13.5 | | | | | | B | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 2.4 | B | 2.8 | C | 3.6 | D | 2.8 | C |
| Bicycle LOS Score / LOS | 1.1 | A | 0.5 | A | 0.6 | A | 1.1 | A |

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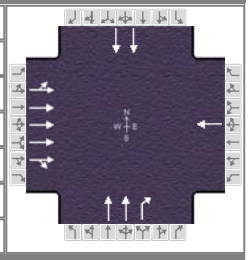
# HCS 2010 Signalized Intersection Results Summary

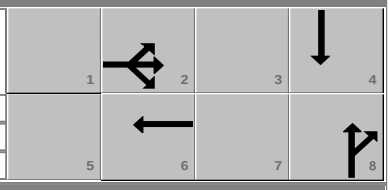
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/25/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | South King Street | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | South King and Ward Av… | File Name | King_Ward_10.18_EVENT_ALL.xus | | |
| Project Description | Event Peak Wednesday 10/18/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | 337 | 1372 | 89 | | 0 | | | 562 | 301 | | 1129 | |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 90.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 45.0 | 35.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | 8 | | 4 |
| Case Number | | 8.0 | | 8.0 | | 7.0 | | 8.0 |
| Phase Duration, s | | 50.0 | | 50.0 | | 40.0 | | 40.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 3.2 | | 0.0 | | 3.2 | | 3.2 |
| Queue Clearance Time ( $g_s$ ), s | | 17.5 | | | | 13.8 | | 30.2 |
| Green Extension Time ( $g_e$ ), s | | 5.8 | | 0.0 | | 6.7 | | 2.9 |
| Phase Call Probability | | 1.00 | | | | 1.00 | | 1.00 |
| Max Out Probability | | 0.03 | | | | 0.10 | | 0.82 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | 5 | 2 | 12 | | 6 | | | 8 | 18 | | 4 | |
| Adjusted Flow Rate ( *v* ), veh/h | 371 | 1191 | 382 | | 0 | | | 611 | 284 | | 1227 | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | 1444 | 1729 | 1662 | | 1900 | | | 1809 | 1610 | | 1809 | |
| Queue Service Time ( $g_s$ ), s | 15.5 | 13.4 | 13.4 | | 0.0 | | | 11.2 | 11.8 | | 28.2 | |
| Cycle Queue Clearance Time ( $g_c$ ), s | 15.5 | 13.4 | 13.4 | | 0.0 | | | 11.2 | 11.8 | | 28.2 | |
| Green Ratio ( *g/C* ) | 0.50 | 0.50 | 0.50 | | 0.50 | | | 0.39 | 0.39 | | 0.39 | |
| Capacity ( *c* ), veh/h | 802 | 2594 | 831 | | 950 | | | 1407 | 626 | | 1407 | |
| Volume-to-Capacity Ratio ( *X* ) | 0.463 | 0.459 | 0.460 | | 0.000 | | | 0.434 | 0.453 | | 0.872 | |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | 123.7 | 126.8 | 122.6 | | 0 | | | 116.2 | 109.4 | | 322.3 | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | 4.9 | 5.1 | 4.9 | | 0.0 | | | 4.6 | 4.4 | | 12.9 | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | 0.00 | 0.00 | 0.00 | | 0.00 | | | 0.00 | 0.00 | | 0.00 | |
| Uniform Delay ( $d_1$ ), s/veh | 15.1 | 14.6 | 14.6 | | 0.0 | | | 20.2 | 20.4 | | 25.4 | |
| Incremental Delay ( $d_2$ ), s/veh | 0.2 | 0.0 | 0.1 | | 0.0 | | | 0.1 | 0.2 | | 6.0 | |
| Initial Queue Delay ( $d_3$ ), s/veh | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.0 | 0.0 | | 0.0 | |
| Control Delay ( *d* ), s/veh | 15.3 | 14.6 | 14.8 | | 0.0 | | | 20.3 | 20.6 | | 31.5 | |
| Level of Service (LOS) | B | B | B | | | | | C | C | | C | |
| Approach Delay, s/veh / LOS | 14.8 | B | | 0.0 | | | 20.4 | C | | 31.5 | C | |
| Intersection Delay, s/veh / LOS | 21.1 | | | | | | C | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 2.9 | C | 2.7 | B | 3.5 | D | 2.7 | B |
| Bicycle LOS Score / LOS | 1.1 | A | 0.5 | A | 1.2 | A | 1.5 | A |

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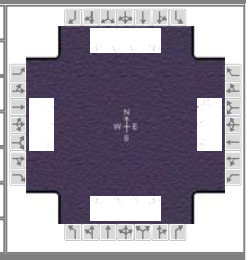
# HCS 2010 Signalized Intersection Results Summary

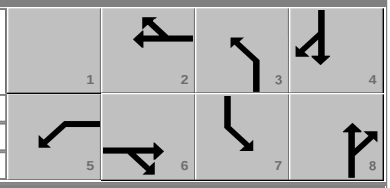
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/25/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | Kapiolani Boulevard | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | Kapiolani and Ward Ave… | File Name | Kapiolani_Ward_10.18_EVENT.xus | | |
| Project Description | Event Peak Wednesday 10/18/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | | 743 | 121 | 202 | 589 | 184 | 179 | 679 | 181 | 303 | 746 | 169 |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 160.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 30.0 | 40.0 | 20.0 | 5.0 | 40.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 0.0 |
| Red | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 6 | 5 | 2 | 3 | 8 | 7 | 4 |
| Case Number | | 8.3 | 2.0 | 4.0 | 2.0 | 3.0 | 2.0 | 3.0 |
| Phase Duration, s | | 45.0 | 35.0 | 80.0 | 25.0 | 45.0 | 35.0 | 55.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 3.2 | 3.3 | 3.2 | 3.3 | 3.2 | 3.3 | 3.2 |
| Queue Clearance Time ( $g_s$ ), s | | 25.7 | 20.0 | 25.4 | 18.9 | 32.8 | 30.9 | 33.8 |
| Green Extension Time ( $g_e$ ), s | | 3.9 | 0.3 | 4.5 | 0.0 | 3.5 | 0.0 | 5.1 |
| Phase Call Probability | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Max Out Probability | | 0.14 | 0.00 | 0.00 | 1.00 | 0.53 | 1.00 | 0.13 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | | 6 | 16 | 5 | 2 | 12 | 3 | 8 | 18 | 7 | 4 | 14 |
| Adjusted Flow Rate ( *v* ), veh/h | | 621 | 294 | 220 | 409 | 383 | 195 | 738 | 173 | 329 | 811 | 160 |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | | 1900 | 1783 | 1810 | 1900 | 1773 | 1810 | 1809 | 1610 | 1810 | 1809 | 1610 |
| Queue Service Time ( $g_s$ ), s | | 23.4 | 23.7 | 18.0 | 23.3 | 23.4 | 16.9 | 30.8 | 14.4 | 28.9 | 31.8 | 12.1 |
| Cycle Queue Clearance Time ( $g_c$ ), s | | 23.4 | 23.7 | 18.0 | 23.3 | 23.4 | 16.9 | 30.8 | 14.4 | 28.9 | 31.8 | 12.1 |
| Green Ratio ( *g/C* ) | | 0.25 | 0.25 | 0.19 | 0.47 | 0.47 | 0.12 | 0.25 | 0.25 | 0.19 | 0.31 | 0.31 |
| Capacity ( *c* ), veh/h | | 950 | 446 | 339 | 891 | 831 | 226 | 904 | 403 | 339 | 1131 | 503 |
| Volume-to-Capacity Ratio ( *X* ) | | 0.654 | 0.660 | 0.647 | 0.460 | 0.461 | 0.860 | 0.816 | 0.429 | 0.971 | 0.717 | 0.318 |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | | 288.8 | 278.8 | 216.8 | 274.1 | 256.4 | 237.9 | 372.4 | 149.1 | 432.3 | 371.8 | 124.1 |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | | 11.6 | 11.2 | 8.7 | 11.0 | 10.3 | 9.5 | 14.9 | 6.0 | 17.3 | 14.9 | 5.0 |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | | 0.00 | 0.00 | 1.14 | 0.00 | 0.00 | 1.70 | 0.00 | 0.83 | 1.75 | 0.00 | 0.00 |
| Uniform Delay ( $d_1$ ), s/veh | | 53.8 | 53.9 | 60.1 | 28.8 | 28.8 | 68.6 | 56.5 | 50.4 | 64.6 | 48.7 | 42.0 |
| Incremental Delay ( $d_2$ ), s/veh | | 1.3 | 2.9 | 3.3 | 0.1 | 0.1 | 25.8 | 5.5 | 0.3 | 40.7 | 1.9 | 0.1 |
| Initial Queue Delay ( $d_3$ ), s/veh | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Control Delay ( *d* ), s/veh | | 55.1 | 56.8 | 63.4 | 28.9 | 28.9 | 94.4 | 62.0 | 50.7 | 105.3 | 50.6 | 42.1 |
| Level of Service (LOS) | | E | E | E | C | C | F | E | D | F | D | D |
| Approach Delay, s/veh / LOS | 55.6 | E | | 36.4 | D | | 65.9 | E | | 63.4 | E | |
| Intersection Delay, s/veh / LOS | 56.1 | | | | | | E | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 3.0 | C | 3.0 | C | 3.3 | C | 2.9 | C |
| Bicycle LOS Score / LOS | 1.0 | A | 1.3 | A | 1.4 | A | 1.6 | A |

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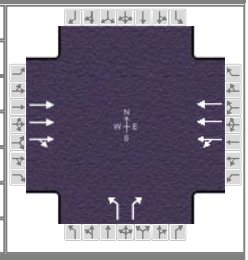
# HCS 2010 Signalized Intersection Results Summary

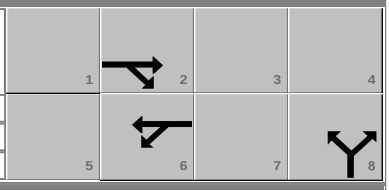
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/24/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | Kapiolani Boulevard | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | Kapiolani and Kamakee | File Name | Kapiolani_Kamakee_10.18_EVENT.xus | | |
| Project Description | Event Peak on Wednesday 10/18/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | | 814 | 110 | 190 | 915 | | 159 | | 139 | | | |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 100.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 60.0 | 30.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | 8 | | |
| Case Number | | 8.0 | | 8.0 | | 9.0 | | |
| Phase Duration, s | | 65.0 | | 65.0 | | 35.0 | | |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | 5.0 | | |
| Max Allow Headway ( *MAH* ), s | | 3.5 | | 3.5 | | 3.4 | | |
| Queue Clearance Time ( $g_s$ ), s | | 10.7 | | 37.9 | | 9.4 | | |
| Green Extension Time ( $g_e$ ), s | | 9.6 | | 8.2 | | 0.7 | | |
| Phase Call Probability | | 1.00 | | 1.00 | | 1.00 | | |
| Max Out Probability | | 0.01 | | 0.18 | | 0.00 | | |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | | 2 | 12 | 1 | 6 | | 3 | | 18 | | | |
| Adjusted Flow Rate ( *v* ), veh/h | | 674 | 319 | 207 | 995 | | 173 | | 151 | | | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | | 1900 | 1790 | 492 | 1729 | | 1810 | | 1610 | | | |
| Queue Service Time ( $g_s$ ), s | | 8.6 | 8.7 | 27.2 | 12.3 | | 7.4 | | 7.2 | | | |
| Cycle Queue Clearance Time ( $g_c$ ), s | | 8.6 | 8.7 | 35.9 | 12.3 | | 7.4 | | 7.2 | | | |
| Green Ratio ( *g/C* ) | | 0.60 | 0.60 | 0.60 | 0.60 | | 0.30 | | 0.30 | | | |
| Capacity ( *c* ), veh/h | | 2280 | 1074 | 367 | 2075 | | 543 | | 483 | | | |
| Volume-to-Capacity Ratio ( *X* ) | | 0.296 | 0.297 | 0.562 | 0.479 | | 0.318 | | 0.313 | | | |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | | 86.6 | 82.5 | 90.4 | 147.6 | | 80.5 | | 70.3 | | | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | | 3.5 | 3.3 | 3.6 | 5.9 | | 3.2 | | 2.8 | | | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | | 0.00 | 0.00 | 0.00 | 0.00 | | 0.58 | | 0.50 | | | |
| Uniform Delay ( $d_1$ ), s/veh | | 9.7 | 9.7 | 18.5 | 11.2 | | 27.1 | | 27.0 | | | |
| Incremental Delay ( $d_2$ ), s/veh | | 0.0 | 0.1 | 1.2 | 0.1 | | 0.1 | | 0.1 | | | |
| Initial Queue Delay ( $d_3$ ), s/veh | | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | | 0.0 | | | |
| Control Delay ( *d* ), s/veh | | 9.8 | 9.8 | 19.7 | 11.3 | | 27.2 | | 27.2 | | | |
| Level of Service (LOS) | | A | A | B | B | | C | | C | | | |
| Approach Delay, s/veh / LOS | 9.8 | A | | 12.7 | B | | 27.2 | C | | 0.0 | | |
| Intersection Delay, s/veh / LOS | 13.4 | | | | | | B | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 1.7 | A | 0.7 | A | 3.2 | C | 3.2 | C |
| Bicycle LOS Score / LOS | 1.0 | A | 1.1 | A | | F | | |

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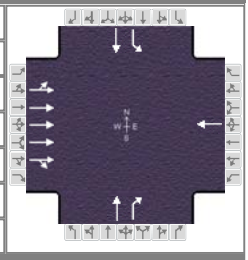
# HCS 2010 Signalized Intersection Results Summary

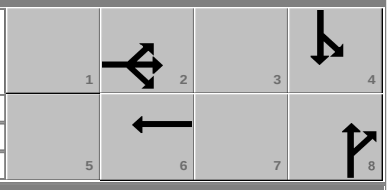
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/24/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | South King Street | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | South King and Victoria… | File Name | King_Victoria_10.15_Sunday_ALL.xus | | |
| Project Description | PM Peak Sunday 10/15/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | 123 | 866 | 192 | | 0 | | | 26 | 95 | 44 | 320 | |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 90.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 58.0 | 22.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | 8 | | 4 |
| Case Number | | 8.0 | | 8.0 | | 7.0 | | 6.0 |
| Phase Duration, s | | 63.0 | | 63.0 | | 27.0 | | 27.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 3.2 | | 0.0 | | 3.2 | | 3.2 |
| Queue Clearance Time ( $g_s$ ), s | | 7.6 | | | | 5.9 | | 17.2 |
| Green Extension Time ( $g_e$ ), s | | 3.3 | | 0.0 | | 1.0 | | 0.6 |
| Phase Call Probability | | 1.00 | | | | 1.00 | | 1.00 |
| Max Out Probability | | 0.00 | | | | 0.00 | | 0.42 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | 5 | 2 | 12 | | 6 | | | 8 | 18 | 7 | 4 | |
| Adjusted Flow Rate ( *v* ), veh/h | 254 | 757 | 230 | | 0 | | | 28 | 87 | 48 | 348 | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | 1635 | 1729 | 1531 | | 1900 | | | 1900 | 1610 | 1404 | 1900 | |
| Queue Service Time ( $g_s$ ), s | 3.8 | 5.5 | 5.6 | | 0.0 | | | 1.0 | 3.9 | 2.4 | 15.2 | |
| Cycle Queue Clearance Time ( $g_c$ ), s | 5.6 | 5.5 | 5.6 | | 0.0 | | | 1.0 | 3.9 | 3.5 | 15.2 | |
| Green Ratio ( *g/C* ) | 0.64 | 0.64 | 0.64 | | 0.64 | | | 0.24 | 0.24 | 0.24 | 0.24 | |
| Capacity ( *c* ), veh/h | 1115 | 3343 | 986 | | 1224 | | | 464 | 394 | 407 | 464 | |
| Volume-to-Capacity Ratio ( *X* ) | 0.228 | 0.226 | 0.233 | | 0.000 | | | 0.061 | 0.221 | 0.117 | 0.749 | |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | 46.3 | 46 | 42.2 | | 0 | | | 11.7 | 37.5 | 20.6 | 191.5 | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | 1.9 | 1.8 | 1.7 | | 0.0 | | | 0.5 | 1.5 | 0.8 | 7.7 | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | 0.00 | 0.00 | 0.00 | | 0.00 | | | 0.00 | 0.00 | 0.00 | 0.00 | |
| Uniform Delay ( $d_1$ ), s/veh | 6.6 | 6.7 | 6.7 | | 0.0 | | | 26.1 | 27.2 | 27.4 | 31.4 | |
| Incremental Delay ( $d_2$ ), s/veh | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.0 | 0.1 | 0.0 | 5.9 | |
| Initial Queue Delay ( $d_3$ ), s/veh | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.0 | |
| Control Delay ( *d* ), s/veh | 6.7 | 6.7 | 6.7 | | 0.0 | | | 26.1 | 27.3 | 27.5 | 37.4 | |
| Level of Service (LOS) | A | A | A | | | | | C | C | C | D | |
| Approach Delay, s/veh / LOS | 6.7 | A | | 0.0 | | | 27.0 | C | | 36.2 | D | |
| Intersection Delay, s/veh / LOS | 14.7 | | | | | | B | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 2.4 | B | 2.4 | B | 3.6 | D | 2.9 | C |
| Bicycle LOS Score / LOS | 0.9 | A | 0.5 | A | 0.7 | A | 1.1 | A |

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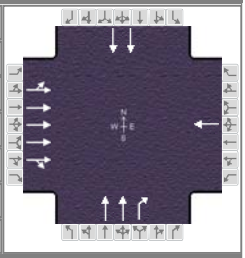
# HCS 2010 Signalized Intersection Results Summary

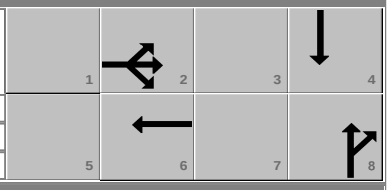
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/24/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 1.00 |
| Urban Street | South King Street | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | South King Street and… | File Name | King_Ward_10.15_Sunday_ALL.xus | | |
| Project Description | PM Peak on Sunday 10/15/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | 151 | 920 | 58 | | 0 | | | 528 | 261 | | 809 | |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 90.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 50.0 | 30.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | 8 | | 4 |
| Case Number | | 8.0 | | 8.0 | | 7.0 | | 8.0 |
| Phase Duration, s | | 55.0 | | 55.0 | | 35.0 | | 35.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 3.2 | | 0.0 | | 3.2 | | 3.2 |
| Queue Clearance Time ( $g_s$ ), s | | 8.5 | | | | 12.3 | | 19.3 |
| Green Extension Time ( $g_e$ ), s | | 2.9 | | 0.0 | | 4.1 | | 3.4 |
| Phase Call Probability | | 1.00 | | | | 1.00 | | 1.00 |
| Max Out Probability | | 0.00 | | | | 0.04 | | 0.19 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | 5 | 2 | 12 | | 6 | | | 8 | 18 | | 4 | |
| Adjusted Flow Rate ( *v* ), veh/h | 226 | 676 | 219 | | 0 | | | 528 | 181 | | 809 | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | 1573 | 1729 | 1661 | | 1900 | | | 1809 | 1610 | | 1809 | |
| Queue Service Time ( $g_s$ ), s | 5.5 | 6.0 | 6.1 | | 0.0 | | | 10.3 | 7.6 | | 17.3 | |
| Cycle Queue Clearance Time ( $g_c$ ), s | 6.5 | 6.0 | 6.1 | | 0.0 | | | 10.3 | 7.6 | | 17.3 | |
| Green Ratio ( *g/C* ) | 0.56 | 0.56 | 0.56 | | 0.56 | | | 0.33 | 0.33 | | 0.33 | |
| Capacity ( *c* ), veh/h | 940 | 2882 | 923 | | 1056 | | | 1206 | 537 | | 1206 | |
| Volume-to-Capacity Ratio ( *X* ) | 0.240 | 0.235 | 0.237 | | 0.000 | | | 0.438 | 0.337 | | 0.671 | |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | 55.9 | 54.7 | 53.5 | | 0 | | | 108.6 | 71.8 | | 187.3 | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | 2.2 | 2.2 | 2.1 | | 0.0 | | | 4.3 | 2.9 | | 7.5 | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | 0.00 | 0.00 | 0.00 | | 0.00 | | | 0.00 | 0.00 | | 0.00 | |
| Uniform Delay ( $d_1$ ), s/veh | 10.3 | 10.2 | 10.2 | | 0.0 | | | 23.4 | 22.5 | | 25.8 | |
| Incremental Delay ( $d_2$ ), s/veh | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.1 | 0.1 | | 1.2 | |
| Initial Queue Delay ( $d_3$ ), s/veh | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.0 | 0.0 | | 0.0 | |
| Control Delay ( *d* ), s/veh | 10.3 | 10.2 | 10.3 | | 0.0 | | | 23.5 | 22.7 | | 27.0 | |
| Level of Service (LOS) | B | B | B | | | | | C | C | | C | |
| Approach Delay, s/veh / LOS | 10.3 | B | | 0.0 | | | 23.3 | C | | 27.0 | C | |
| Intersection Delay, s/veh / LOS | 18.9 | | | | | | B | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 2.9 | C | 2.7 | B | 3.6 | D | 2.7 | B |
| Bicycle LOS Score / LOS | 0.9 | A | 0.5 | A | 1.1 | A | 1.2 | A |

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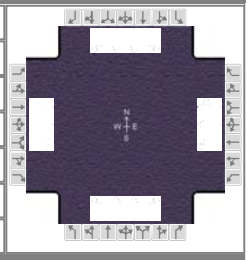
# HCS 2010 Signalized Intersection Results Summary

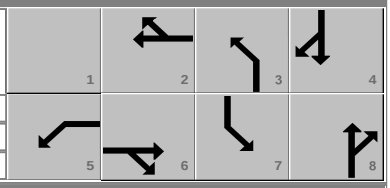
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/24/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | Kapiolani Boulevard | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | Kapiolani Boulevard and… | File Name | Kapiolani_Ward_10.15_Sunday_ALL.xus | | |
| Project Description | PM Peak on Sunday 10/15/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | | 573 | 123 | 199 | 503 | 244 | 138 | 545 | 96 | 288 | 494 | 85 |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 120.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 20.0 | 30.0 | 15.0 | 5.0 | 25.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 0.0 |
| Red | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 6 | 5 | 2 | 3 | 8 | 7 | 4 |
| Case Number | | 8.3 | 2.0 | 4.0 | 2.0 | 3.0 | 2.0 | 3.0 |
| Phase Duration, s | | 35.0 | 25.0 | 60.0 | 20.0 | 30.0 | 30.0 | 40.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 3.2 | 3.3 | 3.2 | 3.3 | 3.2 | 3.3 | 3.2 |
| Queue Clearance Time ( $g_s$ ), s | | 15.9 | 15.6 | 19.6 | 11.5 | 20.6 | 21.9 | 16.8 |
| Green Extension Time ( $g_e$ ), s | | 3.4 | 0.2 | 3.8 | 0.1 | 1.7 | 0.2 | 3.3 |
| Phase Call Probability | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Max Out Probability | | 0.11 | 0.34 | 0.00 | 0.76 | 0.72 | 1.00 | 0.02 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | | 6 | 16 | 5 | 2 | 12 | 3 | 8 | 18 | 7 | 4 | 14 |
| Adjusted Flow Rate ( *v* ), veh/h | | 500 | 235 | 216 | 403 | 365 | 150 | 592 | 83 | 313 | 537 | 71 |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | | 1900 | 1750 | 1810 | 1900 | 1713 | 1810 | 1809 | 1610 | 1810 | 1809 | 1610 |
| Queue Service Time ( $g_s$ ), s | | 13.6 | 13.9 | 13.6 | 17.5 | 17.6 | 9.5 | 18.6 | 5.1 | 19.9 | 14.8 | 3.9 |
| Cycle Queue Clearance Time ( $g_c$ ), s | | 13.6 | 13.9 | 13.6 | 17.5 | 17.6 | 9.5 | 18.6 | 5.1 | 19.9 | 14.8 | 3.9 |
| Green Ratio ( *g/C* ) | | 0.25 | 0.25 | 0.17 | 0.46 | 0.46 | 0.12 | 0.21 | 0.21 | 0.21 | 0.29 | 0.29 |
| Capacity ( *c* ), veh/h | | 950 | 437 | 302 | 871 | 785 | 226 | 754 | 335 | 377 | 1055 | 470 |
| Volume-to-Capacity Ratio ( *X* ) | | 0.526 | 0.537 | 0.717 | 0.463 | 0.465 | 0.663 | 0.786 | 0.246 | 0.830 | 0.509 | 0.150 |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | | 161.5 | 153.5 | 168.5 | 197.8 | 179.4 | 117.4 | 223.2 | 52 | 260.1 | 165.6 | 38.8 |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | | 6.5 | 6.1 | 6.7 | 7.9 | 7.2 | 4.7 | 8.9 | 2.1 | 10.4 | 6.6 | 1.6 |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | | 0.00 | 0.00 | 0.89 | 0.00 | 0.00 | 0.84 | 0.00 | 0.29 | 1.05 | 0.00 | 0.00 |
| Uniform Delay ( $d_1$ ), s/veh | | 38.9 | 39.0 | 47.3 | 22.3 | 22.4 | 50.1 | 45.0 | 39.6 | 45.5 | 35.4 | 31.5 |
| Incremental Delay ( $d_2$ ), s/veh | | 0.3 | 0.7 | 6.9 | 0.1 | 0.2 | 5.7 | 5.1 | 0.1 | 13.6 | 0.2 | 0.1 |
| Initial Queue Delay ( $d_3$ ), s/veh | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Control Delay ( *d* ), s/veh | | 39.1 | 39.7 | 54.2 | 22.5 | 22.5 | 55.8 | 50.0 | 39.8 | 59.1 | 35.5 | 31.5 |
| Level of Service (LOS) | | D | D | D | C | C | E | D | D | E | D | C |
| Approach Delay, s/veh / LOS | 39.3 | D | | 29.5 | C | | 50.1 | D | | 43.2 | D | |
| Intersection Delay, s/veh / LOS | 40.1 | | | | | | D | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 3.0 | C | 3.0 | C | 3.2 | C | 2.9 | C |
| Bicycle LOS Score / LOS | 0.9 | A | 1.3 | A | 1.2 | A | 1.2 | A |

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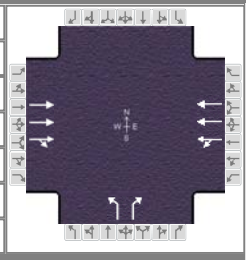
# HCS 2010 Signalized Intersection Results Summary

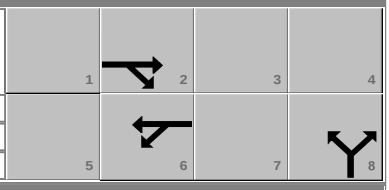
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/24/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | Kapiolani Boulevard | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | Kapiolani and Kamakee | File Name | Kapiolani_Kamakee_10.15_Sunday_ALL.xus | | |
| Project Description | PM Peak on Sunday 10/15 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | | 896 | 61 | 166 | 900 | | 118 | | 136 | | | |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 120.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 85.0 | 25.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | 8 | | |
| Case Number | | 8.0 | | 8.0 | | 9.0 | | |
| Phase Duration, s | | 90.0 | | 90.0 | | 30.0 | | |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | 5.0 | | |
| Max Allow Headway ( *MAH* ), s | | 3.5 | | 3.5 | | 3.4 | | |
| Queue Clearance Time ( $g_s$ ), s | | 9.8 | | 30.4 | | 11.6 | | |
| Green Extension Time ( $g_e$ ), s | | 9.4 | | 9.3 | | 0.5 | | |
| Phase Call Probability | | 1.00 | | 1.00 | | 1.00 | | |
| Max Out Probability | | 0.00 | | 0.01 | | 0.00 | | |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | | 2 | 12 | 1 | 6 | | 3 | | 18 | | | |
| Adjusted Flow Rate ( *v* ), veh/h | | 692 | 337 | 180 | 978 | | 128 | | 148 | | | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | | 1900 | 1845 | 505 | 1729 | | 1810 | | 1610 | | | |
| Queue Service Time ( $g_s$ ), s | | 7.8 | 7.8 | 20.5 | 10.4 | | 7.2 | | 9.6 | | | |
| Cycle Queue Clearance Time ( $g_c$ ), s | | 7.8 | 7.8 | 28.4 | 10.4 | | 7.2 | | 9.6 | | | |
| Green Ratio ( *g/C* ) | | 0.71 | 0.71 | 0.71 | 0.71 | | 0.21 | | 0.21 | | | |
| Capacity ( *c* ), veh/h | | 2692 | 1307 | 418 | 2449 | | 377 | | 335 | | | |
| Volume-to-Capacity Ratio ( *X* ) | | 0.257 | 0.258 | 0.432 | 0.399 | | 0.340 | | 0.441 | | | |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | | 74.7 | 72.9 | 62.4 | 120.6 | | 82.4 | | 97.3 | | | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | | 3.0 | 2.9 | 2.5 | 4.8 | | 3.3 | | 3.9 | | | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | | 0.00 | 0.00 | 0.00 | 0.00 | | 0.59 | | 0.69 | | | |
| Uniform Delay ( $d_1$ ), s/veh | | 6.2 | 6.2 | 11.3 | 7.1 | | 40.5 | | 41.4 | | | |
| Incremental Delay ( $d_2$ ), s/veh | | 0.0 | 0.0 | 0.3 | 0.0 | | 0.2 | | 0.3 | | | |
| Initial Queue Delay ( $d_3$ ), s/veh | | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | | 0.0 | | | |
| Control Delay ( *d* ), s/veh | | 6.3 | 6.3 | 11.6 | 7.2 | | 40.7 | | 41.7 | | | |
| Level of Service (LOS) | | A | A | B | A | | D | | D | | | |
| Approach Delay, s/veh / LOS | 6.3 | A | | 7.8 | A | | 41.2 | D | | 0.0 | | |
| Intersection Delay, s/veh / LOS | 10.9 | | | | | | B | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 1.6 | A | 0.7 | A | 3.2 | C | 3.2 | C |
| Bicycle LOS Score / LOS | 1.1 | A | 1.1 | A | | F | | |

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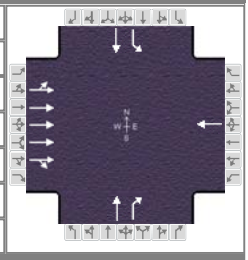
# HCS 2010 Signalized Intersection Results Summary

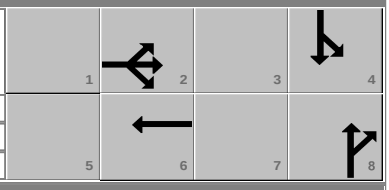
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/25/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | South King Street | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | South King and Victoria… | File Name | King_Victoria_10.18_AM_Future.xus | | |
| Project Description | AM Peak Hour Wednesday 10/18/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | 240 | 1393 | 105 | | 0 | | | 8 | 0 | 389 | 168 | |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 90.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | No | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 58.0 | 22.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | 8 | | 4 |
| Case Number | | 8.0 | | 8.0 | | 7.0 | | 6.0 |
| Phase Duration, s | | 63.0 | | 63.0 | | 27.0 | | 27.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 0.0 | | 0.0 | | 3.2 | | 3.2 |
| Queue Clearance Time ( $g_s$ ), s | | | | | | 2.3 | | 24.0 |
| Green Extension Time ( $g_e$ ), s | | 0.0 | | 0.0 | | 1.2 | | 0.0 |
| Phase Call Probability | | | | | | 1.00 | | 1.00 |
| Max Out Probability | | | | | | 0.00 | | 1.00 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | 5 | 2 | 12 | | 6 | | | 8 | 18 | 7 | 4 | |
| Adjusted Flow Rate ( *v* ), veh/h | 365 | 1157 | 366 | | 0 | | | 9 | 0 | 423 | 183 | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | 1547 | 1729 | 1637 | | 1900 | | | 1900 | 1610 | 1429 | 1900 | |
| Queue Service Time ( $g_s$ ), s | 9.9 | 9.2 | 9.2 | | 0.0 | | | 0.3 | 0.0 | 21.7 | 7.2 | |
| Cycle Queue Clearance Time ( $g_c$ ), s | 9.9 | 9.2 | 9.2 | | 0.0 | | | 0.3 | 0.0 | 22.0 | 7.2 | |
| Green Ratio ( *g/C* ) | 0.64 | 0.64 | 0.64 | | 0.64 | | | 0.24 | 0.24 | 0.24 | 0.24 | |
| Capacity ( *c* ), veh/h | 1066 | 3343 | 1055 | | 1224 | | | 464 | 394 | 424 | 464 | |
| Volume-to-Capacity Ratio ( *X* ) | 0.343 | 0.346 | 0.347 | | 0.000 | | | 0.019 | 0.000 | 0.997 | 0.393 | |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | 81.1 | 79.4 | 79.9 | | 0 | | | 3.6 | 0 | 361.6 | 82.6 | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | 3.2 | 3.2 | 3.2 | | 0.0 | | | 0.1 | 0.0 | 14.5 | 3.3 | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | 0.00 | 0.00 | 0.00 | | 0.00 | | | 0.00 | 0.00 | 1.38 | 0.00 | |
| Uniform Delay ( $d_1$ ), s/veh | 7.4 | 7.3 | 7.3 | | 0.0 | | | 25.8 | 0.0 | 36.2 | 28.4 | |
| Incremental Delay ( $d_2$ ), s/veh | 0.9 | 0.3 | 0.9 | | 0.0 | | | 0.0 | 0.0 | 42.7 | 0.2 | |
| Initial Queue Delay ( $d_3$ ), s/veh | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.0 | |
| Control Delay ( *d* ), s/veh | 8.3 | 7.6 | 8.2 | | 0.0 | | | 25.8 | 0.0 | 78.9 | 28.6 | |
| Level of Service (LOS) | A | A | A | | | | | C | | E | C | |
| Approach Delay, s/veh / LOS | 7.9 | A | | 0.0 | | | 25.8 | C | | 63.7 | E | |
| Intersection Delay, s/veh / LOS | 21.4 | | | | | | C | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 2.4 | B | 2.6 | B | 3.6 | D | 2.7 | B |
| Bicycle LOS Score / LOS | 1.1 | A | 0.5 | A | 0.5 | A | 1.5 | A |

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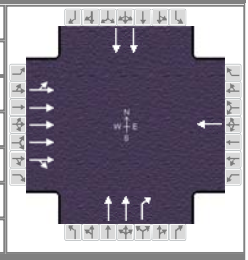
# HCS 2010 Signalized Intersection Results Summary

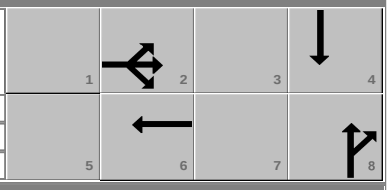
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/25/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | South King Street | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | South King and Ward Av… | File Name | King_Ward_10.18_AM_Future.xus | | |
| Project Description | AM Peak Hour Wednesday 10/18/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | 185 | 1487 | 80 | | 0 | | | 197 | 251 | | 1176 | |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 90.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | No | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 40.0 | 40.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | 8 | | 4 |
| Case Number | | 8.0 | | 8.0 | | 7.0 | | 8.0 |
| Phase Duration, s | | 45.0 | | 45.0 | | 45.0 | | 45.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 0.0 | | 0.0 | | 3.2 | | 3.2 |
| Queue Clearance Time ( $g_s$ ), s | | | | | | 12.2 | | 29.3 |
| Green Extension Time ( $g_e$ ), s | | 0.0 | | 0.0 | | 5.7 | | 4.2 |
| Phase Call Probability | | | | | | 1.00 | | 1.00 |
| Max Out Probability | | | | | | 0.02 | | 0.29 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | 5 | 2 | 12 | | 6 | | | 8 | 18 | | 4 | |
| Adjusted Flow Rate ( *v* ), veh/h | 381 | 1154 | 370 | | 0 | | | 214 | 273 | | 1278 | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | 1629 | 1729 | 1659 | | 1900 | | | 1809 | 1610 | | 1809 | |
| Queue Service Time ( $g_s$ ), s | 14.8 | 14.3 | 14.3 | | 0.0 | | | 3.1 | 10.2 | | 27.3 | |
| Cycle Queue Clearance Time ( $g_c$ ), s | 15.2 | 14.3 | 14.3 | | 0.0 | | | 3.1 | 10.2 | | 27.3 | |
| Green Ratio ( *g/C* ) | 0.44 | 0.44 | 0.44 | | 0.44 | | | 0.44 | 0.44 | | 0.44 | |
| Capacity ( *c* ), veh/h | 785 | 2305 | 737 | | 844 | | | 1608 | 716 | | 1608 | |
| Volume-to-Capacity Ratio ( *X* ) | 0.485 | 0.500 | 0.501 | | 0.000 | | | 0.133 | 0.381 | | 0.795 | |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | 150.8 | 142.8 | 145.7 | | 0 | | | 32 | 92.7 | | 291.6 | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | 6.0 | 5.7 | 5.8 | | 0.0 | | | 1.3 | 3.7 | | 11.7 | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | 0.00 | 0.00 | 0.00 | | 0.00 | | | 0.00 | 0.00 | | 0.00 | |
| Uniform Delay ( $d_1$ ), s/veh | 18.1 | 17.9 | 17.9 | | 0.0 | | | 14.8 | 16.7 | | 21.5 | |
| Incremental Delay ( $d_2$ ), s/veh | 2.1 | 0.8 | 2.4 | | 0.0 | | | 0.0 | 0.1 | | 2.6 | |
| Initial Queue Delay ( $d_3$ ), s/veh | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.0 | 0.0 | | 0.0 | |
| Control Delay ( *d* ), s/veh | 20.2 | 18.6 | 20.3 | | 0.0 | | | 14.8 | 16.8 | | 24.1 | |
| Level of Service (LOS) | C | B | C | | | | | B | B | | C | |
| Approach Delay, s/veh / LOS | 19.3 | B | | 0.0 | | | 15.9 | B | | 24.1 | C | |
| Intersection Delay, s/veh / LOS | 20.5 | | | | | | C | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 2.8 | C | 2.7 | B | 3.5 | D | 2.7 | B |
| Bicycle LOS Score / LOS | 1.1 | A | 0.5 | A | 0.9 | A | 1.5 | A |

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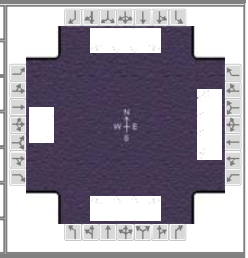
# HCS 2010 Signalized Intersection Results Summary

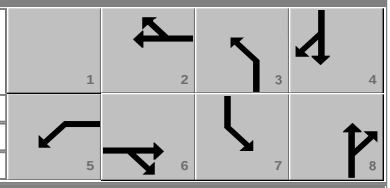
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/25/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | Kapiolani Boulevard | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | Kapiolani and Ward Ave… | File Name | Kapiolani_Ward_10.18_AM_Future.xus | | |
| Project Description | AM Peak Hour Wednesday 10/18/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | | 492 | 107 | 243 | 1244 | 87 | 126 | 361 | 78 | 188 | 796 | 272 |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 120.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | No | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 20.0 | 27.0 | 13.0 | 3.0 | 32.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 0.0 |
| Red | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 6 | 5 | 2 | 3 | 8 | 7 | 4 |
| Case Number | | 8.3 | 2.0 | 4.0 | 2.0 | 3.0 | 2.0 | 3.0 |
| Phase Duration, s | | 32.0 | 25.0 | 57.0 | 18.0 | 37.0 | 26.0 | 45.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 0.0 | 3.3 | 0.0 | 3.3 | 3.2 | 3.3 | 3.2 |
| Queue Clearance Time ( $g_s$ ), s | | | 19.1 | | 10.8 | 12.7 | 14.6 | 27.1 |
| Green Extension Time ( $g_e$ ), s | | 0.0 | 0.1 | 0.0 | 0.0 | 4.5 | 0.2 | 4.0 |
| Phase Call Probability | | | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 |
| Max Out Probability | | | 1.00 | | 1.00 | 0.05 | 0.05 | 0.16 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | | 6 | 16 | 5 | 2 | 12 | 3 | 8 | 18 | 7 | 4 | 14 |
| Adjusted Flow Rate ( *v* ), veh/h | | 335 | 316 | 264 | 976 | 471 | 137 | 392 | 85 | 204 | 865 | 296 |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | | 1900 | 1782 | 1810 | 1900 | 1834 | 1810 | 1809 | 1610 | 1810 | 1809 | 1610 |
| Queue Service Time ( $g_s$ ), s | | 19.8 | 20.1 | 17.1 | 23.5 | 23.5 | 8.8 | 10.7 | 4.9 | 12.6 | 25.1 | 18.0 |
| Cycle Queue Clearance Time ( $g_c$ ), s | | 19.8 | 20.1 | 17.1 | 23.5 | 23.5 | 8.8 | 10.7 | 4.9 | 12.6 | 25.1 | 18.0 |
| Green Ratio ( *g/C* ) | | 0.22 | 0.22 | 0.17 | 0.43 | 0.43 | 0.11 | 0.27 | 0.27 | 0.18 | 0.33 | 0.33 |
| Capacity ( *c* ), veh/h | | 428 | 401 | 302 | 1647 | 795 | 196 | 965 | 429 | 317 | 1206 | 537 |
| Volume-to-Capacity Ratio ( *X* ) | | 0.783 | 0.789 | 0.876 | 0.593 | 0.593 | 0.699 | 0.407 | 0.197 | 0.645 | 0.718 | 0.551 |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | | 275.1 | 262.9 | 242.2 | 275 | 274.6 | 112.3 | 120.1 | 48.9 | 150.6 | 285.4 | 179.6 |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | | 11.0 | 10.5 | 9.7 | 11.0 | 11.0 | 4.5 | 4.8 | 2.0 | 6.0 | 11.4 | 7.2 |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.80 | 0.00 | 0.27 | 0.61 | 0.00 | 0.00 |
| Uniform Delay ( $d_1$ ), s/veh | | 43.7 | 43.8 | 48.8 | 25.9 | 25.9 | 51.6 | 36.2 | 34.1 | 46.0 | 35.0 | 32.7 |
| Incremental Delay ( $d_2$ ), s/veh | | 13.4 | 14.5 | 23.0 | 1.6 | 3.2 | 8.9 | 0.1 | 0.1 | 3.5 | 1.8 | 0.7 |
| Initial Queue Delay ( $d_3$ ), s/veh | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Control Delay ( *d* ), s/veh | | 57.1 | 58.3 | 71.8 | 27.5 | 29.2 | 60.5 | 36.3 | 34.1 | 49.6 | 36.8 | 33.4 |
| Level of Service (LOS) | | E | E | E | C | C | E | D | C | D | D | C |
| Approach Delay, s/veh / LOS | 57.7 | E | | 34.8 | C | | 41.4 | D | | 38.0 | D | |
| Intersection Delay, s/veh / LOS | 40.2 | | | | | | D | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 3.0 | C | 2.9 | C | 3.0 | C | 3.1 | C |
| Bicycle LOS Score / LOS | 1.0 | A | 1.4 | A | 1.0 | A | 1.6 | A |

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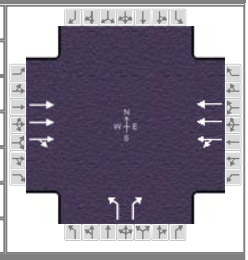
# HCS 2010 Signalized Intersection Results Summary

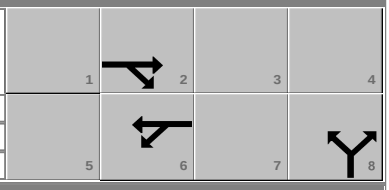
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/24/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | Kapiolani Boulevard | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | Kapiolani and Kamakee | File Name | Kapiolani_Kamakee_10.18_AM_Future.xus | | |
| Project Description | AM Peak on Wednesday 10/18/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | | 653 | 105 | 177 | 1557 | | 83 | | 46 | | | |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 120.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | No | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 85.0 | 25.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | 8 | | |
| Case Number | | 8.0 | | 8.0 | | 9.0 | | |
| Phase Duration, s | | 90.0 | | 90.0 | | 30.0 | | |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | 5.0 | | |
| Max Allow Headway ( *MAH* ), s | | 0.0 | | 0.0 | | 3.3 | | |
| Queue Clearance Time ( $g_s$ ), s | | | | | | 7.0 | | |
| Green Extension Time ( $g_e$ ), s | | 0.0 | | 0.0 | | 0.2 | | |
| Phase Call Probability | | | | | | 1.00 | | |
| Max Out Probability | | | | | | 0.00 | | |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | | 2 | 12 | 1 | 6 | | 3 | | 18 | | | |
| Adjusted Flow Rate ( *v* ), veh/h | | 560 | 264 | 448 | 1437 | | 90 | | 50 | | | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | | 1900 | 1763 | 1013 | 1729 | | 1810 | | 1610 | | | |
| Queue Service Time ( $g_s$ ), s | | 6.0 | 6.2 | 26.6 | 20.0 | | 5.0 | | 3.0 | | | |
| Cycle Queue Clearance Time ( $g_c$ ), s | | 6.0 | 6.2 | 32.8 | 20.0 | | 5.0 | | 3.0 | | | |
| Green Ratio ( *g/C* ) | | 0.71 | 0.71 | 0.71 | 0.71 | | 0.21 | | 0.21 | | | |
| Capacity ( *c* ), veh/h | | 2692 | 1249 | 760 | 2449 | | 377 | | 335 | | | |
| Volume-to-Capacity Ratio ( *X* ) | | 0.208 | 0.211 | 0.589 | 0.587 | | 0.239 | | 0.149 | | | |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | | 59.4 | 57.9 | 176.1 | 225.4 | | 56.6 | | 30.8 | | | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | | 2.4 | 2.3 | 7.0 | 9.0 | | 2.3 | | 1.2 | | | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | | 0.00 | 0.00 | 0.00 | 0.00 | | 0.40 | | 0.22 | | | |
| Uniform Delay ( $d_1$ ), s/veh | | 6.0 | 6.0 | 11.0 | 8.7 | | 39.6 | | 38.8 | | | |
| Incremental Delay ( $d_2$ ), s/veh | | 0.2 | 0.4 | 3.3 | 1.0 | | 0.1 | | 0.1 | | | |
| Initial Queue Delay ( $d_3$ ), s/veh | | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | | 0.0 | | | |
| Control Delay ( *d* ), s/veh | | 6.2 | 6.4 | 14.3 | 9.8 | | 39.7 | | 38.9 | | | |
| Level of Service (LOS) | | A | A | B | A | | D | | D | | | |
| Approach Delay, s/veh / LOS | 6.2 | A | | 10.8 | B | | 39.4 | D | | 0.0 | | |
| Intersection Delay, s/veh / LOS | 10.9 | | | | | | B | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 1.6 | A | 0.7 | A | 3.2 | C | 3.2 | C |
| Bicycle LOS Score / LOS | 0.9 | A | 1.5 | A | | F | | |

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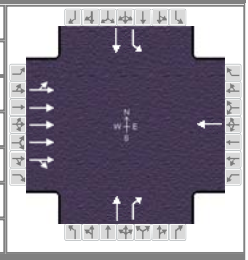
# HCS 2010 Signalized Intersection Results Summary

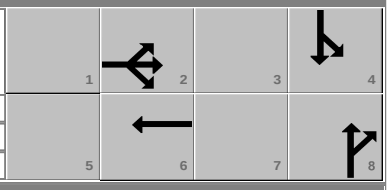
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/25/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | South King Street | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | South King and Victoria… | File Name | King_Victoria_10.18_PM_Future.xus | | |
| Project Description | PM Peak Hour Wednesday 10/18/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | 419 | 1800 | 187 | | 0 | | | 152 | 107 | 206 | 136 | |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 90.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 58.0 | 22.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | 8 | | 4 |
| Case Number | | 8.0 | | 8.0 | | 7.0 | | 6.0 |
| Phase Duration, s | | 63.0 | | 63.0 | | 27.0 | | 27.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 3.2 | | 0.0 | | 3.4 | | 3.4 |
| Queue Clearance Time ( $g_s$ ), s | | 17.8 | | | | 8.5 | | 24.0 |
| Green Extension Time ( $g_e$ ), s | | 9.7 | | 0.0 | | 1.3 | | 0.0 |
| Phase Call Probability | | 1.00 | | | | 1.00 | | 1.00 |
| Max Out Probability | | 0.04 | | | | 0.01 | | 1.00 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | 5 | 2 | 12 | | 6 | | | 8 | 18 | 7 | 4 | |
| Adjusted Flow Rate ( *v* ), veh/h | 482 | 1589 | 501 | | 0 | | | 165 | 100 | 224 | 148 | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | 1460 | 1729 | 1635 | | 1900 | | | 1900 | 1610 | 1240 | 1900 | |
| Queue Service Time ( $g_s$ ), s | 15.8 | 14.1 | 14.1 | | 0.0 | | | 6.5 | 4.5 | 15.5 | 5.7 | |
| Cycle Queue Clearance Time ( $g_c$ ), s | 15.8 | 14.1 | 14.1 | | 0.0 | | | 6.5 | 4.5 | 22.0 | 5.7 | |
| Green Ratio ( *g/C* ) | 0.64 | 0.64 | 0.64 | | 0.64 | | | 0.24 | 0.24 | 0.24 | 0.24 | |
| Capacity ( *c* ), veh/h | 1018 | 3343 | 1054 | | 1224 | | | 464 | 394 | 294 | 464 | |
| Volume-to-Capacity Ratio ( *X* ) | 0.474 | 0.475 | 0.475 | | 0.000 | | | 0.356 | 0.254 | 0.762 | 0.318 | |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | 113.4 | 118.7 | 112.9 | | 0 | | | 73.9 | 43.5 | 143.7 | 65.4 | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | 4.5 | 4.7 | 4.5 | | 0.0 | | | 3.0 | 1.7 | 5.7 | 2.6 | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | 0.00 | 0.00 | 0.00 | | 0.00 | | | 0.00 | 0.32 | 0.55 | 0.00 | |
| Uniform Delay ( $d_1$ ), s/veh | 8.5 | 8.2 | 8.2 | | 0.0 | | | 28.1 | 27.4 | 37.6 | 27.9 | |
| Incremental Delay ( $d_2$ ), s/veh | 0.1 | 0.0 | 0.1 | | 0.0 | | | 0.2 | 0.1 | 10.1 | 0.1 | |
| Initial Queue Delay ( $d_3$ ), s/veh | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.0 | |
| Control Delay ( *d* ), s/veh | 8.6 | 8.2 | 8.3 | | 0.0 | | | 28.3 | 27.5 | 47.7 | 28.0 | |
| Level of Service (LOS) | A | A | A | | | | | C | C | D | C | |
| Approach Delay, s/veh / LOS | 8.3 | A | | 0.0 | | | 28.0 | C | | 39.8 | D | |
| Intersection Delay, s/veh / LOS | 13.6 | | | | | | B | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 2.4 | B | 2.8 | C | 3.6 | D | 2.7 | B |
| Bicycle LOS Score / LOS | 1.3 | A | 0.5 | A | 0.9 | A | 1.1 | A |

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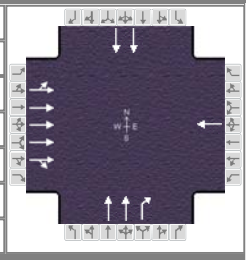
# HCS 2010 Signalized Intersection Results Summary

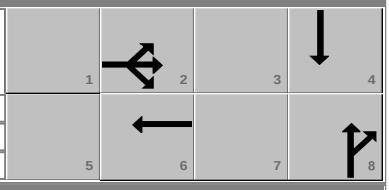
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/25/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | South King Street | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | South King and Ward Av… | File Name | King_Ward_10.18_PM_Future.xus | | |
| Project Description | PM Peak Wednesday 10/18/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | 248 | 2059 | 147 | | 0 | | | 455 | 347 | | 1138 | |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 90.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 50.0 | 30.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | 8 | | 4 |
| Case Number | | 8.0 | | 8.0 | | 7.0 | | 8.0 |
| Phase Duration, s | | 55.0 | | 55.0 | | 35.0 | | 35.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 3.2 | | 0.0 | | 3.2 | | 3.2 |
| Queue Clearance Time ( $g_s$ ), s | | 20.7 | | | | 17.7 | | 32.0 |
| Green Extension Time ( $g_e$ ), s | | 9.4 | | 0.0 | | 5.3 | | 0.0 |
| Phase Call Probability | | 1.00 | | | | 1.00 | | 1.00 |
| Max Out Probability | | 0.12 | | | | 0.31 | | 1.00 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | 5 | 2 | 12 | | 6 | | | 8 | 18 | | 4 | |
| Adjusted Flow Rate ( *v* ), veh/h | 519 | 1594 | 511 | | 0 | | | 495 | 334 | | 1237 | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | 1630 | 1729 | 1661 | | 1900 | | | 1809 | 1610 | | 1809 | |
| Queue Service Time ( $g_s$ ), s | 18.7 | 17.8 | 17.8 | | 0.0 | | | 9.5 | 15.7 | | 30.0 | |
| Cycle Queue Clearance Time ( $g_c$ ), s | 18.7 | 17.8 | 17.8 | | 0.0 | | | 9.5 | 15.7 | | 30.0 | |
| Green Ratio ( *g/C* ) | 0.56 | 0.56 | 0.56 | | 0.56 | | | 0.33 | 0.33 | | 0.33 | |
| Capacity ( *c* ), veh/h | 966 | 2882 | 923 | | 1056 | | | 1206 | 537 | | 1206 | |
| Volume-to-Capacity Ratio ( *X* ) | 0.537 | 0.553 | 0.553 | | 0.000 | | | 0.410 | 0.622 | | 1.026 | |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | 163.2 | 162.6 | 158.1 | | 0 | | | 100.5 | 153.3 | | 453.4 | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | 6.5 | 6.5 | 6.3 | | 0.0 | | | 4.0 | 6.1 | | 18.1 | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | 0.00 | 0.00 | 0.00 | | 0.00 | | | 0.00 | 0.00 | | 0.00 | |
| Uniform Delay ( $d_1$ ), s/veh | 13.0 | 12.8 | 12.8 | | 0.0 | | | 23.2 | 25.2 | | 30.0 | |
| Incremental Delay ( $d_2$ ), s/veh | 0.3 | 0.1 | 0.4 | | 0.0 | | | 0.1 | 1.7 | | 32.7 | |
| Initial Queue Delay ( $d_3$ ), s/veh | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.0 | 0.0 | | 0.0 | |
| Control Delay ( *d* ), s/veh | 13.4 | 13.0 | 13.3 | | 0.0 | | | 23.3 | 26.9 | | 62.7 | |
| Level of Service (LOS) | B | B | B | | | | | C | C | | F | |
| Approach Delay, s/veh / LOS | 13.1 | B | | 0.0 | | | 24.7 | C | | 62.7 | E | |
| Intersection Delay, s/veh / LOS | 28.2 | | | | | | C | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 2.9 | C | 2.7 | B | 3.6 | D | 2.8 | C |
| Bicycle LOS Score / LOS | 1.4 | A | 0.5 | A | 1.2 | A | 1.5 | A |

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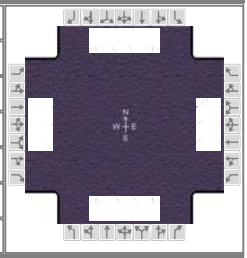
# HCS 2010 Signalized Intersection Results Summary

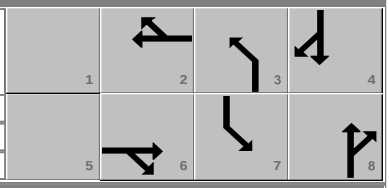
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/25/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | Kapiolani Boulevard | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | Kapiolani and Ward Ave… | File Name | Kapiolani_Ward_10.18_PM_Future.xus | | |
| Project Description | PM Peak Wednesday 10/18/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | | 1337 | 126 | | 1263 | 233 | 182 | 570 | 233 | 293 | 834 | 158 |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 120.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 55.0 | 15.0 | 5.0 | 25.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 4.0 | 4.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 1.0 | 1.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 6 | | 2 | 3 | 8 | 7 | 4 |
| Case Number | | 8.0 | | 8.0 | 2.0 | 3.0 | 2.0 | 3.0 |
| Phase Duration, s | | 60.0 | | 60.0 | 20.0 | 30.0 | 30.0 | 40.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 3.2 | | 3.2 | 3.3 | 3.2 | 3.3 | 3.2 |
| Queue Clearance Time ( $g_s$ ), s | | 26.9 | | 27.3 | 14.9 | 21.6 | 22.3 | 30.4 |
| Green Extension Time ( $g_e$ ), s | | 11.7 | | 11.6 | 0.0 | 2.0 | 0.2 | 2.5 |
| Phase Call Probability | | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Max Out Probability | | 0.25 | | 0.26 | 1.00 | 0.98 | 1.00 | 0.81 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | | 6 | 16 | | 2 | 12 | 3 | 8 | 18 | 7 | 4 | 14 |
| Adjusted Flow Rate ( *v* ), veh/h | | 1051 | 507 | | 1063 | 498 | 198 | 620 | 221 | 318 | 907 | 139 |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | | 1900 | 1832 | | 1900 | 1779 | 1810 | 1809 | 1610 | 1810 | 1809 | 1610 |
| Queue Service Time ( $g_s$ ), s | | 24.8 | 24.9 | | 25.0 | 25.3 | 12.9 | 19.6 | 15.1 | 20.3 | 28.4 | 8.0 |
| Cycle Queue Clearance Time ( $g_c$ ), s | | 24.8 | 24.9 | | 25.0 | 25.3 | 12.9 | 19.6 | 15.1 | 20.3 | 28.4 | 8.0 |
| Green Ratio ( *g/C* ) | | 0.46 | 0.46 | | 0.46 | 0.46 | 0.12 | 0.21 | 0.21 | 0.21 | 0.29 | 0.29 |
| Capacity ( *c* ), veh/h | | 1742 | 840 | | 1742 | 815 | 226 | 754 | 335 | 377 | 1055 | 470 |
| Volume-to-Capacity Ratio ( *X* ) | | 0.603 | 0.603 | | 0.610 | 0.611 | 0.875 | 0.822 | 0.658 | 0.845 | 0.859 | 0.296 |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | | 281.7 | 274.3 | | 286.6 | 271.4 | 191.7 | 239.5 | 160.2 | 269 | 342.1 | 80.1 |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | | 11.3 | 11.0 | | 11.5 | 10.9 | 7.7 | 9.6 | 6.4 | 10.8 | 13.7 | 3.2 |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | | 0.00 | 0.00 | | 0.00 | 0.00 | 1.37 | 0.00 | 0.89 | 1.09 | 0.00 | 0.00 |
| Uniform Delay ( $d_1$ ), s/veh | | 24.3 | 24.3 | | 24.4 | 24.4 | 51.6 | 45.4 | 43.6 | 45.6 | 40.2 | 33.0 |
| Incremental Delay ( $d_2$ ), s/veh | | 0.4 | 0.9 | | 0.5 | 1.0 | 28.4 | 6.8 | 3.7 | 15.2 | 6.9 | 0.1 |
| Initial Queue Delay ( $d_3$ ), s/veh | | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Control Delay ( *d* ), s/veh | | 24.8 | 25.2 | | 24.9 | 25.4 | 80.0 | 52.2 | 47.3 | 60.9 | 47.1 | 33.1 |
| Level of Service (LOS) | | C | C | | C | C | E | D | D | E | D | C |
| Approach Delay, s/veh / LOS | 24.9 | C | | 25.1 | C | | 56.5 | E | | 48.9 | D | |
| Intersection Delay, s/veh / LOS | 36.8 | | | | | | D | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 3.0 | C | 3.0 | C | 3.3 | C | 3.2 | C |
| Bicycle LOS Score / LOS | 1.3 | A | 1.3 | A | 1.3 | A | 1.6 | A |

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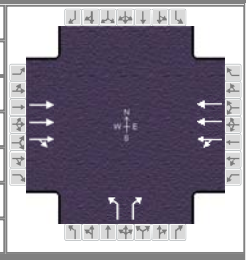
# HCS 2010 Signalized Intersection Results Summary

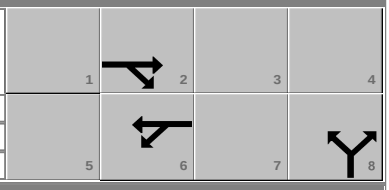
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/24/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | Kapiolani Boulevard | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | Kapiolani and Kamakee | File Name | Kapiolani_Kamakee_10.18_PM_Future.xus | | |
| Project Description | PM Peak on Wednesday 10/18/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | | 1769 | 94 | 48 | 1444 | | 215 | | 181 | | | |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 120.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 85.0 | 25.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | 8 | | |
| Case Number | | 8.0 | | 8.0 | | 9.0 | | |
| Phase Duration, s | | 90.0 | | 90.0 | | 30.0 | | |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | 5.0 | | |
| Max Allow Headway ( *MAH* ), s | | 3.4 | | 3.4 | | 3.4 | | |
| Queue Clearance Time ( $g_s$ ), s | | 21.4 | | 26.8 | | 16.1 | | |
| Green Extension Time ( $g_e$ ), s | | 23.8 | | 23.2 | | 0.7 | | |
| Phase Call Probability | | 1.00 | | 1.00 | | 1.00 | | |
| Max Out Probability | | 0.18 | | 0.21 | | 0.04 | | |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | | 2 | 12 | 1 | 6 | | 3 | | 18 | | | |
| Adjusted Flow Rate ( *v* ), veh/h | | 1352 | 662 | 345 | 1277 | | 234 | | 197 | | | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | | 1900 | 1854 | 923 | 1729 | | 1810 | | 1610 | | | |
| Queue Service Time ( $g_s$ ), s | | 19.3 | 19.4 | 5.4 | 17.1 | | 14.1 | | 13.2 | | | |
| Cycle Queue Clearance Time ( $g_c$ ), s | | 19.3 | 19.4 | 24.8 | 17.1 | | 14.1 | | 13.2 | | | |
| Green Ratio ( *g/C* ) | | 0.71 | 0.71 | 0.71 | 0.71 | | 0.21 | | 0.21 | | | |
| Capacity ( *c* ), veh/h | | 2692 | 1313 | 688 | 2449 | | 377 | | 335 | | | |
| Volume-to-Capacity Ratio ( *X* ) | | 0.502 | 0.504 | 0.501 | 0.521 | | 0.620 | | 0.586 | | | |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | | 185.5 | 182.7 | 75.3 | 179 | | 165.1 | | 137 | | | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | | 7.4 | 7.3 | 3.0 | 7.2 | | 6.6 | | 5.5 | | | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | | 0.00 | 0.00 | 0.00 | 0.00 | | 1.18 | | 0.98 | | | |
| Uniform Delay ( $d_1$ ), s/veh | | 7.9 | 7.9 | 6.7 | 8.1 | | 43.2 | | 42.8 | | | |
| Incremental Delay ( $d_2$ ), s/veh | | 0.1 | 0.1 | 0.2 | 0.1 | | 2.3 | | 1.8 | | | |
| Initial Queue Delay ( $d_3$ ), s/veh | | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | | 0.0 | | | |
| Control Delay ( *d* ), s/veh | | 8.0 | 8.1 | 6.9 | 8.2 | | 45.5 | | 44.6 | | | |
| Level of Service (LOS) | | A | A | A | A | | D | | D | | | |
| Approach Delay, s/veh / LOS | 8.0 | A | | 7.9 | A | | 45.1 | D | | 0.0 | | |
| Intersection Delay, s/veh / LOS | 11.9 | | | | | | B | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 1.6 | A | 0.7 | A | 3.2 | C | 3.2 | C |
| Bicycle LOS Score / LOS | 1.6 | A | 1.4 | A | | F | | |

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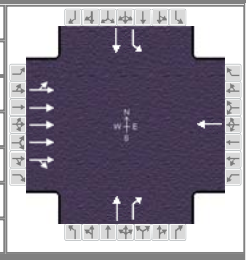
# HCS 2010 Signalized Intersection Results Summary

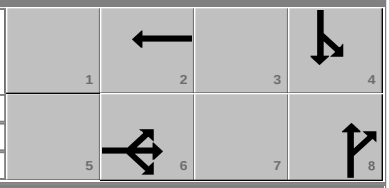
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/25/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | South King Street | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | South King and Victoria… | File Name | King_Victoria_10.18_EVENT_Future.xus | | |
| Project Description | Event Peak Hour Wednesday 10/18/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | 176 | 1342 | 190 | | 0 | | | 36 | 47 | 149 | 205 | |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 90.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 50.0 | 30.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 6 | | 2 | | 8 | | 4 |
| Case Number | | 8.0 | | 8.0 | | 7.0 | | 6.0 |
| Phase Duration, s | | 55.0 | | 55.0 | | 35.0 | | 35.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 3.2 | | 0.0 | | 3.2 | | 3.2 |
| Queue Clearance Time ( $g_s$ ), s | | 13.5 | | | | 3.8 | | 11.3 |
| Green Extension Time ( $g_e$ ), s | | 5.6 | | 0.0 | | 0.9 | | 0.9 |
| Phase Call Probability | | 1.00 | | | | 1.00 | | 1.00 |
| Max Out Probability | | 0.01 | | | | 0.00 | | 0.00 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | 1 | 6 | 16 | | 2 | | | 8 | 18 | 7 | 4 | |
| Adjusted Flow Rate ( *v* ), veh/h | 372 | 1130 | 343 | | 0 | | | 39 | 47 | 162 | 223 | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | 1639 | 1729 | 1568 | | 1900 | | | 1900 | 1610 | 1390 | 1900 | |
| Queue Service Time ( $g_s$ ), s | 10.2 | 11.1 | 11.2 | | 0.0 | | | 1.3 | 1.8 | 8.1 | 8.0 | |
| Cycle Queue Clearance Time ( $g_c$ ), s | 11.5 | 11.1 | 11.2 | | 0.0 | | | 1.3 | 1.8 | 9.3 | 8.0 | |
| Green Ratio ( *g/C* ) | 0.56 | 0.56 | 0.56 | | 0.56 | | | 0.33 | 0.33 | 0.33 | 0.33 | |
| Capacity ( *c* ), veh/h | 971 | 2882 | 871 | | 1056 | | | 633 | 537 | 524 | 633 | |
| Volume-to-Capacity Ratio ( *X* ) | 0.383 | 0.392 | 0.394 | | 0.000 | | | 0.062 | 0.087 | 0.309 | 0.352 | |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | 101.4 | 101.7 | 93.4 | | 0 | | | 14 | 16.9 | 66.2 | 88.7 | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | 4.1 | 4.1 | 3.7 | | 0.0 | | | 0.6 | 0.7 | 2.6 | 3.5 | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | 0.00 | 0.00 | 0.00 | | 0.00 | | | 0.00 | 0.12 | 0.25 | 0.00 | |
| Uniform Delay ( $d_1$ ), s/veh | 11.4 | 11.4 | 11.4 | | 0.0 | | | 20.4 | 20.6 | 23.6 | 22.7 | |
| Incremental Delay ( $d_2$ ), s/veh | 0.1 | 0.0 | 0.1 | | 0.0 | | | 0.0 | 0.0 | 0.1 | 0.1 | |
| Initial Queue Delay ( $d_3$ ), s/veh | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.0 | |
| Control Delay ( *d* ), s/veh | 11.5 | 11.4 | 11.5 | | 0.0 | | | 20.4 | 20.6 | 23.7 | 22.8 | |
| Level of Service (LOS) | B | B | B | | | | | C | C | C | C | |
| Approach Delay, s/veh / LOS | 11.4 | B | | 0.0 | | | 20.5 | C | | 23.2 | C | |
| Intersection Delay, s/veh / LOS | 13.7 | | | | | | B | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 2.4 | B | 2.8 | C | 3.6 | D | 2.8 | C |
| Bicycle LOS Score / LOS | 1.1 | A | 0.5 | A | 0.6 | A | 1.1 | A |

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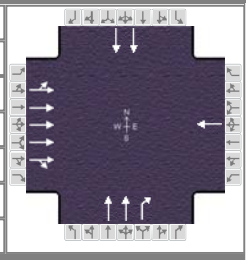
# HCS 2010 Signalized Intersection Results Summary

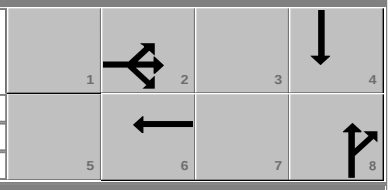
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/25/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | South King Street | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | South King and Ward Av… | File Name | King_Ward_10.18_EVENT_FUTURE.xus | | |
| Project Description | Event Peak Wednesday 10/18/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | 337 | 1401 | 89 | | 0 | | | 562 | 307 | | 1129 | |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 90.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 45.0 | 35.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | 8 | | 4 |
| Case Number | | 8.0 | | 8.0 | | 7.0 | | 8.0 |
| Phase Duration, s | | 50.0 | | 50.0 | | 40.0 | | 40.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 3.2 | | 0.0 | | 3.2 | | 3.2 |
| Queue Clearance Time ( $g_s$ ), s | | 17.8 | | | | 14.1 | | 30.2 |
| Green Extension Time ( $g_e$ ), s | | 6.0 | | 0.0 | | 6.7 | | 2.9 |
| Phase Call Probability | | 1.00 | | | | 1.00 | | 1.00 |
| Max Out Probability | | 0.03 | | | | 0.11 | | 0.82 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | 5 | 2 | 12 | | 6 | | | 8 | 18 | | 4 | |
| Adjusted Flow Rate ( *v* ), veh/h | 377 | 1210 | 388 | | 0 | | | 611 | 290 | | 1227 | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | 1450 | 1729 | 1663 | | 1900 | | | 1809 | 1610 | | 1809 | |
| Queue Service Time ( $g_s$ ), s | 15.8 | 13.7 | 13.7 | | 0.0 | | | 11.2 | 12.1 | | 28.2 | |
| Cycle Queue Clearance Time ( $g_c$ ), s | 15.8 | 13.7 | 13.7 | | 0.0 | | | 11.2 | 12.1 | | 28.2 | |
| Green Ratio ( *g/C* ) | 0.50 | 0.50 | 0.50 | | 0.50 | | | 0.39 | 0.39 | | 0.39 | |
| Capacity ( *c* ), veh/h | 804 | 2594 | 831 | | 950 | | | 1407 | 626 | | 1407 | |
| Volume-to-Capacity Ratio ( *X* ) | 0.469 | 0.466 | 0.467 | | 0.000 | | | 0.434 | 0.463 | | 0.872 | |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | 126.2 | 129.4 | 125.2 | | 0 | | | 116.2 | 112.3 | | 322.3 | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | 5.0 | 5.2 | 5.0 | | 0.0 | | | 4.6 | 4.5 | | 12.9 | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | 0.00 | 0.00 | 0.00 | | 0.00 | | | 0.00 | 0.00 | | 0.00 | |
| Uniform Delay ( $d_1$ ), s/veh | 15.2 | 14.7 | 14.7 | | 0.0 | | | 20.2 | 20.5 | | 25.4 | |
| Incremental Delay ( $d_2$ ), s/veh | 0.2 | 0.0 | 0.2 | | 0.0 | | | 0.1 | 0.2 | | 6.0 | |
| Initial Queue Delay ( $d_3$ ), s/veh | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.0 | 0.0 | | 0.0 | |
| Control Delay ( *d* ), s/veh | 15.4 | 14.7 | 14.8 | | 0.0 | | | 20.3 | 20.7 | | 31.5 | |
| Level of Service (LOS) | B | B | B | | | | | C | C | | C | |
| Approach Delay, s/veh / LOS | 14.9 | B | | 0.0 | | | 20.4 | C | | 31.5 | C | |
| Intersection Delay, s/veh / LOS | 21.1 | | | | | | C | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 2.9 | C | 2.7 | B | 3.5 | D | 2.7 | B |
| Bicycle LOS Score / LOS | 1.1 | A | 0.5 | A | 1.2 | A | 1.5 | A |

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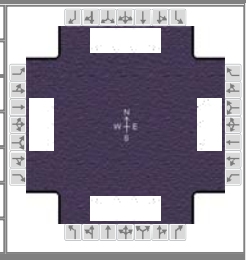
# HCS 2010 Signalized Intersection Results Summary

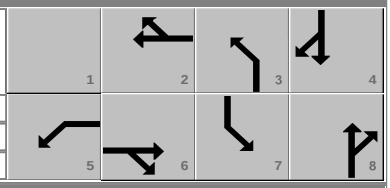
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/25/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | Kapiolani Boulevard | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | Kapiolani and Ward Ave… | File Name | Kapiolani_Ward_10.18_EVENT_FUTURE.xus | | |
| Project Description | Event Peak Wednesday 10/18/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | | 743 | 121 | 202 | 589 | 184 | 179 | 685 | 181 | 303 | 746 | 169 |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 160.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 30.0 | 40.0 | 20.0 | 5.0 | 40.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 0.0 |
| Red | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 6 | 5 | 2 | 3 | 8 | 7 | 4 |
| Case Number | | 8.3 | 2.0 | 4.0 | 2.0 | 3.0 | 2.0 | 3.0 |
| Phase Duration, s | | 45.0 | 35.0 | 80.0 | 25.0 | 45.0 | 35.0 | 55.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 3.2 | 3.3 | 3.2 | 3.3 | 3.2 | 3.3 | 3.2 |
| Queue Clearance Time ( $g_s$ ), s | | 25.7 | 20.0 | 25.4 | 18.9 | 33.1 | 30.9 | 33.8 |
| Green Extension Time ( $g_e$ ), s | | 3.9 | 0.3 | 4.5 | 0.0 | 3.4 | 0.0 | 5.1 |
| Phase Call Probability | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Max Out Probability | | 0.14 | 0.00 | 0.00 | 1.00 | 0.56 | 1.00 | 0.13 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | | 6 | 16 | 5 | 2 | 12 | 3 | 8 | 18 | 7 | 4 | 14 |
| Adjusted Flow Rate ( *v* ), veh/h | | 621 | 294 | 220 | 409 | 383 | 195 | 745 | 173 | 329 | 811 | 160 |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | | 1900 | 1783 | 1810 | 1900 | 1773 | 1810 | 1809 | 1610 | 1810 | 1809 | 1610 |
| Queue Service Time ( $g_s$ ), s | | 23.4 | 23.7 | 18.0 | 23.3 | 23.4 | 16.9 | 31.1 | 14.4 | 28.9 | 31.8 | 12.1 |
| Cycle Queue Clearance Time ( $g_c$ ), s | | 23.4 | 23.7 | 18.0 | 23.3 | 23.4 | 16.9 | 31.1 | 14.4 | 28.9 | 31.8 | 12.1 |
| Green Ratio ( *g/C* ) | | 0.25 | 0.25 | 0.19 | 0.47 | 0.47 | 0.12 | 0.25 | 0.25 | 0.19 | 0.31 | 0.31 |
| Capacity ( *c* ), veh/h | | 950 | 446 | 339 | 891 | 831 | 226 | 904 | 403 | 339 | 1131 | 503 |
| Volume-to-Capacity Ratio ( *X* ) | | 0.654 | 0.660 | 0.647 | 0.460 | 0.461 | 0.860 | 0.823 | 0.429 | 0.971 | 0.717 | 0.318 |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | | 288.8 | 278.8 | 216.8 | 274.1 | 256.4 | 237.9 | 377.7 | 149.1 | 432.3 | 371.8 | 124.1 |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | | 11.6 | 11.2 | 8.7 | 11.0 | 10.3 | 9.5 | 15.1 | 6.0 | 17.3 | 14.9 | 5.0 |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | | 0.00 | 0.00 | 1.14 | 0.00 | 0.00 | 1.70 | 0.00 | 0.83 | 1.75 | 0.00 | 0.00 |
| Uniform Delay ( $d_1$ ), s/veh | | 53.8 | 53.9 | 60.1 | 28.8 | 28.8 | 68.6 | 56.7 | 50.4 | 64.6 | 48.7 | 42.0 |
| Incremental Delay ( $d_2$ ), s/veh | | 1.3 | 2.9 | 3.3 | 0.1 | 0.1 | 25.8 | 5.8 | 0.3 | 40.7 | 1.9 | 0.1 |
| Initial Queue Delay ( $d_3$ ), s/veh | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Control Delay ( *d* ), s/veh | | 55.1 | 56.8 | 63.4 | 28.9 | 28.9 | 94.4 | 62.5 | 50.7 | 105.3 | 50.6 | 42.1 |
| Level of Service (LOS) | | E | E | E | C | C | F | E | D | F | D | D |
| Approach Delay, s/veh / LOS | 55.6 | E | | 36.4 | D | | 66.2 | E | | 63.4 | E | |
| Intersection Delay, s/veh / LOS | 56.2 | | | | | | E | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 3.0 | C | 3.0 | C | 3.3 | C | 2.9 | C |
| Bicycle LOS Score / LOS | 1.0 | A | 1.3 | A | 1.4 | A | 1.6 | A |

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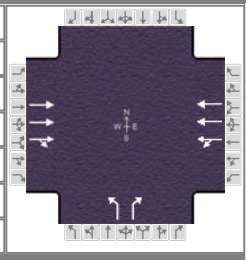
# HCS 2010 Signalized Intersection Results Summary

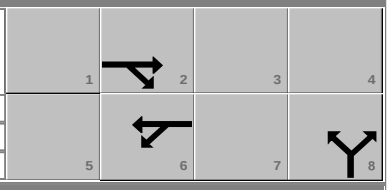
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/24/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | Kapiolani Boulevard | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | Kapiolani and Kamakee | File Name | Kapiolani_Kamakee_10.18_EVENT_FUTURE.xus | | |
| Project Description | Event Peak on Wednesday 10/18/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | | 814 | 110 | 190 | 1408 | | 244 | | 139 | | | |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 100.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 60.0 | 30.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | 8 | | |
| Case Number | | 8.0 | | 8.0 | | 9.0 | | |
| Phase Duration, s | | 65.0 | | 65.0 | | 35.0 | | |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | 5.0 | | |
| Max Allow Headway ( *MAH* ), s | | 3.4 | | 3.4 | | 3.3 | | |
| Queue Clearance Time ( $g_s$ ), s | | 10.7 | | 41.6 | | 14.0 | | |
| Green Extension Time ( $g_e$ ), s | | 13.9 | | 9.8 | | 0.8 | | |
| Phase Call Probability | | 1.00 | | 1.00 | | 1.00 | | |
| Max Out Probability | | 0.07 | | 0.41 | | 0.00 | | |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | | 2 | 12 | 1 | 6 | | 3 | | 18 | | | |
| Adjusted Flow Rate ( *v* ), veh/h | | 674 | 319 | 307 | 1430 | | 265 | | 151 | | | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | | 1900 | 1790 | 662 | 1729 | | 1810 | | 1610 | | | |
| Queue Service Time ( $g_s$ ), s | | 8.6 | 8.7 | 30.9 | 20.8 | | 12.0 | | 7.2 | | | |
| Cycle Queue Clearance Time ( $g_c$ ), s | | 8.6 | 8.7 | 39.6 | 20.8 | | 12.0 | | 7.2 | | | |
| Green Ratio ( *g/C* ) | | 0.60 | 0.60 | 0.60 | 0.60 | | 0.30 | | 0.30 | | | |
| Capacity ( *c* ), veh/h | | 2280 | 1074 | 457 | 2075 | | 543 | | 483 | | | |
| Volume-to-Capacity Ratio ( *X* ) | | 0.296 | 0.297 | 0.672 | 0.689 | | 0.489 | | 0.313 | | | |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | | 86.6 | 82.5 | 144.5 | 263 | | 131.2 | | 70.3 | | | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | | 3.5 | 3.3 | 5.8 | 10.5 | | 5.2 | | 2.8 | | | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | | 0.00 | 0.00 | 0.00 | 0.00 | | 0.94 | | 0.50 | | | |
| Uniform Delay ( $d_1$ ), s/veh | | 9.7 | 9.7 | 18.3 | 13.6 | | 28.7 | | 27.0 | | | |
| Incremental Delay ( $d_2$ ), s/veh | | 0.0 | 0.1 | 3.1 | 0.8 | | 0.3 | | 0.1 | | | |
| Initial Queue Delay ( $d_3$ ), s/veh | | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | | 0.0 | | | |
| Control Delay ( *d* ), s/veh | | 9.8 | 9.8 | 21.4 | 14.5 | | 29.0 | | 27.2 | | | |
| Level of Service (LOS) | | A | A | C | B | | C | | C | | | |
| Approach Delay, s/veh / LOS | 9.8 | A | | 15.7 | B | | 28.3 | C | | 0.0 | | |
| Intersection Delay, s/veh / LOS | 15.5 | | | | | | B | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 1.7 | A | 0.7 | A | 3.2 | C | 3.2 | C |
| Bicycle LOS Score / LOS | 1.0 | A | 1.4 | A | | F | | |

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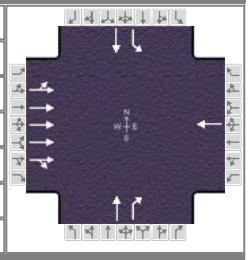
# HCS 2010 Signalized Intersection Results Summary

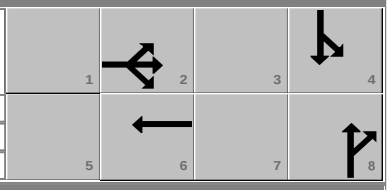
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/24/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | South King Street | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | South King and Victoria… | File Name | King_Victoria_10.15_Sunday_Future.xus | | |
| Project Description | PM Peak Sunday 10/15/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | 123 | 866 | 148 | | 0 | | | 26 | 95 | 44 | 247 | |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 90.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 58.0 | 22.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | 8 | | 4 |
| Case Number | | 8.0 | | 8.0 | | 7.0 | | 6.0 |
| Phase Duration, s | | 63.0 | | 63.0 | | 27.0 | | 27.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 3.2 | | 0.0 | | 3.2 | | 3.2 |
| Queue Clearance Time ( $g_s$ ), s | | 7.3 | | | | 5.9 | | 13.2 |
| Green Extension Time ( $g_e$ ), s | | 3.2 | | 0.0 | | 0.8 | | 0.7 |
| Phase Call Probability | | 1.00 | | | | 1.00 | | 1.00 |
| Max Out Probability | | 0.00 | | | | 0.00 | | 0.03 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | 5 | 2 | 12 | | 6 | | | 8 | 18 | 7 | 4 | |
| Adjusted Flow Rate ( *v* ), veh/h | 243 | 724 | 226 | | 0 | | | 28 | 87 | 48 | 268 | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | 1624 | 1729 | 1581 | | 1900 | | | 1900 | 1610 | 1404 | 1900 | |
| Queue Service Time ( $g_s$ ), s | 3.7 | 5.2 | 5.3 | | 0.0 | | | 1.0 | 3.9 | 2.4 | 11.2 | |
| Cycle Queue Clearance Time ( $g_c$ ), s | 5.3 | 5.2 | 5.3 | | 0.0 | | | 1.0 | 3.9 | 3.5 | 11.2 | |
| Green Ratio ( *g/C* ) | 0.64 | 0.64 | 0.64 | | 0.64 | | | 0.24 | 0.24 | 0.24 | 0.24 | |
| Capacity ( *c* ), veh/h | 1108 | 3343 | 1019 | | 1224 | | | 464 | 394 | 407 | 464 | |
| Volume-to-Capacity Ratio ( *X* ) | 0.219 | 0.217 | 0.221 | | 0.000 | | | 0.061 | 0.221 | 0.117 | 0.578 | |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | 44.1 | 43.7 | 41.2 | | 0 | | | 11.7 | 37.5 | 20.6 | 130.6 | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | 1.8 | 1.7 | 1.6 | | 0.0 | | | 0.5 | 1.5 | 0.8 | 5.2 | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | 0.00 | 0.00 | 0.00 | | 0.00 | | | 0.00 | 0.00 | 0.00 | 0.00 | |
| Uniform Delay ( $d_1$ ), s/veh | 6.6 | 6.6 | 6.6 | | 0.0 | | | 26.1 | 27.2 | 27.4 | 29.9 | |
| Incremental Delay ( $d_2$ ), s/veh | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.0 | 0.1 | 0.0 | 1.2 | |
| Initial Queue Delay ( $d_3$ ), s/veh | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.0 | |
| Control Delay ( *d* ), s/veh | 6.6 | 6.6 | 6.7 | | 0.0 | | | 26.1 | 27.3 | 27.5 | 31.1 | |
| Level of Service (LOS) | A | A | A | | | | | C | C | C | C | |
| Approach Delay, s/veh / LOS | 6.6 | A | | 0.0 | | | 27.0 | C | | 30.5 | C | |
| Intersection Delay, s/veh / LOS | 12.7 | | | | | | B | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 2.4 | B | 2.4 | B | 3.6 | D | 2.9 | C |
| Bicycle LOS Score / LOS | 0.9 | A | 0.5 | A | 0.7 | A | 1.0 | A |

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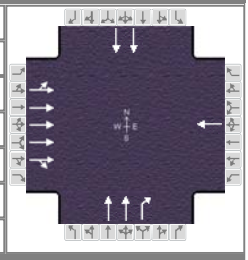
# HCS 2010 Signalized Intersection Results Summary

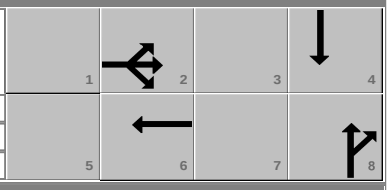
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/24/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 1.00 |
| Urban Street | South King Street | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | South King Street and… | File Name | King_Ward_10.15_Sunday_Future.xus | | |
| Project Description | PM Peak on Sunday 10/15/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | 151 | 920 | 58 | | 0 | | | 528 | 252 | | 809 | |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 90.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 50.0 | 30.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | 8 | | 4 |
| Case Number | | 8.0 | | 8.0 | | 7.0 | | 8.0 |
| Phase Duration, s | | 55.0 | | 55.0 | | 35.0 | | 35.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 3.2 | | 0.0 | | 3.2 | | 3.2 |
| Queue Clearance Time ( $g_s$ ), s | | 8.5 | | | | 12.3 | | 19.3 |
| Green Extension Time ( $g_e$ ), s | | 2.9 | | 0.0 | | 4.0 | | 3.4 |
| Phase Call Probability | | 1.00 | | | | 1.00 | | 1.00 |
| Max Out Probability | | 0.00 | | | | 0.04 | | 0.19 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | 5 | 2 | 12 | | 6 | | | 8 | 18 | | 4 | |
| Adjusted Flow Rate ( *v* ), veh/h | 226 | 676 | 219 | | 0 | | | 528 | 172 | | 809 | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | 1573 | 1729 | 1661 | | 1900 | | | 1809 | 1610 | | 1809 | |
| Queue Service Time ( $g_s$ ), s | 5.5 | 6.0 | 6.1 | | 0.0 | | | 10.3 | 7.2 | | 17.3 | |
| Cycle Queue Clearance Time ( $g_c$ ), s | 6.5 | 6.0 | 6.1 | | 0.0 | | | 10.3 | 7.2 | | 17.3 | |
| Green Ratio ( *g/C* ) | 0.56 | 0.56 | 0.56 | | 0.56 | | | 0.33 | 0.33 | | 0.33 | |
| Capacity ( *c* ), veh/h | 940 | 2882 | 923 | | 1056 | | | 1206 | 537 | | 1206 | |
| Volume-to-Capacity Ratio ( *X* ) | 0.240 | 0.235 | 0.237 | | 0.000 | | | 0.438 | 0.320 | | 0.671 | |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | 55.9 | 54.7 | 53.5 | | 0 | | | 108.6 | 67.8 | | 187.3 | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | 2.2 | 2.2 | 2.1 | | 0.0 | | | 4.3 | 2.7 | | 7.5 | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | 0.00 | 0.00 | 0.00 | | 0.00 | | | 0.00 | 0.00 | | 0.00 | |
| Uniform Delay ( $d_1$ ), s/veh | 10.3 | 10.2 | 10.2 | | 0.0 | | | 23.4 | 22.4 | | 25.8 | |
| Incremental Delay ( $d_2$ ), s/veh | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.1 | 0.1 | | 1.2 | |
| Initial Queue Delay ( $d_3$ ), s/veh | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.0 | 0.0 | | 0.0 | |
| Control Delay ( *d* ), s/veh | 10.3 | 10.2 | 10.3 | | 0.0 | | | 23.5 | 22.5 | | 27.0 | |
| Level of Service (LOS) | B | B | B | | | | | C | C | | C | |
| Approach Delay, s/veh / LOS | 10.3 | B | | 0.0 | | | 23.3 | C | | 27.0 | C | |
| Intersection Delay, s/veh / LOS | 18.9 | | | | | | B | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 2.9 | C | 2.7 | B | 3.6 | D | 2.7 | B |
| Bicycle LOS Score / LOS | 0.9 | A | 0.5 | A | 1.1 | A | 1.2 | A |

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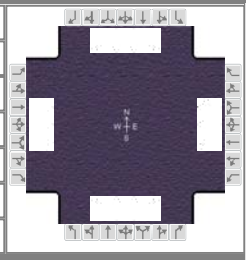
# HCS 2010 Signalized Intersection Results Summary

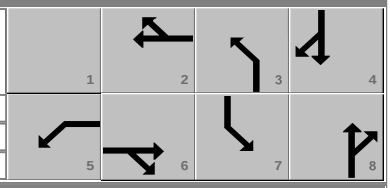
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/24/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | Kapiolani Boulevard | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | Kapiolani Boulevard and… | File Name | Kapiolani_Ward_10.15_Sunday_Future.xus | | |
| Project Description | PM Peak on Sunday 10/15/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | | 573 | 123 | 199 | 503 | 244 | 138 | 536 | 96 | 288 | 494 | 85 |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 120.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 20.0 | 30.0 | 15.0 | 5.0 | 25.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 0.0 |
| Red | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 6 | 5 | 2 | 3 | 8 | 7 | 4 |
| Case Number | | 8.3 | 2.0 | 4.0 | 2.0 | 3.0 | 2.0 | 3.0 |
| Phase Duration, s | | 35.0 | 25.0 | 60.0 | 20.0 | 30.0 | 30.0 | 40.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 3.2 | 3.3 | 3.2 | 3.3 | 3.2 | 3.3 | 3.2 |
| Queue Clearance Time ( $g_s$ ), s | | 15.9 | 15.6 | 19.6 | 11.5 | 20.2 | 21.9 | 16.8 |
| Green Extension Time ( $g_e$ ), s | | 3.4 | 0.2 | 3.8 | 0.1 | 1.8 | 0.2 | 3.3 |
| Phase Call Probability | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Max Out Probability | | 0.11 | 0.34 | 0.00 | 0.76 | 0.65 | 1.00 | 0.02 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | | 6 | 16 | 5 | 2 | 12 | 3 | 8 | 18 | 7 | 4 | 14 |
| Adjusted Flow Rate ( *v* ), veh/h | | 500 | 235 | 216 | 403 | 365 | 150 | 583 | 83 | 313 | 537 | 71 |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | | 1900 | 1750 | 1810 | 1900 | 1713 | 1810 | 1809 | 1610 | 1810 | 1809 | 1610 |
| Queue Service Time ( $g_s$ ), s | | 13.6 | 13.9 | 13.6 | 17.5 | 17.6 | 9.5 | 18.2 | 5.1 | 19.9 | 14.8 | 3.9 |
| Cycle Queue Clearance Time ( $g_c$ ), s | | 13.6 | 13.9 | 13.6 | 17.5 | 17.6 | 9.5 | 18.2 | 5.1 | 19.9 | 14.8 | 3.9 |
| Green Ratio ( *g/C* ) | | 0.25 | 0.25 | 0.17 | 0.46 | 0.46 | 0.12 | 0.21 | 0.21 | 0.21 | 0.29 | 0.29 |
| Capacity ( *c* ), veh/h | | 950 | 437 | 302 | 871 | 785 | 226 | 754 | 335 | 377 | 1055 | 470 |
| Volume-to-Capacity Ratio ( *X* ) | | 0.526 | 0.537 | 0.717 | 0.463 | 0.465 | 0.663 | 0.773 | 0.246 | 0.830 | 0.509 | 0.150 |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | | 161.5 | 153.5 | 168.5 | 197.8 | 179.4 | 117.4 | 217.6 | 52 | 260.1 | 165.6 | 38.8 |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | | 6.5 | 6.1 | 6.7 | 7.9 | 7.2 | 4.7 | 8.7 | 2.1 | 10.4 | 6.6 | 1.6 |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | | 0.00 | 0.00 | 0.89 | 0.00 | 0.00 | 0.84 | 0.00 | 0.29 | 1.05 | 0.00 | 0.00 |
| Uniform Delay ( $d_1$ ), s/veh | | 38.9 | 39.0 | 47.3 | 22.3 | 22.4 | 50.1 | 44.8 | 39.6 | 45.5 | 35.4 | 31.5 |
| Incremental Delay ( $d_2$ ), s/veh | | 0.3 | 0.7 | 6.9 | 0.1 | 0.2 | 5.7 | 4.5 | 0.1 | 13.6 | 0.2 | 0.1 |
| Initial Queue Delay ( $d_3$ ), s/veh | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Control Delay ( *d* ), s/veh | | 39.1 | 39.7 | 54.2 | 22.5 | 22.5 | 55.8 | 49.4 | 39.8 | 59.1 | 35.5 | 31.5 |
| Level of Service (LOS) | | D | D | D | C | C | E | D | D | E | D | C |
| Approach Delay, s/veh / LOS | 39.3 | D | | 29.5 | C | | 49.6 | D | | 43.2 | D | |
| Intersection Delay, s/veh / LOS | 40.0 | | | | | | D | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 3.0 | C | 3.0 | C | 3.2 | C | 2.9 | C |
| Bicycle LOS Score / LOS | 0.9 | A | 1.3 | A | 1.2 | A | 1.2 | A |

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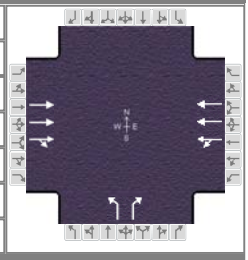
# HCS 2010 Signalized Intersection Results Summary

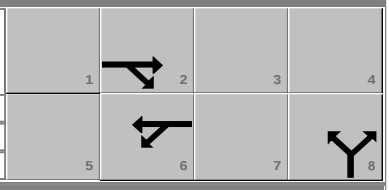
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/24/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | Kapiolani Boulevard | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | Kapiolani and Kamakee | File Name | Kapiolani_Kamakee_10.15_Sunday_Future.xus | | |
| Project Description | PM Peak on Sunday 10/15 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | | 896 | 61 | 166 | 1380 | | 180 | | 136 | | | |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 120.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 85.0 | 25.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | 8 | | |
| Case Number | | 8.0 | | 8.0 | | 9.0 | | |
| Phase Duration, s | | 90.0 | | 90.0 | | 30.0 | | |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | 5.0 | | |
| Max Allow Headway ( *MAH* ), s | | 3.4 | | 3.4 | | 3.4 | | |
| Queue Clearance Time ( $g_s$ ), s | | 9.8 | | 32.2 | | 13.5 | | |
| Green Extension Time ( $g_e$ ), s | | 13.7 | | 13.3 | | 0.6 | | |
| Phase Call Probability | | 1.00 | | 1.00 | | 1.00 | | |
| Max Out Probability | | 0.01 | | 0.05 | | 0.00 | | |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | | 2 | 12 | 1 | 6 | | 3 | | 18 | | | |
| Adjusted Flow Rate ( *v* ), veh/h | | 692 | 337 | 319 | 1362 | | 196 | | 148 | | | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | | 1900 | 1845 | 763 | 1729 | | 1810 | | 1610 | | | |
| Queue Service Time ( $g_s$ ), s | | 7.8 | 7.8 | 22.3 | 17.4 | | 11.5 | | 9.6 | | | |
| Cycle Queue Clearance Time ( $g_c$ ), s | | 7.8 | 7.8 | 30.2 | 17.4 | | 11.5 | | 9.6 | | | |
| Green Ratio ( *g/C* ) | | 0.71 | 0.71 | 0.71 | 0.71 | | 0.21 | | 0.21 | | | |
| Capacity ( *c* ), veh/h | | 2692 | 1307 | 587 | 2449 | | 377 | | 335 | | | |
| Volume-to-Capacity Ratio ( *X* ) | | 0.257 | 0.258 | 0.543 | 0.556 | | 0.519 | | 0.441 | | | |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | | 74.7 | 72.9 | 111.5 | 199 | | 131.6 | | 97.3 | | | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | | 3.0 | 2.9 | 4.5 | 8.0 | | 5.3 | | 3.9 | | | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | | 0.00 | 0.00 | 0.00 | 0.00 | | 0.94 | | 0.69 | | | |
| Uniform Delay ( $d_1$ ), s/veh | | 6.2 | 6.2 | 10.3 | 8.4 | | 42.2 | | 41.4 | | | |
| Incremental Delay ( $d_2$ ), s/veh | | 0.0 | 0.0 | 0.6 | 0.2 | | 0.6 | | 0.3 | | | |
| Initial Queue Delay ( $d_3$ ), s/veh | | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | | 0.0 | | | |
| Control Delay ( *d* ), s/veh | | 6.3 | 6.3 | 10.9 | 8.6 | | 42.8 | | 41.7 | | | |
| Level of Service (LOS) | | A | A | B | A | | D | | D | | | |
| Approach Delay, s/veh / LOS | 6.3 | A | | 9.0 | A | | 42.3 | D | | 0.0 | | |
| Intersection Delay, s/veh / LOS | 11.8 | | | | | | B | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 1.6 | A | 0.7 | A | 3.2 | C | 3.2 | C |
| Bicycle LOS Score / LOS | 1.1 | A | 1.4 | A | | F | | |

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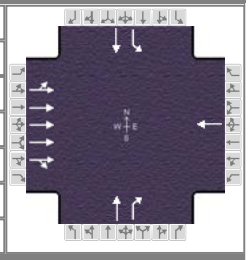
# HCS 2010 Signalized Intersection Results Summary

| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/25/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | South King Street | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | South King and Victoria… | File Name | King_Victoria_10.18_PM_Future_What If.xus | | |
| Project Description | PM Peak Hour Wednesday 10/18/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | 419 | 1800 | 187 | | 0 | | | 152 | 107 | 206 | 136 | |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 90.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Green | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1 | 2 | 3 | 4 |
| Yellow | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5 | 6 | 7 | 8 |
| Red | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | |

| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | 8 | | 4 |
| Case Number | | 8.0 | | 8.0 | | 7.0 | | 6.0 |
| Phase Duration, s | | 39.0 | | 39.0 | | 18.0 | | 18.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 0.0 | | 0.0 | | 0.0 | | 0.0 |
| Queue Clearance Time ( $g_s$ ), s | | 0.0 | | 0.0 | | 0.0 | | 0.0 |
| Green Extension Time ( $g_e$ ), s | | 0.0 | | 0.0 | | 0.0 | | 0.0 |
| Phase Call Probability | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| Max Out Probability | | 0.00 | | 0.00 | | 0.00 | | 0.00 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | 5 | 2 | 12 | | 6 | | | 8 | 18 | 7 | 4 | |
| Adjusted Flow Rate ( *v* ), veh/h | 0 | 0 | 0 | | 0 | | | 0 | 0 | 0 | 0 | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | 0 | 0 | 0 | | 0 | | | 0 | 0 | 0 | 0 | |
| Queue Service Time ( $g_s$ ), s | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.0 | |
| Cycle Queue Clearance Time ( $g_c$ ), s | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.0 | |
| Green Ratio ( *g/C* ) | 0.38 | 0.38 | 0.38 | | 0.38 | | | 0.14 | 0.14 | 0.14 | 0.14 | |
| Capacity ( *c* ), veh/h | 633 | 1960 | 617 | | 718 | | | 274 | 233 | 158 | 274 | |
| Volume-to-Capacity Ratio ( *X* ) | 0.794 | 0.803 | 0.803 | | 0.000 | | | 0.602 | 0.430 | 1.417 | 0.539 | |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | 274.2 | 253.1 | 259.4 | | 0 | | | 89.7 | 50.6 | 330.1 | 77.1 | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | 11.0 | 10.1 | 10.4 | | 0.0 | | | 3.6 | 2.0 | 13.2 | 3.1 | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | 0.00 | 0.00 | 0.00 | | 0.00 | | | 0.00 | 0.37 | 1.26 | 0.00 | |
| Uniform Delay ( $d_1$ ), s/veh | 26.4 | 25.0 | 25.0 | | 0.0 | | | 36.1 | 35.1 | 43.6 | 35.7 | |
| Incremental Delay ( $d_2$ ), s/veh | 6.4 | 2.3 | 7.0 | | 0.0 | | | 2.6 | 0.5 | 220.4 | 1.2 | |
| Initial Queue Delay ( $d_3$ ), s/veh | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.0 | |
| Control Delay ( *d* ), s/veh | 32.8 | 27.3 | 32.0 | | 0.0 | | | 38.7 | 35.6 | 264.0 | 36.9 | |
| Level of Service (LOS) | C | C | C | | | | | D | D | F | D | |
| Approach Delay, s/veh / LOS | 29.3 | C | | 0.0 | | | 37.5 | D | | 173.7 | F | |
| Intersection Delay, s/veh / LOS | 46.7 | | | | | | D | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 2.4 | B | 2.9 | C | 3.6 | D | 2.8 | C |
| Bicycle LOS Score / LOS | 1.3 | A | 0.5 | A | 0.9 | A | 1.1 | A |

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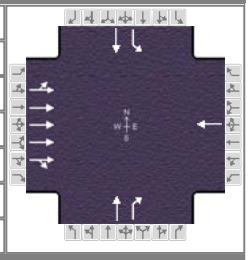
# HCS 2010 Signalized Intersection Results Summary

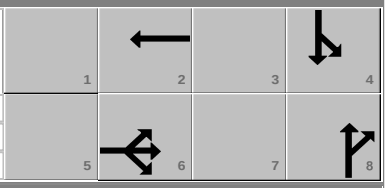
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/25/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | South King Street | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | South King and Victoria… | File Name | King_Victoria_10.18_EVENT_Future_What If.xus | | |
| Project Description | Event Peak Hour Wednesday 10/18/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | 176 | 1342 | 190 | | 0 | | | 36 | 47 | 149 | 205 | |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 90.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yellow | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Red | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 6 | | 2 | | 8 | | 4 |
| Case Number | | 8.0 | | 8.0 | | 7.0 | | 6.0 |
| Phase Duration, s | | 39.0 | | 39.0 | | 18.0 | | 18.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 0.0 | | 0.0 | | 0.0 | | 0.0 |
| Queue Clearance Time ( $g_s$ ), s | | 0.0 | | 0.0 | | 0.0 | | 0.0 |
| Green Extension Time ( $g_e$ ), s | | 0.0 | | 0.0 | | 0.0 | | 0.0 |
| Phase Call Probability | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| Max Out Probability | | 0.00 | | 0.00 | | 0.00 | | 0.00 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | 1 | 6 | 16 | | 2 | | | 8 | 18 | 7 | 4 | |
| Adjusted Flow Rate ( *v* ), veh/h | 0 | 0 | 0 | | 0 | | | 0 | 0 | 0 | 0 | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | 0 | 0 | 0 | | 0 | | | 0 | 0 | 0 | 0 | |
| Queue Service Time ( $g_s$ ), s | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.0 | |
| Cycle Queue Clearance Time ( $g_c$ ), s | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.0 | |
| Green Ratio ( *g/C* ) | 0.38 | 0.38 | 0.38 | | 0.38 | | | 0.14 | 0.14 | 0.14 | 0.14 | |
| Capacity ( *c* ), veh/h | 679 | 1960 | 592 | | 718 | | | 274 | 233 | 256 | 274 | |
| Volume-to-Capacity Ratio ( *X* ) | 0.554 | 0.575 | 0.578 | | 0.000 | | | 0.143 | 0.201 | 0.633 | 0.812 | |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | 160 | 155.7 | 144.9 | | 0 | | | 18.9 | 22.8 | 94.8 | 147.9 | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | 6.4 | 6.2 | 5.8 | | 0.0 | | | 0.8 | 0.9 | 3.8 | 5.9 | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | 0.00 | 0.00 | 0.00 | | 0.00 | | | 0.00 | 0.17 | 0.36 | 0.00 | |
| Uniform Delay ( $d_1$ ), s/veh | 22.6 | 22.3 | 22.3 | | 0.0 | | | 33.6 | 33.9 | 38.9 | 37.3 | |
| Incremental Delay ( $d_2$ ), s/veh | 0.6 | 0.3 | 0.9 | | 0.0 | | | 0.1 | 0.2 | 3.9 | 15.6 | |
| Initial Queue Delay ( $d_3$ ), s/veh | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.0 | |
| Control Delay ( *d* ), s/veh | 23.2 | 22.5 | 23.2 | | 0.0 | | | 33.7 | 34.1 | 42.7 | 52.9 | |
| Level of Service (LOS) | C | C | C | | | | | C | C | D | D | |
| Approach Delay, s/veh / LOS | 22.8 | C | | 0.0 | | | 33.9 | C | | 48.6 | D | |
| Intersection Delay, s/veh / LOS | 27.5 | | | | | | C | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 2.4 | B | 2.9 | C | 3.6 | D | 2.8 | C |
| Bicycle LOS Score / LOS | 1.1 | A | 0.5 | A | 0.6 | A | 1.1 | A |

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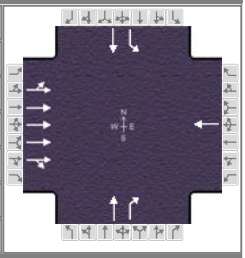
# HCS 2010 Signalized Intersection Results Summary

| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 10/24/2017 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | South King Street | Analysis Year | 2017 | Analysis Period | 1> 7:00 |
| Intersection | South King and Victoria… | File Name | King_Victoria_10.15_Sunday_Future_What If.xus | | |
| Project Description | PM Peak Sunday 10/15/17 | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | 123 | 866 | 148 | | 0 | | | 26 | 95 | 44 | 247 | |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 90.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Green | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1 | 2 | 3 | 4 |
| Yellow | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5 | 6 | 7 | 8 |
| Red | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | |

| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | 8 | | 4 |
| Case Number | | 8.0 | | 8.0 | | 7.0 | | 6.0 |
| Phase Duration, s | | 39.0 | | 39.0 | | 18.0 | | 18.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 0.0 | | 0.0 | | 0.0 | | 0.0 |
| Queue Clearance Time ( $g_s$ ), s | | 0.0 | | 0.0 | | 0.0 | | 0.0 |
| Green Extension Time ( $g_e$ ), s | | 0.0 | | 0.0 | | 0.0 | | 0.0 |
| Phase Call Probability | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| Max Out Probability | | 0.00 | | 0.00 | | 0.00 | | 0.00 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | 5 | 2 | 12 | | 6 | | | 8 | 18 | 7 | 4 | |
| Adjusted Flow Rate ( *v* ), veh/h | 0 | 0 | 0 | | 0 | | | 0 | 0 | 0 | 0 | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | 0 | 0 | 0 | | 0 | | | 0 | 0 | 0 | 0 | |
| Queue Service Time ( $g_s$ ), s | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.0 | |
| Cycle Queue Clearance Time ( $g_c$ ), s | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.0 | |
| Green Ratio ( *g/C* ) | 0.38 | 0.38 | 0.38 | | 0.38 | | | 0.14 | 0.14 | 0.14 | 0.14 | |
| Capacity ( *c* ), veh/h | 679 | 1960 | 597 | | 718 | | | 274 | 233 | 265 | 274 | |
| Volume-to-Capacity Ratio ( *X* ) | 0.365 | 0.368 | 0.376 | | 0.000 | | | 0.103 | 0.374 | 0.181 | 0.978 | |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | 94.1 | 89.9 | 84.8 | | 0 | | | 13.5 | 43.6 | 23.8 | 237.6 | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | 3.8 | 3.6 | 3.4 | | 0.0 | | | 0.5 | 1.7 | 1.0 | 9.5 | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | 0.00 | 0.00 | 0.00 | | 0.00 | | | 0.00 | 0.00 | 0.00 | 0.00 | |
| Uniform Delay ( $d_1$ ), s/veh | 20.4 | 20.2 | 20.3 | | 0.0 | | | 33.4 | 34.8 | 35.1 | 38.4 | |
| Incremental Delay ( $d_2$ ), s/veh | 0.1 | 0.0 | 0.1 | | 0.0 | | | 0.1 | 0.4 | 0.1 | 48.0 | |
| Initial Queue Delay ( $d_3$ ), s/veh | 0.0 | 0.0 | 0.0 | | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.0 | |
| Control Delay ( *d* ), s/veh | 20.5 | 20.3 | 20.5 | | 0.0 | | | 33.5 | 35.2 | 35.3 | 86.3 | |
| Level of Service (LOS) | C | C | C | | | | | C | D | D | F | |
| Approach Delay, s/veh / LOS | 20.4 | C | | 0.0 | | | 34.8 | C | | 78.6 | E | |
| Intersection Delay, s/veh / LOS | 32.7 | | | | | | C | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 2.4 | B | 2.4 | B | 3.6 | D | 2.9 | C |
| Bicycle LOS Score / LOS | 0.9 | A | 0.5 | A | 0.7 | A | 1.0 | A |

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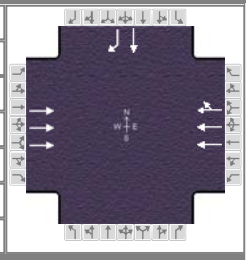
# HCS 2010 Signalized Intersection Results Summary

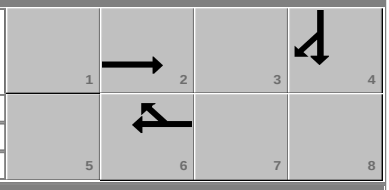
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 9/26/2018 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | Kapiolani Boulevard | Analysis Year | 2018 | Analysis Period | 1> 7:00 |
| Intersection | Kapiolani and Victoria | File Name | Kapiolani_Victoria_Weekday_PM_Future.xus | | |
| Project Description | Weekday PM Peak Hour | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | | 1863 | | | 1432 | 593 | | | | | 0 | 63 |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 120.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 70.0 | 18.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | | | 4 |
| Case Number | | 8.0 | | 8.0 | | | | 11.0 |
| Phase Duration, s | | 75.0 | | 75.0 | | | | 23.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | | | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 3.2 | | 3.2 | | | | 3.5 |
| Queue Clearance Time ( $g_s$ ), s | | 34.1 | | 32.7 | | | | 6.5 |
| Green Extension Time ( $g_e$ ), s | | 21.8 | | 22.3 | | | | 0.1 |
| Phase Call Probability | | 1.00 | | 1.00 | | | | 1.00 |
| Max Out Probability | | 0.47 | | 0.46 | | | | 0.00 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | | 2 | | | 6 | 16 | | | | | 4 | 14 |
| Adjusted Flow Rate ( *v* ), veh/h | | 2025 | | | 1416 | 634 | | | | | 0 | 68 |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | | 1725 | | | 1900 | 1666 | | | | | 1900 | 1610 |
| Queue Service Time ( $g_s$ ), s | | 32.1 | | | 28.7 | 30.7 | | | | | 0.0 | 4.5 |
| Cycle Queue Clearance Time ( $g_c$ ), s | | 32.1 | | | 28.7 | 30.7 | | | | | 0.0 | 4.5 |
| Green Ratio ( *g/C* ) | | 0.58 | | | 0.58 | 0.58 | | | | | 0.15 | 0.15 |
| Capacity ( *c* ), veh/h | | 3019 | | | 2217 | 972 | | | | | 285 | 242 |
| Volume-to-Capacity Ratio ( *X* ) | | 0.671 | | | 0.639 | 0.652 | | | | | 0.000 | 0.284 |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | | 314.1 | | | 320.4 | 294.9 | | | | | 0 | 46.3 |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | | 12.6 | | | 12.8 | 11.8 | | | | | 0.0 | 1.9 |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | | 0.00 | | | 0.00 | 0.00 | | | | | 0.00 | 0.00 |
| Uniform Delay ( $d_1$ ), s/veh | | 17.1 | | | 16.6 | 16.8 | | | | | 0.0 | 45.3 |
| Incremental Delay ( $d_2$ ), s/veh | | 0.5 | | | 0.5 | 1.2 | | | | | 0.0 | 0.2 |
| Initial Queue Delay ( $d_3$ ), s/veh | | 0.0 | | | 0.0 | 0.0 | | | | | 0.0 | 0.0 |
| Control Delay ( *d* ), s/veh | | 17.6 | | | 17.1 | 18.0 | | | | | 0.0 | 45.5 |
| Level of Service (LOS) | | B | | | B | B | | | | | | D |
| Approach Delay, s/veh / LOS | 17.6 | B | | 17.4 | B | | 0.0 | | | 45.5 | D | |
| Intersection Delay, s/veh / LOS | 17.9 | | | | | | B | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 1.9 | A | 1.7 | A | 3.4 | C | 3.2 | C |
| Bicycle LOS Score / LOS | 1.6 | A | 1.6 | A | | | 0.6 | A |

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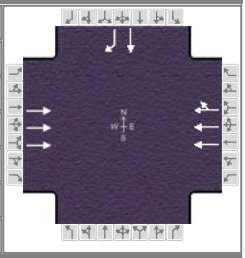
# HCS 2010 Signalized Intersection Results Summary

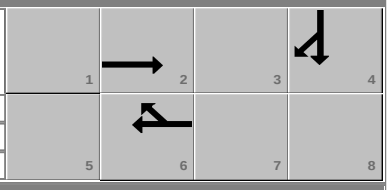
| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 9/26/2018 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | Kapiolani Boulevard | Analysis Year | 2018 | Analysis Period | 1> 7:00 |
| Intersection | Kapiolani and Victoria | File Name | Kapiolani_Victoria_Weekday_Event_Future_REV.… | | |
| Project Description | Weekday Event Peak Hour | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | | 924 | | | 928 | 724 | | | | | 0 | 47 |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 160.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | 104.0 | 24.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yellow | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Red | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |




| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | | | 4 |
| Case Number | | 8.0 | | 8.0 | | | | 11.0 |
| Phase Duration, s | | 109.0 | | 109.0 | | | | 29.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | | | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 3.2 | | 3.2 | | | | 3.5 |
| Queue Clearance Time ( $g_s$ ), s | | 15.5 | | 37.2 | | | | 6.5 |
| Green Extension Time ( $g_e$ ), s | | 11.2 | | 11.1 | | | | 0.1 |
| Phase Call Probability | | 1.00 | | 1.00 | | | | 1.00 |
| Max Out Probability | | 0.00 | | 0.01 | | | | 0.00 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | | 2 | | | 6 | 16 | | | | | 4 | 14 |
| Adjusted Flow Rate ( *v* ), veh/h | | 1004 | | | 1009 | 622 | | | | | 0 | 51 |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | | 1725 | | | 1900 | 1610 | | | | | 1900 | 1610 |
| Queue Service Time ( $g_s$ ), s | | 13.5 | | | 20.2 | 35.2 | | | | | 0.0 | 4.5 |
| Cycle Queue Clearance Time ( $g_c$ ), s | | 13.5 | | | 20.2 | 35.2 | | | | | 0.0 | 4.5 |
| Green Ratio ( *g/C* ) | | 0.65 | | | 0.65 | 0.65 | | | | | 0.15 | 0.15 |
| Capacity ( *c* ), veh/h | | 3364 | | | 2470 | 1047 | | | | | 285 | 242 |
| Volume-to-Capacity Ratio ( *X* ) | | 0.299 | | | 0.408 | 0.594 | | | | | 0.000 | 0.212 |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | | 133.8 | | | 221.3 | 330.6 | | | | | 0 | 46.6 |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | | 5.4 | | | 8.9 | 13.2 | | | | | 0.0 | 1.9 |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | | 0.00 | | | 0.00 | 0.00 | | | | | 0.00 | 0.00 |
| Uniform Delay ( $d_1$ ), s/veh | | 12.2 | | | 13.3 | 16.0 | | | | | 0.0 | 59.7 |
| Incremental Delay ( $d_2$ ), s/veh | | 0.0 | | | 0.0 | 0.6 | | | | | 0.0 | 0.2 |
| Initial Queue Delay ( $d_3$ ), s/veh | | 0.0 | | | 0.0 | 0.0 | | | | | 0.0 | 0.0 |
| Control Delay ( *d* ), s/veh | | 12.2 | | | 13.4 | 16.6 | | | | | 0.0 | 59.9 |
| Level of Service (LOS) | | B | | | B | B | | | | | | E |
| Approach Delay, s/veh / LOS | 12.2 | B | | 14.6 | B | | 0.0 | | | 59.9 | E | |
| Intersection Delay, s/veh / LOS | 14.6 | | | | | | B | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 1.9 | A | 1.7 | A | 3.4 | C | 3.2 | C |
| Bicycle LOS Score / LOS | 1.0 | A | 1.4 | A | | | 0.6 | A |

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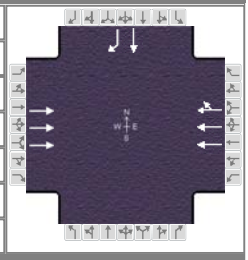
# HCS 2010 Signalized Intersection Results Summary

| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | | | | Duration, h | 0.25 |
| Analyst | | Analysis Date | 9/26/2018 | Area Type | Other |
| Jurisdiction | | Time Period | | PHF | 0.92 |
| Urban Street | Kapiolani Boulevard | Analysis Year | 2018 | Analysis Period | 1> 7:00 |
| Intersection | Kapiolani and Victoria | File Name | Kapiolani_Victoria_Weekend_Future.xus | | |
| Project Description | Weekend Peak Hour | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | | 957 | | | 836 | 724 | | | | | 0 | 110 |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 120.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | Yes | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Green | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1 | 2 | 3 | 4 |
| Yellow | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5 | 6 | 7 | 8 |
| Red | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | |

| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 2 | | 6 | | | | 4 |
| Case Number | | 8.0 | | 8.0 | | | | 11.0 |
| Phase Duration, s | | 75.0 | | 75.0 | | | | 23.0 |
| Change Period, ( $Y+R_c$ ), s | | 5.0 | | 5.0 | | | | 5.0 |
| Max Allow Headway ( *MAH* ), s | | 0.0 | | 0.0 | | | | 0.0 |
| Queue Clearance Time ( $g_s$ ), s | | 0.0 | | 0.0 | | | | 0.0 |
| Green Extension Time ( $g_e$ ), s | | 0.0 | | 0.0 | | | | 0.0 |
| Phase Call Probability | | 0.00 | | 0.00 | | | | 0.00 |
| Max Out Probability | | 0.00 | | 0.00 | | | | 0.00 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | | 2 | | | 6 | 16 | | | | | 4 | 14 |
| Adjusted Flow Rate ( *v* ), veh/h | | 0 | | | 0 | 0 | | | | | 0 | 0 |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | | 0 | | | 0 | 0 | | | | | 0 | 0 |
| Queue Service Time ( $g_s$ ), s | | 0.0 | | | 0.0 | 0.0 | | | | | 0.0 | 0.0 |
| Cycle Queue Clearance Time ( $g_c$ ), s | | 0.0 | | | 0.0 | 0.0 | | | | | 0.0 | 0.0 |
| Green Ratio ( *g/C* ) | | 0.58 | | | 0.58 | 0.58 | | | | | 0.15 | 0.15 |
| Capacity ( *c* ), veh/h | | 3019 | | | 2217 | 939 | | | | | 285 | 242 |
| Volume-to-Capacity Ratio ( *X* ) | | 0.345 | | | 0.410 | 0.641 | | | | | 0.000 | 0.495 |
| Back of Queue ( *Q* ), ft/ln ( 50 th percentile) | | 121.8 | | | 167.6 | 277.3 | | | | | 0 | 83.8 |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | | 4.9 | | | 6.7 | 11.1 | | | | | 0.0 | 3.4 |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | | 0.00 | | | 0.00 | 0.00 | | | | | 0.00 | 0.00 |
| Uniform Delay ( $d_1$ ), s/veh | | 13.0 | | | 13.7 | 16.6 | | | | | 0.0 | 46.8 |
| Incremental Delay ( $d_2$ ), s/veh | | 0.0 | | | 0.0 | 1.2 | | | | | 0.0 | 0.6 |
| Initial Queue Delay ( $d_3$ ), s/veh | | 0.0 | | | 0.0 | 0.0 | | | | | 0.0 | 0.0 |
| Control Delay ( *d* ), s/veh | | 13.1 | | | 13.7 | 17.8 | | | | | 0.0 | 47.4 |
| Level of Service (LOS) | | B | | | B | B | | | | | | D |
| Approach Delay, s/veh / LOS | 13.1 | B | | 15.4 | B | | 0.0 | | | 47.4 | D | |
| Intersection Delay, s/veh / LOS | 15.9 | | | | | | B | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 1.9 | A | 1.7 | A | 3.5 | C | 3.2 | C |
| Bicycle LOS Score / LOS | 1.1 | A | 1.3 | A | | | 0.7 | A |

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FEHR PEERS

# MEMORANDUM

Date: December 19, 2017

To: City of Honolulu, DTS

From: Nathan Schmidt, Cecily Taylor, Fehr & Peers

**Subject: Honolulu Urban Core: Pensacola Street – Preliminary Traffic Operations Analysis**

*SD17-0242*

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This memorandum summarizes the findings of a preliminary mobility assessment for the proposed Complete Streets improvements. This mobility assessment includes the evaluation of traffic operations under Existing and Existing with Project conditions. The Existing with Project conditions includes an alternatives analysis testing of three options for intersection lane geometry at the intersections provided below:

- Pensacola St & Lunalilo St
- Pensacola St & Kinau St
- Pensacola St & S Beretania St
- Pensacola St & S King St
- Pensacola St & Kapiolani Blvd
- Pensacola St & Waimanu St

Throughout the corridor, the Project conditions remove one travel lane to provide a two-way protected cycle track on the diamond head side of the road. Where turns would conflict with the bicycle lane, protected phasing is recommended if not already present. The three Project alternatives differ only in the turn configurations in the makai bound direction at the intersections of Pensacola St & Kinau St and Pensacola St & S King St. The alternatives are described below, and all lane geometries are shown in **Figure 1**.

- Alternative 1: A single exclusive left turn lane for makai bound traffic.
- Alternative 2: A single shared through/left turn lane for makai bound traffic.
- Alternative 3: An exclusive left turn lane and an adjacent shared through/left turn lane for makai bound traffic.

The signal timing in all three options was constrained to maintain the current overall cycle length and provide a protected left turn phase during the conflicting bicycle/pedestrian crossing phase. Compared to existing conditions, all three project conditions reduced green time for diamond-head-bound traffic in the AM peak period by 7 seconds and reallocated this time to the southbound left turn phase. In the PM peak period, the King Street intersection maintained the existing timing, and the Kinau Street intersection reduced green time for diamond-head-bound traffic by 5 seconds and allocated this time to the southbound left turn phase.

Results from Level of Service Testing along the Pensacola Street corridor are presented in **Table 1** on the following page. Under Existing Conditions, Pensacola St & S King St is operating at a substandard LOS E at both peak hours. All other intersections are operating at an acceptable LOS of D or better. Under all Project Conditions, all study intersections would operate at an acceptable LOS of D or better. Alternatives 1 and 3 offer nearly identical LOS operations, and Alternative 2 provides the most favorable LOS of the Project conditions.

Because LOS calculations favor through movements over turning movements, queues for the left turns at the alternative configurations were also analyzed using SimTraffic simulations. Queue lengths were then compared to the distance to upstream intersections; Pensacola St & Lunalilo St is the upstream intersection to Pensacola St & Kinau St, and Pensacola St & Young St is the upstream intersection to Pensacola St & S King St. Results are presented in **Table 2**. Under existing conditions, the queue at Pensacola St & S King St extends to the upstream intersection in the AM peak period. Alternatives 1 and 2 both show generally exacerbated queueing. Alternative 3 is the only condition that does not show queues extending to the upstream intersection under either peak hour.

**TABLE 1 – EXISTING VS. EXISTING + PROJECT LEVELS OF SERVICE**

| Intersection | Traffic Control | HCM Methodology | Peak Hour | Existing Conditions (sec/veh)[1] | Existing LOS[2,3] | Alt 1 Project Conditions (sec/veh)[1] | Alt 1 Project LOS[2,3] | Alt 1 Delay Delta | Alt 2 Project Conditions (sec/veh)[1] | Alt 2 Project LOS[2,3] | Alt 2 Delay Delta | Alt 3 Project Conditions (sec/veh)[1] | Alt 3 Project LOS[2,3] | Alt 3 Delay Delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8. Pensacola St & Lunalilo St | Signalized | 2010 | AM | 53.2 | D | 51.9 | D | -1.3 | 51.9 | D | -1.3 | 51.9 | D | -1.3 |
| | | | PM | 21.4 | C | 21.6 | C | 0.2 | 21.6 | C | 0.2 | 21.6 | C | 0.2 |
| 11. Pensacola St & Kinau St | Signalized | 2000 | AM | 14.1 | B | 17.1 | B | 3.0 | 14.2 | B | 0.1 | 17.0 | B | 2.9 |
| | | | PM | 9.4 | A | 12.2 | B | 2.8 | 10.4 | B | 1.0 | 11.2 | B | 1.8 |
| 18. Pensacola St & S Beretania St | Signalized | 2010 | AM | 33.6 | C | 34.8 | C | 1.2 | 32.6 | C | -1.0 | 32.6 | C | -1.0 |
| | | | PM | 28.5 | C | 29.6 | C | 1.1 | 29.4 | C | 0.9 | 29.0 | C | 0.5 |
| 28. Pensacola St & S King St | Signalized | 2000 | AM | **66.2** | **E** | 47.4 | D | -18.8 | 22.4 | C | -43.8 | 47.5 | D | -18.7 |
| | | | PM | **56.9** | **E** | 53.0 | D | -3.9 | 38.1 | D | -4.0 | 52.9 | D | -4.0 |
| 39. Pensacola St & Kapiolani Blvd | Signalized | 2000 | AM | 23.9 | C | 23.4 | C | -0.5 | 23.4 | C | -0.5 | 23.4 | C | -0.5 |
| | | | PM | 21.9 | C | 27.8 | C | 5.9 | 27.8 | C | 5.9 | 27.8 | C | 5.9 |
| 52. Pensacola St & Waimanu St | Signalized | 2000 | AM | 24.3 | C | 32.9 | C | 8.6 | 32.9 | C | 8.6 | 32.9 | C | 8.6 |
| | | | PM | 31.0 | C | 30.0 | C | -1.0 | 30.0 | C | -1.0 | 30.0 | C | -1.0 |

Source: Fehr & Peers, 2017

Changes to King and Kinau intersections only:

Alternative 1: Exclusive Lefts

Alternative 2: Shared Through/Lefts

Alternative 3: Exclusive + Shared Through/Lefts

Notes:

[1] Whole intersection weighted average stopped delay expressed in seconds per vehicle for signalized intersections. Worst movement delay reported for side-street-stop-controlled intersection

[2] LOS calculations performed using the *Highway Capacity Manual (HCM)* method.

[3] Unacceptable seconds of delay per vehicle and LOS highlighted in **bold.**

**TABLE 2**
**EXISTING VS. EXISTING + PROJECT QUEUEING RESULTS**

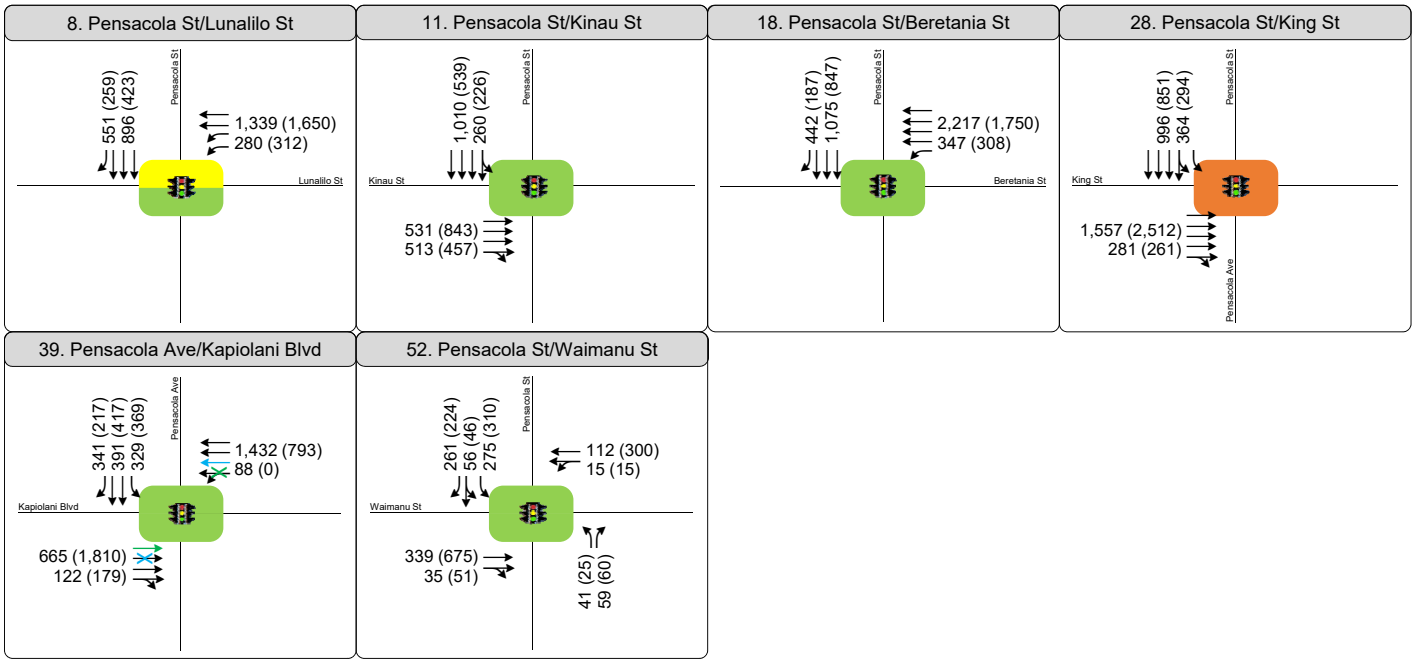
| Intersection | | Peak Hour | Movement | Distance to Upstream Intersection (feet) | 95th Percentile Queue (feet) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Existing | Alt 1 – Exclusive Left Lane | Alt 2 – Shared Through Left Lane | Alt 3 – Exclusive Left + Shared Through/Left |
| 11 | Pensacola St & Kinau St | AM | SBL | 350 | 258 | 230 | 302 | 175 |
| | | PM | SBL | 350 | 142 | 212 | **239** | 145 |
| 28 | Pensacola St & S King St | AM | SBL | 275 | **339** | **385** | **400** | 186 |
| | | PM | SBL | 275 | 185 | **360** | **311** | 192 |

*Source: Fehr & Peers, 2017.*
Changes to King and Kinau intersections only:

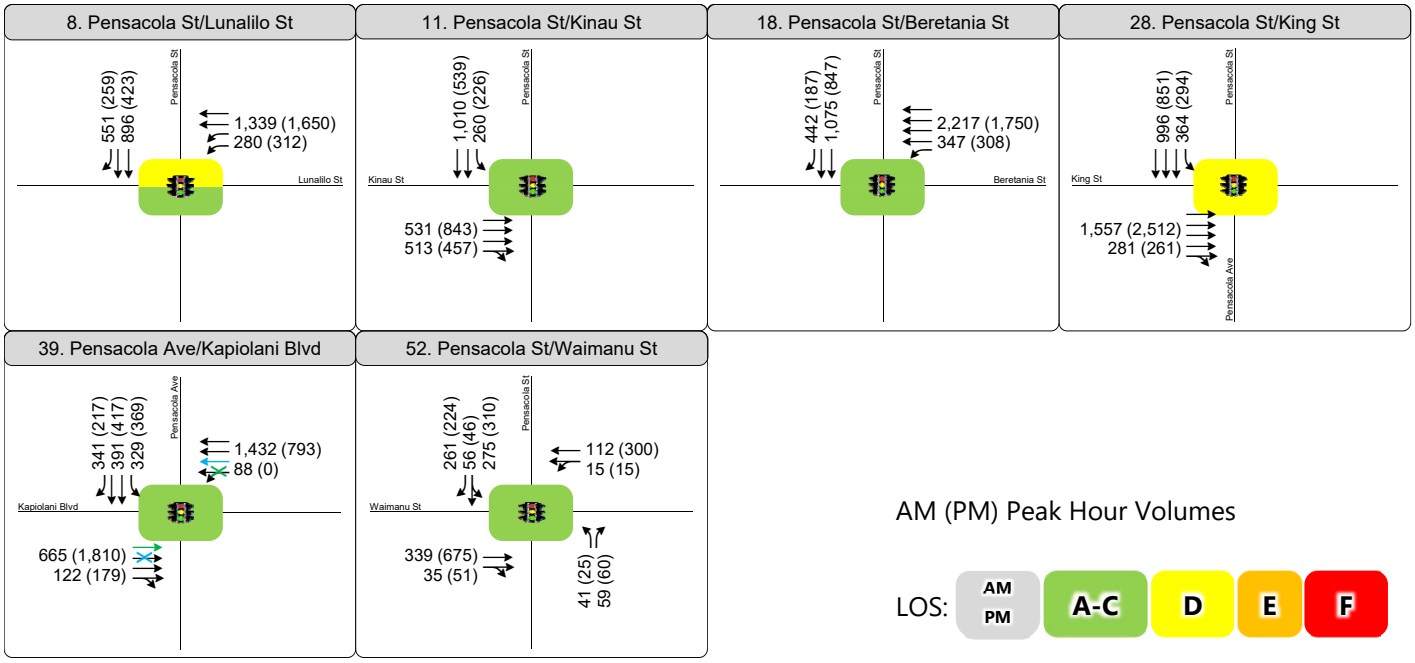
Notes:

1. 95th queue calculated in SimTraffic, a microsimulation software
2. **Bold** results indicate queue extends to upstream intersection

## Existing Conditions




## Alternative 1




AM (PM) Peak Hour Volumes

LOS: AM PM | A-C | D | E | F

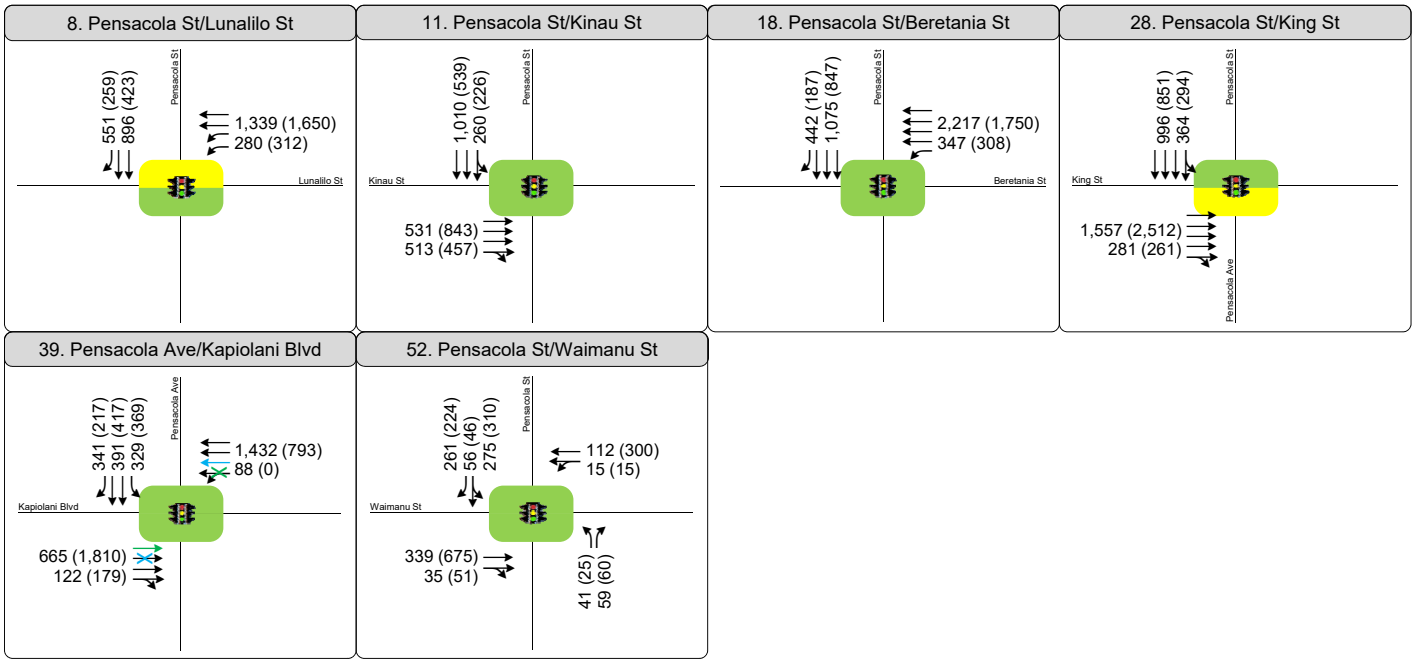
AM Contra-Flow Lane

PM Contra-Flow Lane

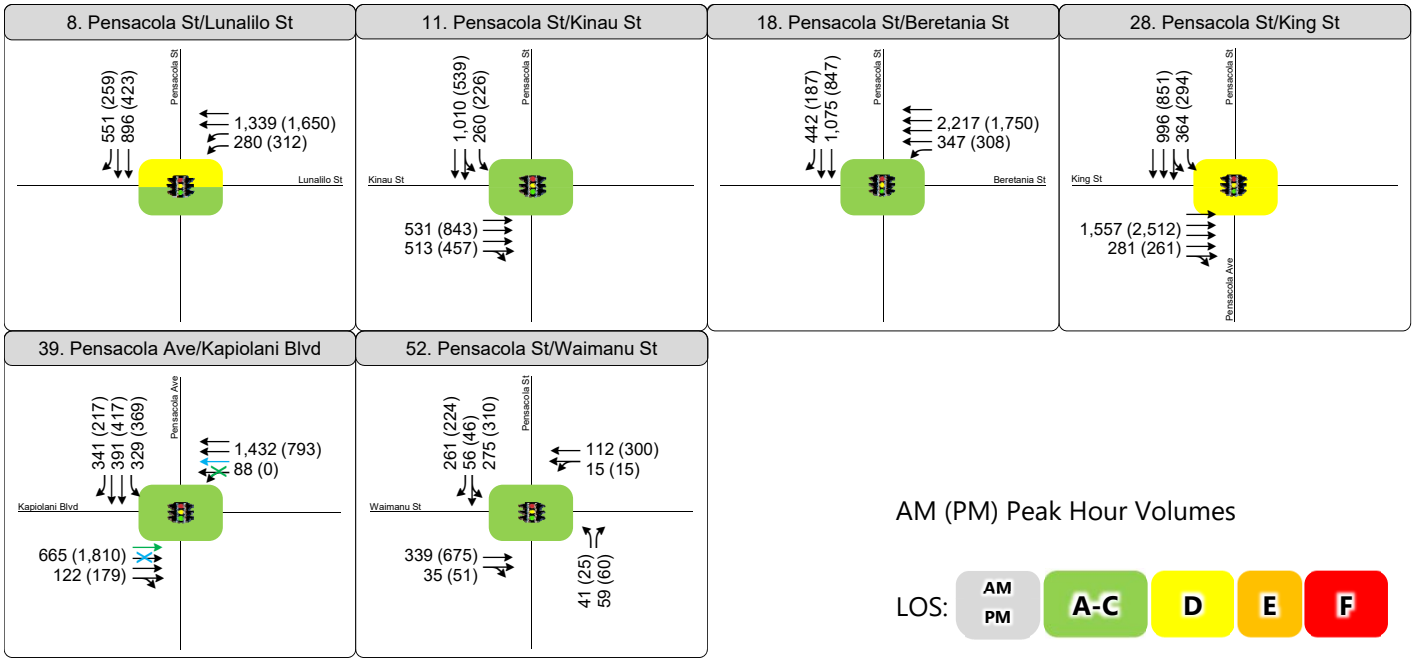
Figure 1

Peak Hour Traffic Volumes and Lane Configurations - Pensacola

Alternative 2




Alternative 3




AM (PM) Peak Hour Volumes

LOS: AM PM | A-C | D | E | F

AM Contra-Flow Lane

PM Contra-Flow Lane

Figure 1 (cont.)

Peak Hour Traffic Volumes and Lane Configurations - Pensacola

# Appendix B

**Intersection Level of Service Definitions**

## Highway Capacity Manual 2010

**Signalized intersection** level of service (LOS) is defined in terms of a weighted average control delay for the entire intersection. Control delay quantifies the increase in travel time that a vehicle experiences due to the traffic signal control as well as provides a surrogate measure for driver discomfort and fuel consumption. Signalized intersection LOS is stated in terms of average control delay per vehicle (in seconds) during a specified time period (e.g., weekday PM peak hour). Control delay is a complex measure based on many variables, including signal phasing and coordination (i.e., progression of movements through the intersection and along the corridor), signal cycle length, and traffic volumes with respect to intersection capacity and resulting queues. Table 1 summarizes the LOS criteria for signalized intersections, as described in the *Highway Capacity Manual 2010* (Transportation Research Board, 2010).

**Table 1. Level of Service Criteria for Signalized Intersections**

| Level of Service | Average Control Delay (seconds/vehicle) | General Description |
|---|---|---|
| A | ≤10 | Free Flow |
| B | >10 – 20 | Stable Flow (slight delays) |
| C | >20 – 35 | Stable flow (acceptable delays) |
| D | >35 – 55 | Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding) |
| E | >55 – 80 | Unstable flow (intolerable delay) |
| F[1] | >80 | Forced flow (congested and queues fail to clear) |

Source: *Highway Capacity Manual 2010*, Transportation Research Board, 2010.

1. If the volume-to-capacity (v/c) ratio for a lane group exceeds 1.0 LOS F is assigned to the individual lane group. LOS for overall approach or intersection is determined solely by the control delay.

**Unsignalized intersection** LOS criteria can be further reduced into three intersection types: all-way stop, two-way stop, and roundabout control. All-way stop and roundabout control intersection LOS is expressed in terms of the weighted average control delay of the overall intersection or by approach. Two-way stop-controlled intersection LOS is defined in terms of the average control delay for each minor-street movement (or shared movement) as well as major-street left-turns. This approach is because major-street through vehicles are assumed to experience zero delay, a weighted average of all movements results in very low overall average delay, and this calculated low delay could mask deficiencies of minor movements. Table 2 shows LOS criteria for unsignalized intersections.

**Table 2. Level of Service Criteria for Unsignalized Intersections**

| Level of Service | Average Control Delay (seconds/vehicle) |
|---|---|
| A | 0 – 10 |
| B | >10 – 15 |
| C | >15 – 25 |
| D | >25 – 35 |
| E | >35 – 50 |
| F[1] | >50 |

Source: *Highway Capacity Manual 2010*, Transportation Research Board, 2010.

1. If the volume-to-capacity (v/c) ratio exceeds 1.0, LOS F is assigned an individual lane group for all unsignalized intersections, or minor street approach at two-way stop-controlled intersections. Overall intersection LOS is determined solely by control delay.

# Appendix C

**Intersection Operations Analysis - Synchro Worksheets**

# HCM 6th Signalized Intersection Summary
## 5: Ward Ave & S. King St

09/15/2020

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 248 | 2029 | 147 | 0 | 0 | 0 | 0 | 455 | 342 | 0 | 1138 | 0 |
| Future Volume (veh/h) | 248 | 2029 | 147 | 0 | 0 | 0 | 0 | 455 | 342 | 0 | 1138 | 0 |
| Initial Q (Qb), veh | 0 | 0 | 0 | | | | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | | | | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | | | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | | | | 0 | 1870 | 1870 | 0 | 1870 | 0 |
| Adj Flow Rate, veh/h | 270 | 2205 | 160 | | | | 0 | 495 | 372 | 0 | 1237 | 0 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | | | | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | | | | 0 | 2 | 2 | 0 | 2 | 0 |
| Cap, veh/h | 393 | 3474 | 256 | | | | 0 | 1402 | 625 | 0 | 1402 | 0 |
| Arrive On Green | 0.51 | 0.51 | 0.51 | | | | 0.00 | 0.39 | 0.39 | 0.00 | 0.39 | 0.00 |
| Sat Flow, veh/h | 777 | 6872 | 506 | | | | 0 | 3647 | 1585 | 0 | 3741 | 0 |
| Grp Volume(v), veh/h | 636 | 1436 | 562 | | | | 0 | 495 | 372 | 0 | 1237 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1831 | 1515 | 1779 | | | | 0 | 1777 | 1585 | 0 | 1777 | 0 |
| Q Serve(g_s), s | 23.7 | 20.6 | 20.6 | | | | 0.0 | 8.8 | 16.7 | 0.0 | 29.1 | 0.0 |
| Cycle Q Clear(g_c), s | 23.7 | 20.6 | 20.6 | | | | 0.0 | 8.8 | 16.7 | 0.0 | 29.1 | 0.0 |
| Prop In Lane | 0.42 | | 0.28 | | | | 0.00 | | 1.00 | 0.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 926 | 2298 | 900 | | | | 0 | 1402 | 625 | 0 | 1402 | 0 |
| V/C Ratio(X) | 0.69 | 0.63 | 0.63 | | | | 0.00 | 0.35 | 0.59 | 0.00 | 0.88 | 0.00 |
| Avail Cap(c_a), veh/h | 926 | 2298 | 900 | | | | 0 | 1402 | 625 | 0 | 1402 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | | | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | | | | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 16.9 | 16.1 | 16.1 | | | | 0.0 | 19.2 | 21.6 | 0.0 | 25.3 | 0.0 |
| Incr Delay (d2), s/veh | 4.1 | 1.3 | 3.3 | | | | 0.0 | 0.7 | 4.1 | 0.0 | 8.3 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 10.3 | 6.9 | 8.6 | | | | 0.0 | 3.7 | 6.7 | 0.0 | 13.2 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 21.0 | 17.4 | 19.4 | | | | 0.0 | 19.9 | 25.7 | 0.0 | 33.6 | 0.0 |
| LnGrp LOS | C | B | B | | | | A | B | C | A | C | A |
| Approach Vol, veh/h | | 2635 | | | | | | 867 | | | 1237 | |
| Approach Delay, s/veh | | 18.7 | | | | | | 22.4 | | | 33.6 | |
| Approach LOS | | B | | | | | | C | | | C | |

| Timer - Assigned Phs | | 2 | | 4 | | 6 |
|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 40.0 | | 50.0 | | 40.0 |
| Change Period (Y+Rc), s | | 4.5 | | 4.5 | | 4.5 |
| Max Green Setting (Gmax), s | | 35.5 | | 45.5 | | 35.5 |
| Max Q Clear Time (g_c+I1), s | | 18.7 | | 25.7 | | 31.1 |
| Green Ext Time (p_c), s | | 4.4 | | 16.7 | | 3.0 |

| Intersection Summary | | |
|---|---|---|
| HCM 6th Ctrl Delay | | 23.3 |
| HCM 6th LOS | | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 1337 | 126 | 0 | 1263 | 232 | 182 | 565 | 233 | 293 | 834 | 158 |
| Future Volume (veh/h) | 0 | 1337 | 126 | 0 | 1263 | 232 | 182 | 565 | 233 | 293 | 834 | 158 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 0 | 1870 | 1870 | 0 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 0 | 1453 | 137 | 0 | 1373 | 252 | 198 | 614 | 253 | 318 | 907 | 172 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 0 | 2 | 2 | 0 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 0 | 2800 | 264 | 0 | 1396 | 253 | 219 | 796 | 355 | 342 | 1041 | 464 |
| Arrive On Green | 0.00 | 0.46 | 0.46 | 0.00 | 0.46 | 0.46 | 0.12 | 0.22 | 0.22 | 0.19 | 0.29 | 0.29 |
| Sat Flow, veh/h | 0 | 6288 | 567 | 0 | 3099 | 544 | 1781 | 3554 | 1585 | 1781 | 3554 | 1585 |
| Grp Volume(v), veh/h | 0 | 1163 | 427 | 0 | 804 | 821 | 198 | 614 | 253 | 318 | 907 | 172 |
| Grp Sat Flow(s),veh/h/ln | 0 | 1609 | 1768 | 0 | 1777 | 1772 | 1781 | 1777 | 1585 | 1781 | 1777 | 1585 |
| Q Serve(g_s), s | 0.0 | 19.2 | 19.3 | 0.0 | 50.0 | 52.2 | 12.4 | 18.3 | 16.7 | 19.8 | 27.4 | 9.7 |
| Cycle Q Clear(g_c), s | 0.0 | 19.2 | 19.3 | 0.0 | 50.0 | 52.2 | 12.4 | 18.3 | 16.7 | 19.8 | 27.4 | 9.7 |
| Prop In Lane | 0.00 | | 0.32 | 0.00 | | 0.31 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 0 | 2242 | 822 | 0 | 826 | 823 | 219 | 796 | 355 | 342 | 1041 | 464 |
| V/C Ratio(X) | 0.00 | 0.52 | 0.52 | 0.00 | 0.97 | 1.00 | 0.90 | 0.77 | 0.71 | 0.93 | 0.87 | 0.37 |
| Avail Cap(c_a), veh/h | 0 | 2242 | 822 | 0 | 826 | 823 | 219 | 796 | 355 | 342 | 1041 | 464 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 0.0 | 21.3 | 21.4 | 0.0 | 29.6 | 30.2 | 48.9 | 41.1 | 40.5 | 44.9 | 37.9 | 31.7 |
| Incr Delay (d2), s/veh | 0.0 | 0.9 | 2.3 | 0.0 | 25.6 | 30.7 | 40.0 | 7.1 | 11.6 | 33.7 | 10.0 | 2.3 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 7.3 | 8.4 | 0.0 | 26.3 | 28.3 | 7.9 | 8.8 | 7.6 | 11.9 | 13.2 | 4.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 22.2 | 23.7 | 0.0 | 55.1 | 60.9 | 88.9 | 48.3 | 52.1 | 78.6 | 47.9 | 33.9 |
| LnGrp LOS | A | C | C | A | E | E | F | D | D | E | D | C |
| Approach Vol, veh/h | | 1590 | | | 1625 | | | 1065 | | | 1397 | |
| Approach Delay, s/veh | | 22.6 | | | 58.0 | | | 56.7 | | | 53.2 | |
| Approach LOS | | C | | | E | | | E | | | D | |

| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 26.2 | 29.8 | | 57.0 | 18.4 | 37.6 | | 57.0 | | | | |
| Change Period (Y+Rc), s | 4.5 | 4.5 | | 4.5 | 4.5 | 4.5 | | 4.5 | | | | |
| Max Green Setting (Gmax), s | 21.7 | 25.3 | | 52.5 | 13.9 | 33.1 | | 52.5 | | | | |
| Max Q Clear Time (g_c+I1), s | 21.8 | 20.3 | | 21.3 | 14.4 | 29.4 | | 54.2 | | | | |
| Green Ext Time (p_c), s | 0.0 | 2.2 | | 14.5 | 0.0 | 2.2 | | 0.0 | | | | |

| Intersection Summary | | |
|---|---|---|
| HCM 6th Ctrl Delay | | 46.7 |
| HCM 6th LOS | | D |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 2512 | 261 | 0 | 0 | 0 | 0 | 0 | 0 | 294 | 851 | 0 |
| Future Volume (veh/h) | 0 | 2512 | 261 | 0 | 0 | 0 | 0 | 0 | 0 | 294 | 851 | 0 |
| Initial Q (Qb), veh | 0 | 0 | 0 | | | | | | | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | | | | | | | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | | | | | | | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | | | | | | | No | |
| Adj Sat Flow, veh/h/ln | 0 | 1870 | 1870 | | | | | | | 1870 | 1870 | 0 |
| Adj Flow Rate, veh/h | 0 | 2730 | 284 | | | | | | | 320 | 925 | 0 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | | | | | | | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 0 | 2 | 2 | | | | | | | 2 | 2 | 0 |
| Cap, veh/h | 0 | 3101 | 321 | | | | | | | 0 | 1639 | 0 |
| Arrive On Green | 0.00 | 0.44 | 0.44 | | | | | | | 0.46 | 0.46 | 0.00 |
| Sat Flow, veh/h | 0 | 7421 | 733 | | | | | | | 0 | 3647 | 0 |
| Grp Volume(v), veh/h | 0 | 2340 | 674 | | | | | | | 0 | 925 | 0 |
| Grp Sat Flow(s),veh/h/ln | 0 | 1515 | 1739 | | | | | | | 0 | 1777 | 0 |
| Q Serve(g_s), s | 0.0 | 31.8 | 32.0 | | | | | | | 0.0 | 17.1 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 31.8 | 32.0 | | | | | | | 0.0 | 17.1 | 0.0 |
| Prop In Lane | 0.00 | | 0.42 | | | | | | | 0.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 0 | 2660 | 763 | | | | | | | 0 | 1639 | 0 |
| V/C Ratio(X) | 0.00 | 0.88 | 0.88 | | | | | | | 0.00 | 0.56 | 0.00 |
| Avail Cap(c_a), veh/h | 0 | 2660 | 763 | | | | | | | 0 | 1639 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | | | | | | | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 1.00 | 1.00 | | | | | | | 0.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 23.1 | 23.1 | | | | | | | 0.0 | 17.7 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 4.6 | 14.1 | | | | | | | 0.0 | 1.4 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | | | | | | | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 11.5 | 15.2 | | | | | | | 0.0 | 6.9 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 27.6 | 37.2 | | | | | | | 0.0 | 19.1 | 0.0 |
| LnGrp LOS | A | C | D | | | | | | | A | B | A |
| Approach Vol, veh/h | | 3014 | | | | | | | | | 925 | |
| Approach Delay, s/veh | | 29.8 | | | | | | | | | 19.1 | |
| Approach LOS | | C | | | | | | | | | B | |

| Timer - Assigned Phs | | 4 | | 6 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 44.0 | | 46.0 | | | | | | | | |
| Change Period (Y+Rc), s | | 4.5 | | * 4.5 | | | | | | | | |
| Max Green Setting (Gmax), s | | 39.5 | | * 42 | | | | | | | | |
| Max Q Clear Time (g_c+I1), s | | 34.0 | | 19.1 | | | | | | | | |
| Green Ext Time (p_c), s | | 5.4 | | 7.0 | | | | | | | | |

| Intersection Summary | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HCM 6th Ctrl Delay | | | 27.3 | | | | | | | | | |
| HCM 6th LOS | | | C | | | | | | | | | |

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 1810 | 179 | 0 | 793 | 0 | 0 | 0 | 0 | 369 | 417 | 217 |
| Future Volume (veh/h) | 0 | 1810 | 179 | 0 | 793 | 0 | 0 | 0 | 0 | 369 | 417 | 217 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | | | | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | | | | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | | | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | | | | No | |
| Adj Sat Flow, veh/h/ln | 0 | 1870 | 1870 | 0 | 1870 | 0 | | | | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 0 | 1967 | 195 | 0 | 862 | 0 | | | | 401 | 453 | 236 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | | | | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 0 | 2 | 2 | 0 | 2 | 0 | | | | 2 | 2 | 2 |
| Cap, veh/h | 0 | 3122 | 309 | 0 | 1851 | 0 | | | | 720 | 1436 | 641 |
| Arrive On Green | 0.00 | 0.52 | 0.52 | 0.00 | 0.52 | 0.00 | | | | 0.40 | 0.40 | 0.40 |
| Sat Flow, veh/h | 0 | 6257 | 594 | 0 | 3741 | 0 | | | | 1781 | 3554 | 1585 |
| Grp Volume(v), veh/h | 0 | 1583 | 579 | 0 | 862 | 0 | | | | 401 | 453 | 236 |
| Grp Sat Flow(s),veh/h/ln | 0 | 1609 | 1763 | 0 | 1777 | 0 | | | | 1781 | 1777 | 1585 |
| Q Serve(g_s), s | 0.0 | 28.1 | 28.1 | 0.0 | 18.4 | 0.0 | | | | 20.8 | 10.4 | 12.5 |
| Cycle Q Clear(g_c), s | 0.0 | 28.1 | 28.1 | 0.0 | 18.4 | 0.0 | | | | 20.8 | 10.4 | 12.5 |
| Prop In Lane | 0.00 | | 0.34 | 0.00 | | 0.00 | | | | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 0 | 2513 | 918 | 0 | 1851 | 0 | | | | 720 | 1436 | 641 |
| V/C Ratio(X) | 0.00 | 0.63 | 0.63 | 0.00 | 0.47 | 0.00 | | | | 0.56 | 0.32 | 0.37 |
| Avail Cap(c_a), veh/h | 0 | 2513 | 918 | 0 | 1851 | 0 | | | | 720 | 1436 | 641 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | | | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | | | | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 0.0 | 20.5 | 20.5 | 0.0 | 18.2 | 0.0 | | | | 27.5 | 24.4 | 25.0 |
| Incr Delay (d2), s/veh | 0.0 | 1.2 | 3.3 | 0.0 | 0.8 | 0.0 | | | | 3.1 | 0.6 | 1.6 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 10.5 | 12.1 | 0.0 | 7.7 | 0.0 | | | | 9.4 | 4.5 | 5.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 21.7 | 23.8 | 0.0 | 19.0 | 0.0 | | | | 30.6 | 25.0 | 26.7 |
| LnGrp LOS | A | C | C | A | B | A | | | | C | C | C |
| Approach Vol, veh/h | | 2162 | | | 862 | | | | | | 1090 | |
| Approach Delay, s/veh | | 22.3 | | | 19.0 | | | | | | 27.4 | |
| Approach LOS | | C | | | B | | | | | | C | |

| Timer - Assigned Phs | | | 4 | | 6 | | 8 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | | 67.0 | | 53.0 | | 67.0 | | | | | |
| Change Period (Y+Rc), s | | | 4.5 | | 4.5 | | 4.5 | | | | | |
| Max Green Setting (Gmax), s | | | 62.5 | | 48.5 | | 62.5 | | | | | |
| Max Q Clear Time (g_c+I1), s | | | 30.1 | | 22.8 | | 20.4 | | | | | |
| Green Ext Time (p_c), s | | | 21.5 | | 5.5 | | 7.5 | | | | | |

| Intersection Summary | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HCM 6th Ctrl Delay | | | 23.0 | | | | | | | | | |
| HCM 6th LOS | | | C | | | | | | | | | |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 419 | 1800 | 152 | 0 | 0 | 0 | 0 | 152 | 107 | 206 | 110 | 0 |
| Future Volume (veh/h) | 419 | 1800 | 152 | 0 | 0 | 0 | 0 | 152 | 107 | 206 | 110 | 0 |
| Initial Q (Qb), veh | 0 | 0 | 0 | | | | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | | | | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | | | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | | | | 0 | 1870 | 1870 | 1870 | 1870 | 0 |
| Adj Flow Rate, veh/h | 455 | 1957 | 165 | | | | 0 | 165 | 116 | 172 | 193 | 0 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | | | | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | | | | 0 | 2 | 2 | 2 | 2 | 0 |
| Cap, veh/h | 645 | 3025 | 257 | | | | 0 | 779 | 1162 | 476 | 779 | 0 |
| Arrive On Green | 0.48 | 0.48 | 0.48 | | | | 0.00 | 0.42 | 0.42 | 0.42 | 0.42 | 0.00 |
| Sat Flow, veh/h | 1334 | 6258 | 531 | | | | 0 | 1870 | 2790 | 1098 | 1870 | 0 |
| Grp Volume(v), veh/h | 615 | 1411 | 551 | | | | 0 | 165 | 116 | 172 | 193 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1804 | 1515 | 1775 | | | | 0 | 1870 | 1395 | 1098 | 1870 | 0 |
| Q Serve(g_s), s | 24.1 | 20.9 | 20.9 | | | | 0.0 | 5.1 | 2.3 | 10.7 | 6.0 | 0.0 |
| Cycle Q Clear(g_c), s | 24.1 | 20.9 | 20.9 | | | | 0.0 | 5.1 | 2.3 | 15.8 | 6.0 | 0.0 |
| Prop In Lane | 0.74 | | 0.30 | | | | 0.00 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 872 | 2197 | 858 | | | | 0 | 779 | 1162 | 476 | 779 | 0 |
| V/C Ratio(X) | 0.71 | 0.64 | 0.64 | | | | 0.00 | 0.21 | 0.10 | 0.36 | 0.25 | 0.00 |
| Avail Cap(c_a), veh/h | 872 | 2197 | 858 | | | | 0 | 779 | 1162 | 476 | 779 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | | | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | | | | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 18.2 | 17.4 | 17.4 | | | | 0.0 | 16.8 | 16.0 | 21.8 | 17.1 | 0.0 |
| Incr Delay (d2), s/veh | 4.8 | 1.5 | 3.7 | | | | 0.0 | 0.6 | 0.2 | 2.1 | 0.8 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 10.5 | 7.1 | 8.9 | | | | 0.0 | 2.2 | 0.7 | 3.0 | 2.7 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 23.0 | 18.9 | 21.1 | | | | 0.0 | 17.4 | 16.1 | 24.0 | 17.8 | 0.0 |
| LnGrp LOS | C | B | C | | | | A | B | B | C | B | A |
| Approach Vol, veh/h | | 2577 | | | | | | 281 | | | 365 | |
| Approach Delay, s/veh | | 20.3 | | | | | | 16.9 | | | 20.7 | |
| Approach LOS | | C | | | | | | B | | | C | |

| Timer - Assigned Phs | | 2 | | 4 | | 6 |
|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 42.0 | | 48.0 | | 42.0 |
| Change Period (Y+Rc), s | | 4.5 | | 4.5 | | 4.5 |
| Max Green Setting (Gmax), s | | 37.5 | | 43.5 | | 37.5 |
| Max Q Clear Time (g_c+I1), s | | 7.1 | | 26.1 | | 17.8 |
| Green Ext Time (p_c), s | | 1.4 | | 14.8 | | 1.7 |

| Intersection Summary | | |
|---|---|---|
| HCM 6th Ctrl Delay | | 20.1 |
| HCM 6th LOS | | C |

Notes

User approved volume balancing among the lanes for turning movement.

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 1769 | 94 | 0 | 933 | 139 | 181 |
| Future Volume (veh/h) | 1769 | 94 | 0 | 933 | 139 | 181 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 1.00 | 1.00 | | 1.00 | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | No | | | No | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 0 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 1923 | 102 | 0 | 1014 | 151 | 197 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 0 | 2 | 2 | 2 |
| Cap, veh/h | 5951 | 316 | 0 | 3356 | 0 | 0 |
| Arrive On Green | 0.94 | 0.94 | 0.00 | 0.94 | 0.00 | 0.00 |
| Sat Flow, veh/h | 6563 | 334 | 0 | 3741 | 0 | |
| Grp Volume(v), veh/h | 1473 | 552 | 0 | 1014 | 0.0 | |
| Grp Sat Flow(s),veh/h/ln | 1609 | 1810 | 0 | 1777 | | |
| Q Serve(g_s), s | 2.0 | 2.0 | 0.0 | 1.8 | | |
| Cycle Q Clear(g_c), s | 2.0 | 2.0 | 0.0 | 1.8 | | |
| Prop In Lane | | 0.18 | 0.00 | | | |
| Lane Grp Cap(c), veh/h | 4557 | 1710 | 0 | 3356 | | |
| V/C Ratio(X) | 0.32 | 0.32 | 0.00 | 0.30 | | |
| Avail Cap(c_a), veh/h | 4557 | 1710 | 0 | 3356 | | |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | | |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | | |
| Uniform Delay (d), s/veh | 0.2 | 0.2 | 0.0 | 0.2 | | |
| Incr Delay (d2), s/veh | 0.2 | 0.5 | 0.0 | 0.2 | | |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | | |
| %ile BackOfQ(50%),veh/ln | 0.1 | 0.2 | 0.0 | 0.1 | | |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 0.4 | 0.7 | 0.0 | 0.4 | | |
| LnGrp LOS | A | A | A | A | | |
| Approach Vol, veh/h | 2025 | | | 1014 | | |
| Approach Delay, s/veh | 0.5 | | | 0.4 | | |
| Approach LOS | A | | | A | | |

| Timer - Assigned Phs | | 4 | | 8 |
|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 81.0 | | 81.0 |
| Change Period (Y+Rc), s | | 4.5 | | 4.5 |
| Max Green Setting (Gmax), s | | 76.5 | | 76.5 |
| Max Q Clear Time (g_c+I1), s | | 4.0 | | 3.8 |
| Green Ext Time (p_c), s | | 28.9 | | 9.8 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 0.4 |
| HCM 6th LOS | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 248 | 2201 | 147 | 0 | 0 | 0 | 0 | 455 | 342 | 0 | 1138 | 0 |
| Future Volume (veh/h) | 248 | 2201 | 147 | 0 | 0 | 0 | 0 | 455 | 342 | 0 | 1138 | 0 |
| Initial Q (Qb), veh | 0 | 0 | 0 | | | | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | | | | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | | | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | | | | 0 | 1870 | 1870 | 0 | 1870 | 0 |
| Adj Flow Rate, veh/h | 270 | 2392 | 160 | | | | 0 | 495 | 372 | 0 | 1237 | 0 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | | | | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | | | | 0 | 2 | 2 | 0 | 2 | 0 |
| Cap, veh/h | 367 | 3521 | 239 | | | | 0 | 1402 | 625 | 0 | 1402 | 0 |
| Arrive On Green | 0.51 | 0.51 | 0.51 | | | | 0.00 | 0.39 | 0.39 | 0.00 | 0.39 | 0.00 |
| Sat Flow, veh/h | 727 | 6965 | 473 | | | | 0 | 3647 | 1585 | 0 | 3741 | 0 |
| Grp Volume(v), veh/h | 682 | 1536 | 604 | | | | 0 | 495 | 372 | 0 | 1237 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1834 | 1515 | 1785 | | | | 0 | 1777 | 1585 | 0 | 1777 | 0 |
| Q Serve(g_s), s | 26.3 | 22.7 | 22.8 | | | | 0.0 | 8.8 | 16.7 | 0.0 | 29.1 | 0.0 |
| Cycle Q Clear(g_c), s | 26.3 | 22.7 | 22.8 | | | | 0.0 | 8.8 | 16.7 | 0.0 | 29.1 | 0.0 |
| Prop In Lane | 0.40 | | 0.26 | | | | 0.00 | | 1.00 | 0.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 927 | 2298 | 903 | | | | 0 | 1402 | 625 | 0 | 1402 | 0 |
| V/C Ratio(X) | 0.74 | 0.67 | 0.67 | | | | 0.00 | 0.35 | 0.59 | 0.00 | 0.88 | 0.00 |
| Avail Cap(c_a), veh/h | 927 | 2298 | 903 | | | | 0 | 1402 | 625 | 0 | 1402 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | | | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | | | | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 17.5 | 16.6 | 16.6 | | | | 0.0 | 19.2 | 21.6 | 0.0 | 25.3 | 0.0 |
| Incr Delay (d2), s/veh | 5.2 | 1.6 | 3.9 | | | | 0.0 | 0.7 | 4.1 | 0.0 | 8.3 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 11.6 | 7.7 | 9.6 | | | | 0.0 | 3.7 | 6.7 | 0.0 | 13.2 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 22.7 | 18.2 | 20.6 | | | | 0.0 | 19.9 | 25.7 | 0.0 | 33.6 | 0.0 |
| LnGrp LOS | C | B | C | | | | A | B | C | A | C | A |
| Approach Vol, veh/h | | 2822 | | | | | | 867 | | | 1237 | |
| Approach Delay, s/veh | | 19.8 | | | | | | 22.4 | | | 33.6 | |
| Approach LOS | | B | | | | | | C | | | C | |

| Timer - Assigned Phs | | 2 | | 4 | | 6 |
|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 40.0 | | 50.0 | | 40.0 |
| Change Period (Y+Rc), s | | 4.5 | | 4.5 | | 4.5 |
| Max Green Setting (Gmax), s | | 35.5 | | 45.5 | | 35.5 |
| Max Q Clear Time (g_c+I1), s | | 18.7 | | 28.3 | | 31.1 |
| Green Ext Time (p_c), s | | 4.4 | | 15.3 | | 3.0 |

| Intersection Summary | | |
|---|---|---|
| HCM 6th Ctrl Delay | | 23.7 |
| HCM 6th LOS | | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 1337 | 126 | 0 | 1263 | 232 | 182 | 565 | 233 | 293 | 834 | 158 |
| Future Volume (veh/h) | 0 | 1337 | 126 | 0 | 1263 | 232 | 182 | 565 | 233 | 293 | 834 | 158 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 0 | 1870 | 1870 | 0 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 0 | 1453 | 137 | 0 | 1373 | 252 | 198 | 614 | 253 | 318 | 907 | 172 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 0 | 2 | 2 | 0 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 0 | 2800 | 264 | 0 | 1396 | 253 | 219 | 796 | 355 | 342 | 1041 | 464 |
| Arrive On Green | 0.00 | 0.46 | 0.46 | 0.00 | 0.46 | 0.46 | 0.12 | 0.22 | 0.22 | 0.19 | 0.29 | 0.29 |
| Sat Flow, veh/h | 0 | 6288 | 567 | 0 | 3099 | 544 | 1781 | 3554 | 1585 | 1781 | 3554 | 1585 |
| Grp Volume(v), veh/h | 0 | 1163 | 427 | 0 | 804 | 821 | 198 | 614 | 253 | 318 | 907 | 172 |
| Grp Sat Flow(s),veh/h/ln | 0 | 1609 | 1768 | 0 | 1777 | 1772 | 1781 | 1777 | 1585 | 1781 | 1777 | 1585 |
| Q Serve(g_s), s | 0.0 | 19.2 | 19.3 | 0.0 | 50.0 | 52.2 | 12.4 | 18.3 | 16.7 | 19.8 | 27.4 | 9.7 |
| Cycle Q Clear(g_c), s | 0.0 | 19.2 | 19.3 | 0.0 | 50.0 | 52.2 | 12.4 | 18.3 | 16.7 | 19.8 | 27.4 | 9.7 |
| Prop In Lane | 0.00 | | 0.32 | 0.00 | | 0.31 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 0 | 2242 | 822 | 0 | 826 | 823 | 219 | 796 | 355 | 342 | 1041 | 464 |
| V/C Ratio(X) | 0.00 | 0.52 | 0.52 | 0.00 | 0.97 | 1.00 | 0.90 | 0.77 | 0.71 | 0.93 | 0.87 | 0.37 |
| Avail Cap(c_a), veh/h | 0 | 2242 | 822 | 0 | 826 | 823 | 219 | 796 | 355 | 342 | 1041 | 464 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 0.0 | 21.3 | 21.4 | 0.0 | 29.6 | 30.2 | 48.9 | 41.1 | 40.5 | 44.9 | 37.9 | 31.7 |
| Incr Delay (d2), s/veh | 0.0 | 0.9 | 2.3 | 0.0 | 25.6 | 30.7 | 40.0 | 7.1 | 11.6 | 33.7 | 10.0 | 2.3 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 7.3 | 8.4 | 0.0 | 26.3 | 28.3 | 7.9 | 8.8 | 7.6 | 11.9 | 13.2 | 4.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 22.2 | 23.7 | 0.0 | 55.1 | 60.9 | 88.9 | 48.3 | 52.1 | 78.6 | 47.9 | 33.9 |
| LnGrp LOS | A | C | C | A | E | E | F | D | D | E | D | C |
| Approach Vol, veh/h | | 1590 | | | 1625 | | | 1065 | | | 1397 | |
| Approach Delay, s/veh | | 22.6 | | | 58.0 | | | 56.7 | | | 53.2 | |
| Approach LOS | | C | | | E | | | E | | | D | |

| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 26.2 | 29.8 | | 57.0 | 18.4 | 37.6 | | 57.0 |
| Change Period (Y+Rc), s | 4.5 | 4.5 | | 4.5 | 4.5 | 4.5 | | 4.5 |
| Max Green Setting (Gmax), s | 21.7 | 25.3 | | 52.5 | 13.9 | 33.1 | | 52.5 |
| Max Q Clear Time (g_c+I1), s | 21.8 | 20.3 | | 21.3 | 14.4 | 29.4 | | 54.2 |
| Green Ext Time (p_c), s | 0.0 | 2.2 | | 14.5 | 0.0 | 2.2 | | 0.0 |

| Intersection Summary | | |
|---|---|---|
| HCM 6th Ctrl Delay | | 46.7 |
| HCM 6th LOS | | D |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 2512 | 261 | 0 | 0 | 0 | 0 | 0 | 0 | 294 | 1205 | 0 |
| Future Volume (veh/h) | 0 | 2512 | 261 | 0 | 0 | 0 | 0 | 0 | 0 | 294 | 1205 | 0 |
| Initial Q (Qb), veh | 0 | 0 | 0 | | | | | | | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | | | | | | | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | | | | | | | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | | | | | | | No | |
| Adj Sat Flow, veh/h/ln | 0 | 1870 | 1870 | | | | | | | 1870 | 1870 | 0 |
| Adj Flow Rate, veh/h | 0 | 2730 | 284 | | | | | | | 320 | 1310 | 0 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | | | | | | | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 0 | 2 | 2 | | | | | | | 2 | 2 | 0 |
| Cap, veh/h | 0 | 3101 | 321 | | | | | | | 0 | 1639 | 0 |
| Arrive On Green | 0.00 | 0.44 | 0.44 | | | | | | | 0.46 | 0.46 | 0.00 |
| Sat Flow, veh/h | 0 | 7421 | 733 | | | | | | | 0 | 3647 | 0 |
| Grp Volume(v), veh/h | 0 | 2340 | 674 | | | | | | | 0 | 1310 | 0 |
| Grp Sat Flow(s),veh/h/ln | 0 | 1515 | 1739 | | | | | | | 0 | 1777 | 0 |
| Q Serve(g_s), s | 0.0 | 31.8 | 32.0 | | | | | | | 0.0 | 28.3 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 31.8 | 32.0 | | | | | | | 0.0 | 28.3 | 0.0 |
| Prop In Lane | 0.00 | | 0.42 | | | | | | | 0.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 0 | 2660 | 763 | | | | | | | 0 | 1639 | 0 |
| V/C Ratio(X) | 0.00 | 0.88 | 0.88 | | | | | | | 0.00 | 0.80 | 0.00 |
| Avail Cap(c_a), veh/h | 0 | 2660 | 763 | | | | | | | 0 | 1639 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | | | | | | | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 1.00 | 1.00 | | | | | | | 0.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 23.1 | 23.1 | | | | | | | 0.0 | 20.7 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 4.6 | 14.1 | | | | | | | 0.0 | 4.2 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | | | | | | | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 11.5 | 15.2 | | | | | | | 0.0 | 11.9 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 27.6 | 37.2 | | | | | | | 0.0 | 24.9 | 0.0 |
| LnGrp LOS | A | C | D | | | | | | | A | C | A |
| Approach Vol, veh/h | | 3014 | | | | | | | | | 1310 | |
| Approach Delay, s/veh | | 29.8 | | | | | | | | | 24.9 | |
| Approach LOS | | C | | | | | | | | | C | |

| Timer - Assigned Phs | | 4 | | 6 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 44.0 | | 46.0 | | | | | | | | |
| Change Period (Y+Rc), s | | 4.5 | | * 4.5 | | | | | | | | |
| Max Green Setting (Gmax), s | | 39.5 | | * 42 | | | | | | | | |
| Max Q Clear Time (g_c+I1), s | | 34.0 | | 30.3 | | | | | | | | |
| Green Ext Time (p_c), s | | 5.4 | | 6.8 | | | | | | | | |

| Intersection Summary | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HCM 6th Ctrl Delay | | | 28.3 | | | | | | | | | |
| HCM 6th LOS | | | C | | | | | | | | | |

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 1810 | 179 | 0 | 1137 | 0 | 0 | 0 | 0 | 369 | 417 | 217 |
| Future Volume (veh/h) | 0 | 1810 | 179 | 0 | 1137 | 0 | 0 | 0 | 0 | 369 | 417 | 217 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | | | | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | | | | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | | | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | | | | No | |
| Adj Sat Flow, veh/h/ln | 0 | 1870 | 1870 | 0 | 1870 | 0 | | | | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 0 | 1967 | 195 | 0 | 1236 | 0 | | | | 401 | 453 | 236 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | | | | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 0 | 2 | 2 | 0 | 2 | 0 | | | | 2 | 2 | 2 |
| Cap, veh/h | 0 | 3122 | 309 | 0 | 1851 | 0 | | | | 720 | 1436 | 641 |
| Arrive On Green | 0.00 | 0.52 | 0.52 | 0.00 | 0.52 | 0.00 | | | | 0.40 | 0.40 | 0.40 |
| Sat Flow, veh/h | 0 | 6257 | 594 | 0 | 3741 | 0 | | | | 1781 | 3554 | 1585 |
| Grp Volume(v), veh/h | 0 | 1583 | 579 | 0 | 1236 | 0 | | | | 401 | 453 | 236 |
| Grp Sat Flow(s),veh/h/ln | 0 | 1609 | 1763 | 0 | 1777 | 0 | | | | 1781 | 1777 | 1585 |
| Q Serve(g_s), s | 0.0 | 28.1 | 28.1 | 0.0 | 30.7 | 0.0 | | | | 20.8 | 10.4 | 12.5 |
| Cycle Q Clear(g_c), s | 0.0 | 28.1 | 28.1 | 0.0 | 30.7 | 0.0 | | | | 20.8 | 10.4 | 12.5 |
| Prop In Lane | 0.00 | | 0.34 | 0.00 | | 0.00 | | | | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 0 | 2513 | 918 | 0 | 1851 | 0 | | | | 720 | 1436 | 641 |
| V/C Ratio(X) | 0.00 | 0.63 | 0.63 | 0.00 | 0.67 | 0.00 | | | | 0.56 | 0.32 | 0.37 |
| Avail Cap(c_a), veh/h | 0 | 2513 | 918 | 0 | 1851 | 0 | | | | 720 | 1436 | 641 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | | | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | | | | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 0.0 | 20.5 | 20.5 | 0.0 | 21.1 | 0.0 | | | | 27.5 | 24.4 | 25.0 |
| Incr Delay (d2), s/veh | 0.0 | 1.2 | 3.3 | 0.0 | 1.9 | 0.0 | | | | 3.1 | 0.6 | 1.6 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 10.5 | 12.1 | 0.0 | 12.9 | 0.0 | | | | 9.4 | 4.5 | 5.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 21.7 | 23.8 | 0.0 | 23.1 | 0.0 | | | | 30.6 | 25.0 | 26.7 |
| LnGrp LOS | A | C | C | A | C | A | | | | C | C | C |
| Approach Vol, veh/h | | 2162 | | | 1236 | | | | | | 1090 | |
| Approach Delay, s/veh | | 22.3 | | | 23.1 | | | | | | 27.4 | |
| Approach LOS | | C | | | C | | | | | | C | |

| Timer - Assigned Phs | | 4 | | 6 | | 8 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 67.0 | | 53.0 | | 67.0 | | | | | | |
| Change Period (Y+Rc), s | | 4.5 | | 4.5 | | 4.5 | | | | | | |
| Max Green Setting (Gmax), s | | 62.5 | | 48.5 | | 62.5 | | | | | | |
| Max Q Clear Time (g_c+I1), s | | 30.1 | | 22.8 | | 32.7 | | | | | | |
| Green Ext Time (p_c), s | | 21.5 | | 5.5 | | 11.3 | | | | | | |

| Intersection Summary | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HCM 6th Ctrl Delay | | | 23.7 | | | | | | | | | |
| HCM 6th LOS | | | C | | | | | | | | | |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 419 | 1972 | 152 | 0 | 0 | 0 | 0 | 152 | 107 | 372 | 110 | 0 |
| Future Volume (veh/h) | 419 | 1972 | 152 | 0 | 0 | 0 | 0 | 152 | 107 | 372 | 110 | 0 |
| Initial Q (Qb), veh | 0 | 0 | 0 | | | | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | | | | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | | | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | | | | 0 | 1870 | 1870 | 1870 | 1870 | 0 |
| Adj Flow Rate, veh/h | 455 | 2143 | 165 | | | | 0 | 165 | 116 | 262 | 319 | 0 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | | | | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | | | | 0 | 2 | 2 | 2 | 2 | 0 |
| Cap, veh/h | 602 | 3090 | 240 | | | | 0 | 779 | 1162 | 476 | 779 | 0 |
| Arrive On Green | 0.48 | 0.48 | 0.48 | | | | 0.00 | 0.42 | 0.42 | 0.42 | 0.42 | 0.00 |
| Sat Flow, veh/h | 1245 | 6393 | 496 | | | | 0 | 1870 | 2790 | 1098 | 1870 | 0 |
| Grp Volume(v), veh/h | 661 | 1510 | 592 | | | | 0 | 165 | 116 | 262 | 319 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1808 | 1515 | 1781 | | | | 0 | 1870 | 1395 | 1098 | 1870 | 0 |
| Q Serve(g_s), s | 26.8 | 23.1 | 23.2 | | | | 0.0 | 5.1 | 2.3 | 18.0 | 10.8 | 0.0 |
| Cycle Q Clear(g_c), s | 26.8 | 23.1 | 23.2 | | | | 0.0 | 5.1 | 2.3 | 23.1 | 10.8 | 0.0 |
| Prop In Lane | 0.69 | | 0.28 | | | | 0.00 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 874 | 2197 | 861 | | | | 0 | 779 | 1162 | 476 | 779 | 0 |
| V/C Ratio(X) | 0.76 | 0.69 | 0.69 | | | | 0.00 | 0.21 | 0.10 | 0.55 | 0.41 | 0.00 |
| Avail Cap(c_a), veh/h | 874 | 2197 | 861 | | | | 0 | 779 | 1162 | 476 | 779 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | | | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | | | | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 18.9 | 18.0 | 18.0 | | | | 0.0 | 16.8 | 16.0 | 24.2 | 18.5 | 0.0 |
| Incr Delay (d2), s/veh | 6.0 | 1.8 | 4.5 | | | | 0.0 | 0.6 | 0.2 | 4.5 | 1.6 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 11.9 | 7.9 | 10.0 | | | | 0.0 | 2.2 | 0.7 | 5.1 | 4.8 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 25.0 | 19.8 | 22.5 | | | | 0.0 | 17.4 | 16.1 | 28.7 | 20.1 | 0.0 |
| LnGrp LOS | C | B | C | | | | A | B | B | C | C | A |
| Approach Vol, veh/h | | 2763 | | | | | | 281 | | | 581 | |
| Approach Delay, s/veh | | 21.6 | | | | | | 16.9 | | | 24.0 | |
| Approach LOS | | C | | | | | | B | | | C | |

| Timer - Assigned Phs | 2 | 4 | 6 |
|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 42.0 | 48.0 | 42.0 |
| Change Period (Y+Rc), s | 4.5 | 4.5 | 4.5 |
| Max Green Setting (Gmax), s | 37.5 | 43.5 | 37.5 |
| Max Q Clear Time (g_c+I1), s | 7.1 | 28.8 | 25.1 |
| Green Ext Time (p_c), s | 1.4 | 13.2 | 2.5 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 21.6 |
| HCM 6th LOS | C |

Notes

User approved volume balancing among the lanes for turning movement.

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 1769 | 94 | 0 | 1277 | 139 | 181 |
| Future Volume (veh/h) | 1769 | 94 | 0 | 1277 | 139 | 181 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 1.00 | 1.00 | | 1.00 | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | No | | | No | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 0 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 1923 | 102 | 0 | 1388 | 151 | 197 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 0 | 2 | 2 | 2 |
| Cap, veh/h | 5951 | 316 | 0 | 3356 | 0 | 0 |
| Arrive On Green | 0.94 | 0.94 | 0.00 | 0.94 | 0.00 | 0.00 |
| Sat Flow, veh/h | 6563 | 334 | 0 | 3741 | 0 | |
| Grp Volume(v), veh/h | 1473 | 552 | 0 | 1388 | 0.0 | |
| Grp Sat Flow(s),veh/h/ln | 1609 | 1810 | 0 | 1777 | | |
| Q Serve(g_s), s | 2.0 | 2.0 | 0.0 | 2.9 | | |
| Cycle Q Clear(g_c), s | 2.0 | 2.0 | 0.0 | 2.9 | | |
| Prop In Lane | | 0.18 | 0.00 | | | |
| Lane Grp Cap(c), veh/h | 4557 | 1710 | 0 | 3356 | | |
| V/C Ratio(X) | 0.32 | 0.32 | 0.00 | 0.41 | | |
| Avail Cap(c_a), veh/h | 4557 | 1710 | 0 | 3356 | | |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | | |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | | |
| Uniform Delay (d), s/veh | 0.2 | 0.2 | 0.0 | 0.2 | | |
| Incr Delay (d2), s/veh | 0.2 | 0.5 | 0.0 | 0.4 | | |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | | |
| %ile BackOfQ(50%),veh/ln | 0.1 | 0.2 | 0.0 | 0.2 | | |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 0.4 | 0.7 | 0.0 | 0.6 | | |
| LnGrp LOS | A | A | A | A | | |
| Approach Vol, veh/h | 2025 | | | 1388 | | |
| Approach Delay, s/veh | 0.5 | | | 0.6 | | |
| Approach LOS | A | | | A | | |

| Timer - Assigned Phs | | 4 | | 8 |
|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 81.0 | | 81.0 |
| Change Period (Y+Rc), s | | 4.5 | | 4.5 |
| Max Green Setting (Gmax), s | | 76.5 | | 76.5 |
| Max Q Clear Time (g_c+I1), s | | 4.0 | | 4.9 |
| Green Ext Time (p_c), s | | 28.9 | | 16.9 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 0.5 |
| HCM 6th LOS | A |

Appendix E

# Literature Review and Field Inspection Report

*Cultural Surveys Hawai‘i, Inc., October 2020*

# Draft

# Archaeological Literature Review and Field Inspection Report in Support of Consultation with the SHPD for the McKinley High School Athletic Complex Improvements Project, Kakaʻako, Honolulu Ahupuaʻa, Honolulu District, Oʻahu TMK: [1] 2-3-009:001 (por.)

## DOE Job No: Q23000-18

Prepared for
G70
and on behalf of the
State of Hawaiʻi Department of Education (DOE)

Prepared by
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Cultural Surveys Hawaiʻi, Inc.
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October 2020

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# Management Summary

| | |
|---|---|
| **Reference** | Archaeological Literature Review and Field Inspection Report in Support of Consultation with the SHPD for the McKinley High School Athletic Complex Improvements Project, Kaka‘ako, Honolulu Ahupua‘a, Honolulu District, O‘ahu, TMK: [1] 2-3-009:001 (por.), DOE Job No: Q23000-18 (Shideler and Sroat 2020) |
| **Date** | October 2020 |
| **Project Number(s)** | State of Hawai‘i Department of Education (DOE) Job No: Q23000-18; Cultural Surveys Hawai‘i, Inc. (CSH) Job Code: KAKAAKO 262 |
| **Investigation Permit Number** | CSH completed the fieldwork component of this study under archaeological fieldwork permit number 20-07, issued by the Hawai‘i State Historic Preservation Division (SHPD) / Department of Land and Natural Resources (DLNR) per Hawai‘i Administrative Rules (HAR) §13-13-282. |
| **Agencies** | SHPD; DOE |
| **Land Jurisdiction** | DOE |
| **Project Proponent** | DOE |
| **Project Funding** | DOE |
| **Project Location** | The project area is located in the southeast corner of McKinley High School (MHS) (1039 South King Street), in the Kewalo area of central Honolulu Ahupua‘a, Honolulu (Kona) District, O‘ahu, Tax Map Key (TMK): [1] 2-3-009:001 (por.). The project area is depicted on a 1998 Honolulu USGS topographic quadrangle (Figure 1), tax map plat (Figure 2), and 2013 aerial photograph (Figure 3). |
| **Project Description** | The State of Hawai‘i DOE is proposing to undertake the MHS Athletic Complex Improvements project, which involves the following improvements to the existing athletic complex:<br><u>Demolition</u><br>• Existing maintenance cottage (complete demolition);<br>• Existing Boy’s Physical Education (PE) locker room (partial demolition).<br><u>Construction</u><br>• New two-story Athletic PE complex with locker/shower rooms (15,900 square feet [sq ft]);<br>• Stadium lighting and bleachers (with 3,444 seats) at the track and field;<br>• Storage facility under the bleachers (1,800 sq ft);<br>• Plaza with gathering areas; and<br>• Replacement gravel parking area with space for 41 unmarked parking stalls. |
| **Project Acreage** | The project area is approximately 1.56 acres (0.63 hectare). |

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| **Historic Preservation Regulatory Context** | This is a state/municipal “governmental” project needing review under Hawai‘i Revised Statutes (HRS) §6E-8 and HAR §13-275. As the project is located within state lands, HRS §6E-7, which states that control and management of historic properties belongs to the DLNR, is also applicable.<br><br>There is no federal involvement that would trigger compliance with federal historic preservation review legislation (e.g., Section 106 of the National Historic Preservation Act). |
| **Document Purpose** | This investigation was designed—through historical, cultural, and archaeological background research and a field inspection of the project area—to determine the likelihood that historic properties may be affected by the proposed project and, based on findings, to consider cultural resource management recommendations. This document is intended to facilitate the project’s planning and to support the project’s historic preservation and environmental review compliance. This investigation does not fulfill the requirements of an archaeological inventory survey (AIS) investigation, per HAR §13-276.<br><br>This information also supports consultation with the SHPD regarding the project’s necessary historic preservation review steps pursuant to HAR §13-275. |
| **Physical Setting** | The project area is approximately 500 m inland (north) from the original coast of O‘ahu’s South Shore (near present day Ala Moana Boulevard) and lies on the low, raised reef limestone plain of Honolulu. Ancient streambeds ran on either side of the location of the present campus (Figure 5) but these streams were disrupted by the Pūowaina (Punchbowl) eruption. The western “HIC Channel” is still associated with an underground watercourse which may have provided potable water for the vicinity. Rainfall is approximately 764 mm (30.1 inches) per year (Kinau Street gage) which is understood as marginal at best for non-irrigated agriculture.<br><br>Soil studies point out that the majority of the project area is “Fill Land, mixed” (Figure 6), understood as resulting from landfill efforts to raise the natural marshy ground surface that was close to the water table. The proximity of the water table is understood to have impeded significantly development of the project area. |
| **Summary of Cultural History** | While it should probably be understood as a sketch, the 1855 LaPasse map (Figure 7) shows the vicinity of the project area as a patchwork of ponded field taro agriculture and fishponds, with a low density of scattered houses. The 1866 Makalena map (Figure 8) shows that the present day King Street bounding the school on the north side was a traditional Hawaiian major trail (the “Alanui Ali‘i”) crossing the Kona District of southeast O‘ahu. King Street extends along the seaward edge of relatively dry land which encouraged development inland and left the marshy land |

| | |
|---|---|
| **Summary of Cultural History (cont.)** | seaward undeveloped until quite late (see the 1881 Covington map, Figure 9).<br><br>At the time of the Māhele of 1848 and the following Kuleana Act, the present project area became part of Land Commission Award (LCA) 10605 to the *ali‘i* (high chief) Jonah Pi‘ikoi (Figure 10). Unfortunately, the *ali‘i* such as Pi‘ikoi who were granted large awards were not required to state the land use for their awards, so there is little information on the agricultural or habitation use of Pi‘ikoi’s LCA 10605. The absence of commoner Land Commission Awards in the vicinity suggests it was too marshy for habitation and not well suited for traditional Hawaiian agriculture.<br><br>Maps from 1887 through 1912 (Figure 11, Figure 13 through Figure 19) convey that it was the low-lying marshy nature of this land that delayed development. Development that moved forward on neighboring higher, drier lands eventually came to encompass the school campus and project area. Maps from 1897 (Figure 14) and 1909 (Figure 17) clearly indicate rice cultivation in the central portion of the school campus and this may well have occupied the vast majority of the present day McKinley High School campus. It is no surprise that one of the earliest photographs of the project vicinity from 1888 (Figure 12) shows a good deal of water—but this may in fact show early efforts to dig channels to create dry land.<br><br>Starting in 1919 (Figure 20), a few houses are visible in the future campus area; that may have become possible by the excavation of a medium-sized pond on the southern west side of the future school campus to allow for drainage.<br><br>Ownership changed over time from a Mrs. K. Fairchild in 1911 (Figure 18) to the Cummins family by 1920 (Figure 21). The McKinley High School was proposed at least as early as 1920 (Figure 21) and substantial school infrastructure was built by 1923 (Figure 22). While an oval track (and athletic field) are indicated within the project area on a 1923 map (Figure 22), this may have been rather informal (a 1927 aerial photograph, Figure 23, does not show such a track) until 1938 (Figure 28).<br><br>Around this time period, large-scale changes were occurring with dredging and pumping of dredge slurry to in-fill low-lying land. The 1920 map (Figure 21) shows the little-modified natural landscape. The 1923 map (Figure 22) shows the new Ala Wai Canal and a “proposed channel.” The 1927 map (Figure 23) shows the immediate vicinity of the project area as relatively natural. The 1928 map (Figure 25) shows the off-shore areas as largely natural but the land in the greater Ala Moana Shopping Center area has a new layout grid of proposed streets. The 1933 map (Figure 26) shows extensive off-shore dredged channels, and the 1938 photograph (Figure 28) indicates very substantial deposition of white coral dredge spoils in the present project area. The 1927 Sanborn map (Figure |

| | |
|---|---|
| | 24) and the 1934 map (Figure 27) show the school infrastructure limited to the central inland portion of the campus by necessity; however, recent land fill would allow for expansion.<br><br>In the 1940s to 1950s period (Figure 29 through Figure 36), the expansion of infrastructure continued to be primarily on the north side of the campus. On the 1949 aerial (Figure 31), the first buildings near the south side of the campus are visible; however, no buildings are visible within the project area until 1959 when a rectangular building is located marginally within the *mauka* (inland) portion of the project area (Figure 37 and Figure 38). By 1963, an additional small building is visible within the *mauka* “arm” of the project area (Figure 39). By 1968, and minimally through 1978, a complex of school infrastructure was located within the *mauka* and southeastern portions of the project area (Figure 40 through Figure 42). With the exception of the two buildings first visible in the 1959 and 1963 aerial photographs (Figure 38 and Figure 39), these buildings are no longer present (see Figure 3). |
| **Summary of Previous Archaeological Studies in the Vicinity** | Four previous archaeological programs have been identified at McKinley High School (Figure 43 and Table 1).<br><br>An archaeological literature review and field inspection (Chiogioji and Hammatt 1992) was conducted for a 5.3-acre parcel at the northwest corner of the intersection of Pensacola Street and Kapi‘olani Boulevard (TMK: [1] 2-3-009:001 por.) that included an eastern portion of the present project area. That study recommended archaeological testing by coring, including pollen and dating analysis with particular reference to the possible presence of wetland deposits which may contain information on paleoenvironments and Hawaiian archaeology.<br><br>An archaeological monitoring report (Hammatt 2014) was prepared for physical education building related construction in two neighboring discrete areas in the southwest/central portion of the McKinley High School. Of note was the identification of naturally deposited alluvial sediments determined to be associated with the Kewalo wetlands (State Inventory of Historic Places [SIHP] # 50-80-14-6636), a natural landscape feature with limited documented instances of human modification, and accordingly the observed areas of the exposure were incorporated into the historic property (Figure 44 and Table 2).<br><br>An archaeological monitoring report (Wheeler and Hammatt 2015) was prepared for construction work on a softball stadium project on the southwestern side of the McKinley High School Campus. Two historic properties were identified: SIHP # -7754, a stone and mortar (ditch) wall oriented northeast to southwest, and SIHP # -7755, a trash layer including several domestic alcohol, milk, glass, and medical bottles and ceramic and |

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| | metal fragments in a layer about 25 to 30 cm thick overlying gleyed silty clay.<br><br>An archaeological monitoring report (Tardona and Hammatt 2018) documents archaeological work in the east central portion of the campus, immediately northeast of the present project area in support of a McKinley High School photovoltaic system installation project. The Kewalo wetlands (SIHP # -6636) were consistently identified during drilling work at approximately 1-2 m (3.2-6.5 ft) below surface (within the monitoring field forms, although not within the report). The study infers the distribution of SIHP # -6636 (Tardona and Hammatt 2018:81) as likely underlying the entire area of the present project (see Appendix B).<br><br>While several finds of human remains have been reported within 250 m to the south of the project area, these are largely *makai* (seaward) of Kapi‘olani Boulevard and associated with a buried backshore sand dune (SIHP #s -6658 and -7429) (Hammatt 2013; Humphrey et al. 2015; Winieski and Hammatt 2000), a berm associated with Kolowalu Pond (SIHP # -6658) (O’Hare et al. 2006), and isolated and fragmented remains within a disturbed stratigraphic context (SIHP # -5598) (O’Hare et al. 2006). The one exception is an inadvertently discovered burial site located at the corner of Pi‘ikoi Street and Kapi‘olani Boulevard, consisting of a pre-Contact, Hawaiian burial within a wetland deposit (i.e., within the extrapolated bounds of SIHP # -6636) (Athens et al. 1994); this burial appeared to represent an unintended, or accidental, burial site. |
| **Historic Properties Previously Identified within the Project Area and Immediate Vicinity** | Two historic properties have been previously identified within the current project area:<br><br>1. McKinley High School (SIHP # 50-80-14-9926) is understood to be on the National Register of Historic Places (NRHP). It was first nominated by Hibbard and Napoka (1979) as a Historic District encompassing the original school buildings within the *mauka* portion of the project area (Figure 44). Contributing components included the six school buildings enclosing the main school plaza and a statue of President McKinley. A subsequent NHRP nomination form by Rev. MacPherson (1993) expanded the Historic District to include the entirety of the 45.6-acre McKinley High School Campus as established in 1922 (see Appendix A). One additional building was added as a contributing element; however, 33 other campus buildings and one structure were considered noncontributing due to their modern architecture (less than 50 years old in the year 1993). While many of these structures have been demolished, quite a few are still extant and are now over 50 years old. Two of these buildings are within the current project area and were constructed between 1952-1959 (current Boys PE/Locker Room and Weight Room) and 1959-1963 (current maintenance cottage). |

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| | 2. The Kewalo wetlands (SIHP # 50-80-14-6636) have been previously identified within the McKinley campus by two previous archaeological studies (Hammatt 2014; Tardona and Hammatt 2018) and have been indicated as likely underlying the entire present project area (Tardona and Hammatt 2018:81; see Appendix B). The Kewalo wetland is primarily a natural buried wetland that encompasses a large portion of the traditional *‘ili* (small land district) of Kewalo (now part of the modern district of Kaka‘ako). Previous archaeological studies and a review of historical maps have documented modifications to these natural wetlands, including constructed ponds, a modified edge (berm), and a coral wall and associated fence post.<br><br>In addition to SIHP #s -9926 and -6636, two historic properties were identified to the northwest of the project area on the McKinley High School campus: SIHP # -7754, a stone and mortar (ditch) wall running at a northeast and southwest direction, and SIHP # -7755, a historical trash layer. While these have not been identified in the present project area, the identified trash layer could be present in other areas of the campus, potentially including the present project area. |
| **Fieldwork Effort** | A field inspection of the project area was conducted on 17 March 2020 by CSH archaeologist David W. Shideler, M.A., and on 3 April 2020 by CSH archaeologist Ena Sroat, B.A. This work required approximately 1/4 and 1/16 person-days to complete, respectively. An archaeologist’s track log with the approximate location and direction of photographs of the project area is presented in Figure 45. Photographs of the current conditions of the project area are presented in Figure 46 through Figure 61.<br><br>In general, the project area consists of open landscaped space or open paved areas surrounding the current McKinley High School track. One feature of note within this open space is a bronze plaque affixed to a concrete foundation dedicated to a previous school coach and educator, William S. Wise. The plaque is regarded as a potential contributing element to the designated SIHP # -9926 historic property. The plaque reads as follows:<br><br>William S. Wise<br>Field<br>Educator, Coach, Friend<br>Gift of 1965 Junior Class<br>30 April 1965<br><br>Within the *mauka* portion of the project area, two buildings were noted to be within the boundaries of the project area. While these two buildings are not currently considered contributing components of SIHP # -9926, based on historical photographs (see Figure 37 and Figure 39) they are older than 50 years of age (constructed circa 1959 and 1963). |

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| | Building Q is marginally in the project area. It consists of a long, rectangular brick and metal structure which currently functions as the Boy’s PE/Locker Room and Weight Room (see Figure 58). On the northwestern exterior wall of Building Q is a dedicatory plaque to a McKinley High School alumnus, Leroy A. Mendonca, who perished in the Korean War (see Figure 59). It reads as follows:<br><br>In Memorium<br>Leroy A Mendonca<br>1932 1951<br>Class of 1950<br><br>The plaque is accompanied by a photograph of the soldier and a presidential letter memorializing the bestowing of a Medal of Honor.<br><br>Within the *mauka* “arm” of the project area is a small wooden cottage which appears to function as a maintenance building (see Figure 60 and Figure 61). |
| **Recommendations** | Based on early consultation with the SHPD architecture branch in July 2020 and September 2020, and the absence within the current project area of any contributing elements of the McKinley High School (SIHP # -9926) NRHP site, the proposed McKinley High School Athletic Complex Improvements project is not anticipated to have any adverse effect on SIHP # -9926. Additionally, per the SHPD, the small maintenance/custodian wooden cottage, which is planned for demolition, has been sufficiently documented in a 2018 *Thematic Historic Context Study* by Mason Architects. For Building Q, only a portion (approximately 20%) of which will be demolished, mitigation in the form of Reconnaissance Survey Level (RSL) documentation of the building was requested (to be included in the DOE transmittal letter). The memorial plaque to Leroy A. Mendonca will not be effected. Current project plans do not anticipate impact to the William S. Wise plaque.<br><br>Based on the results of background research and previous archaeological studies, archaeological historic properties likely within the proposed McKinley High School Athletic Complex Improvements project area consist of the Kewalo wetlands (SIHP # -6636), located approximately 1-2 m (3.2-6.5 ft) below the current surface. Based on early consultation with the SHPD archaeology branch, project-related excavations which extend to the presumed depth of SIHP # -6636 may effect this historic property and mitigation should be considered. Given the results of previous archaeological studies within the McKinley High School campus, an archaeological inventory survey does not appear warranted. Instead, a program of archaeological monitoring consisting of a combination of on-site and on-call monitoring is recommended. |

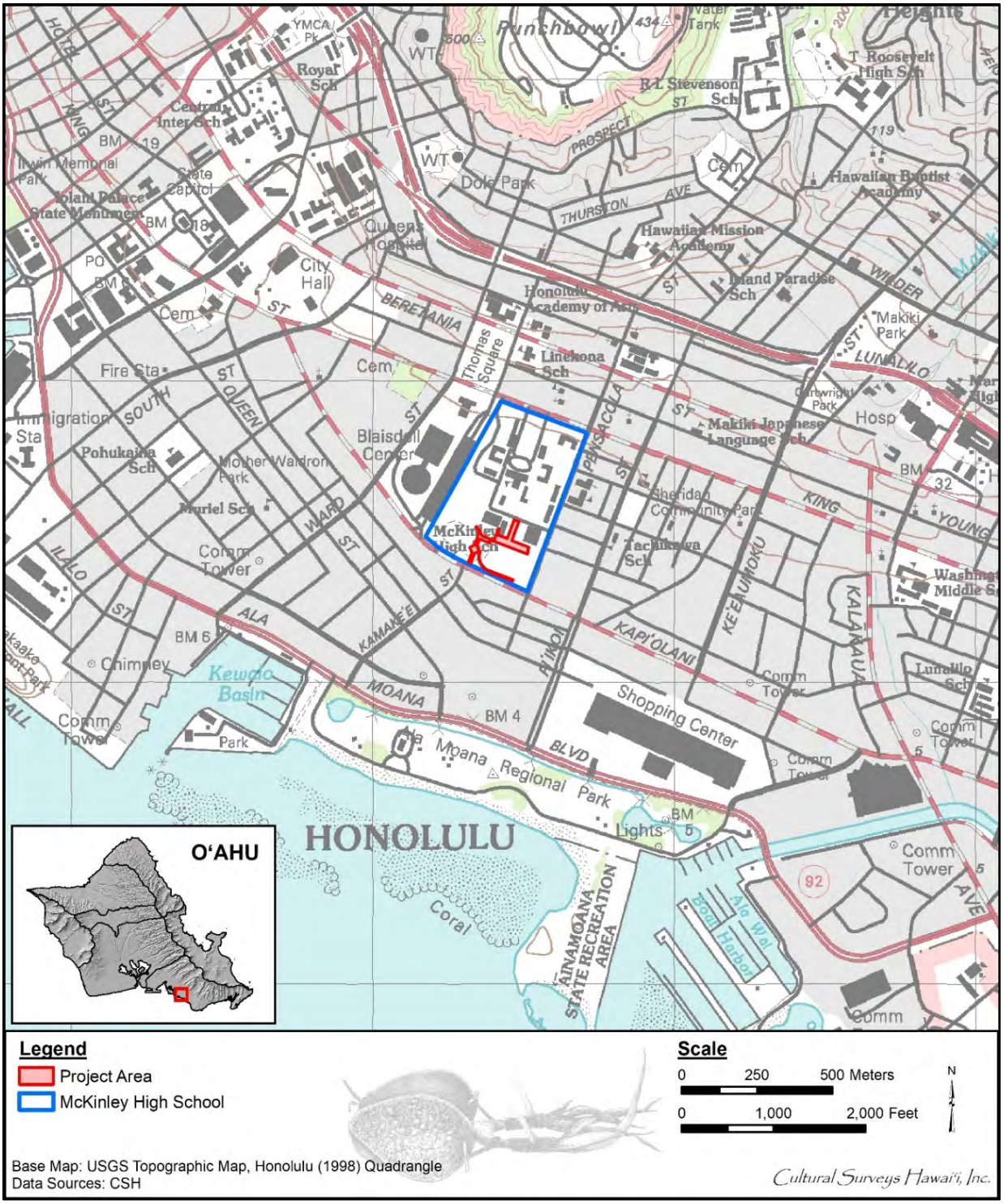


Figure 1. Portion of the 1998 Honolulu USGS 7.5-minute topographic quadrangle showing the location of McKinley High School and the project area

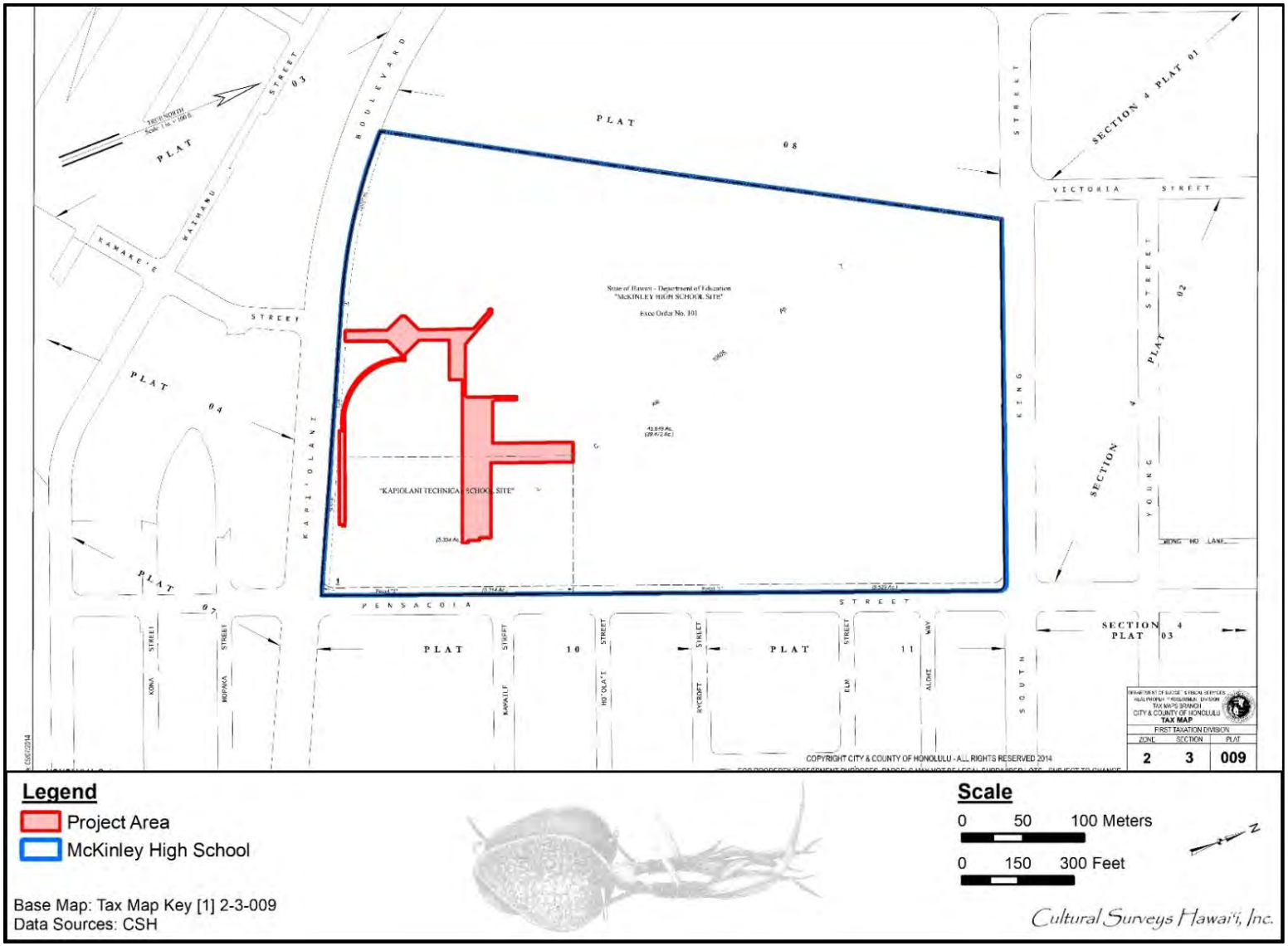


Figure 2. Tax Map Key (TMK) [1] 2-3-009 showing the location of McKinley High School and the project area (Hawai‘i TMK Service 2014)

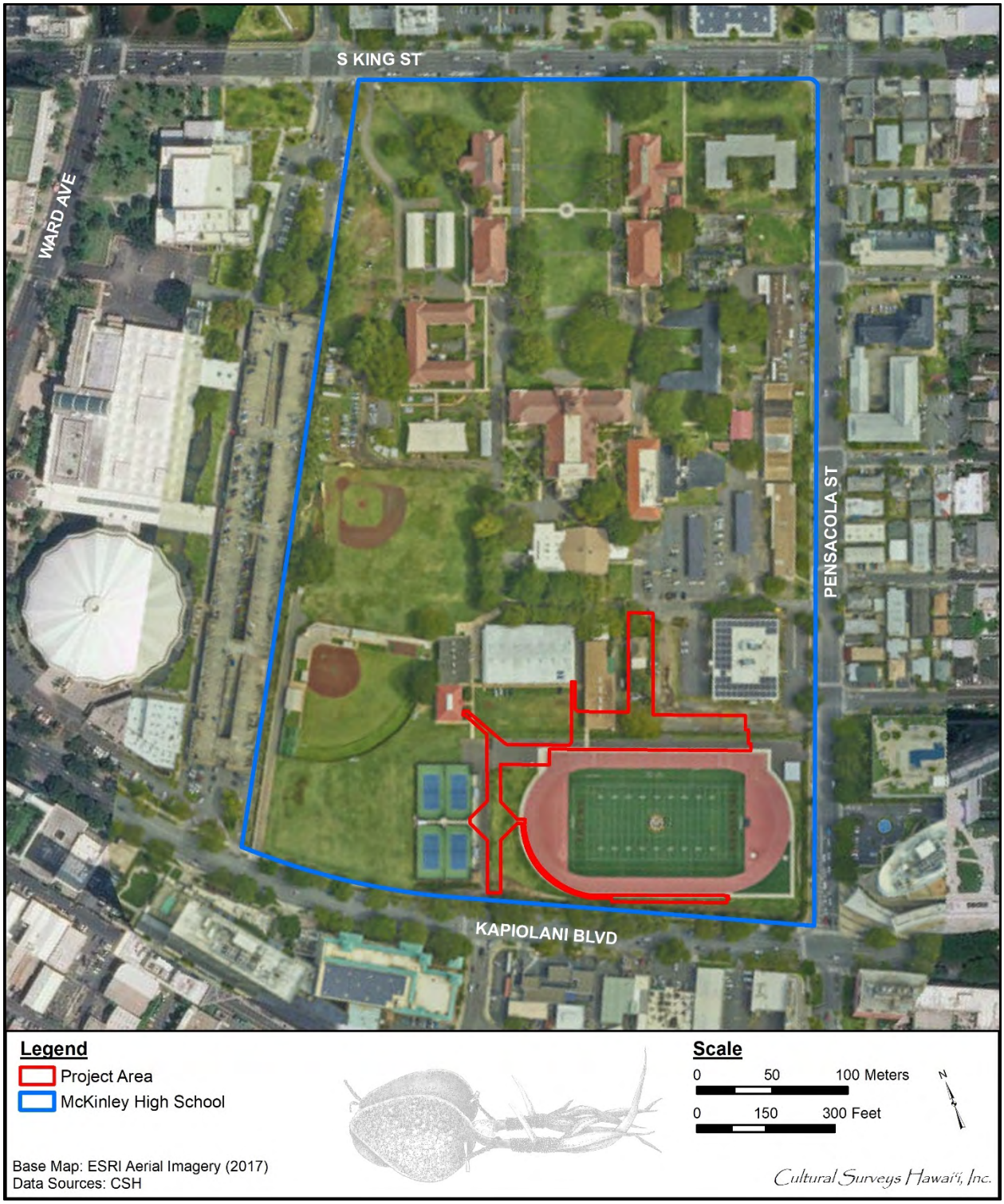


Figure 3. Aerial photograph showing the location of McKinley High School and the project area (Google Earth 2013)

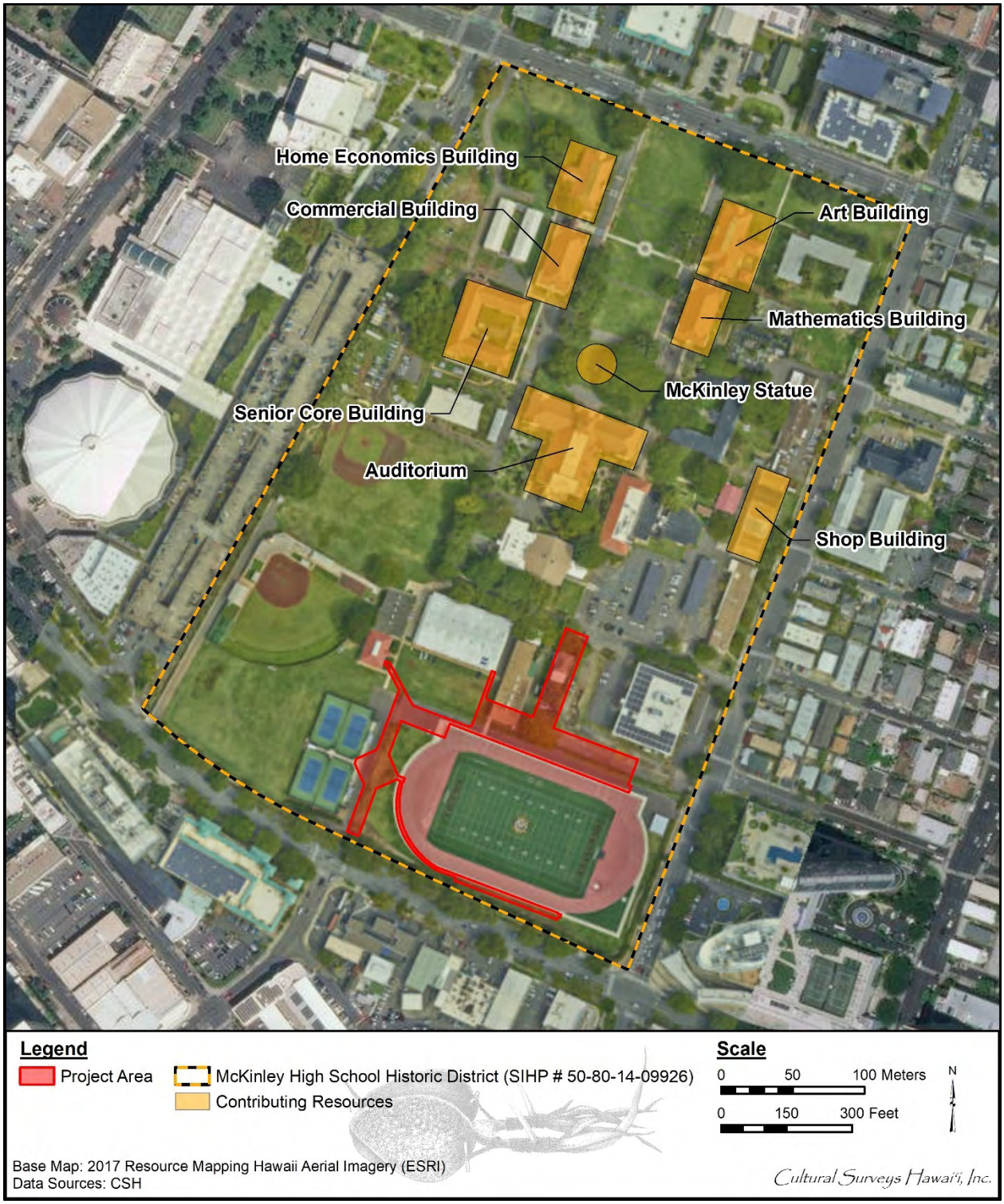


Figure 4. Map showing the relationship of the McKinley High School project area to the designated contributing elements of the National Register of Historic Places historic property (SIHP # -9926)

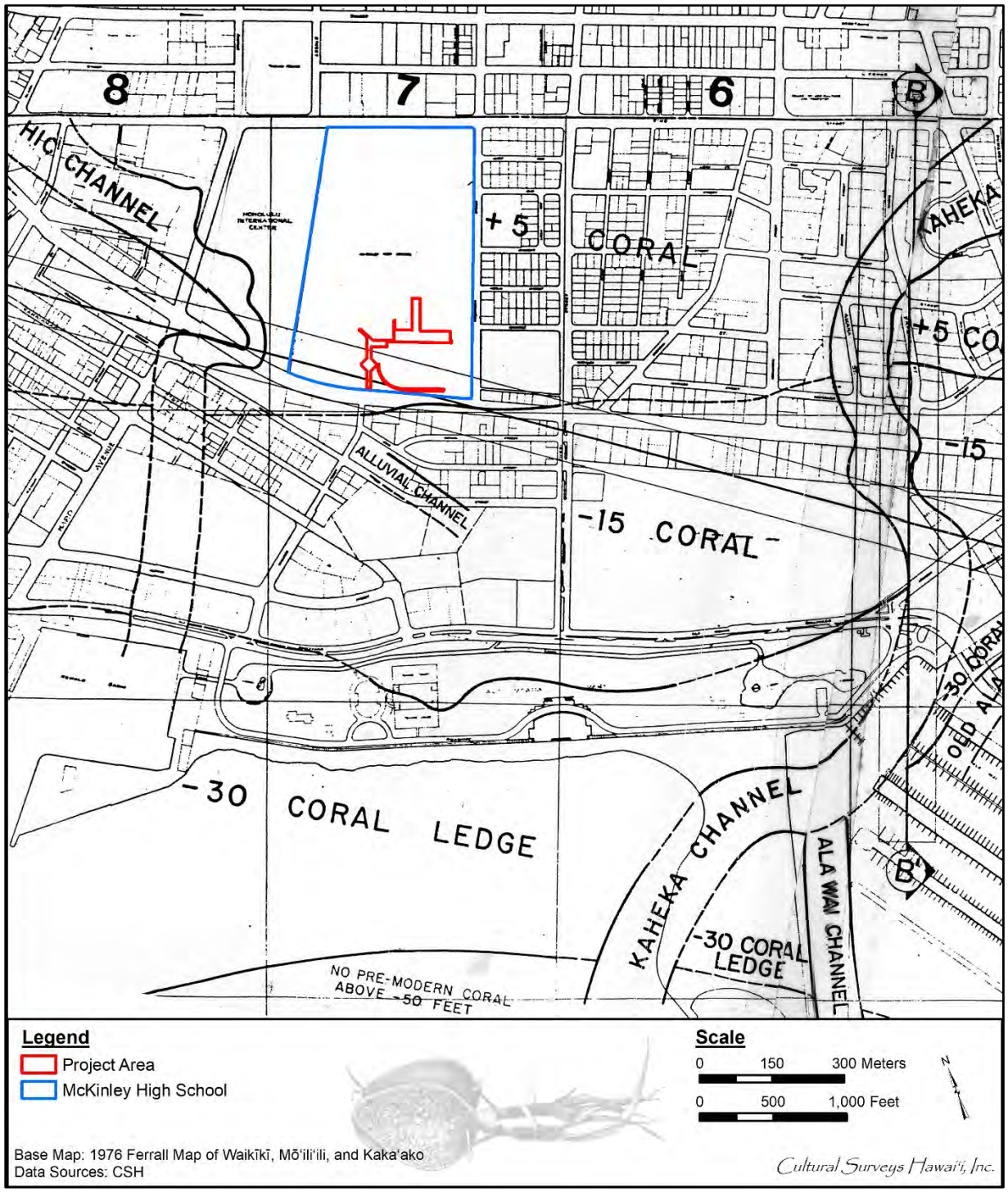


Figure 5. Ferrall (1976) map of Waikīkī, Mō‘ili‘ili and Kaka‘ako showing the reconstructed geological landscape and the location of McKinley High School and the project area; the school lies on raised reef limestone between two former stream channels, the “HIC Channel” to the west and the “Kaheka Channel” to the east understood as ancient watercourses disrupted by the Pūowaina (Punchbowl) eruption

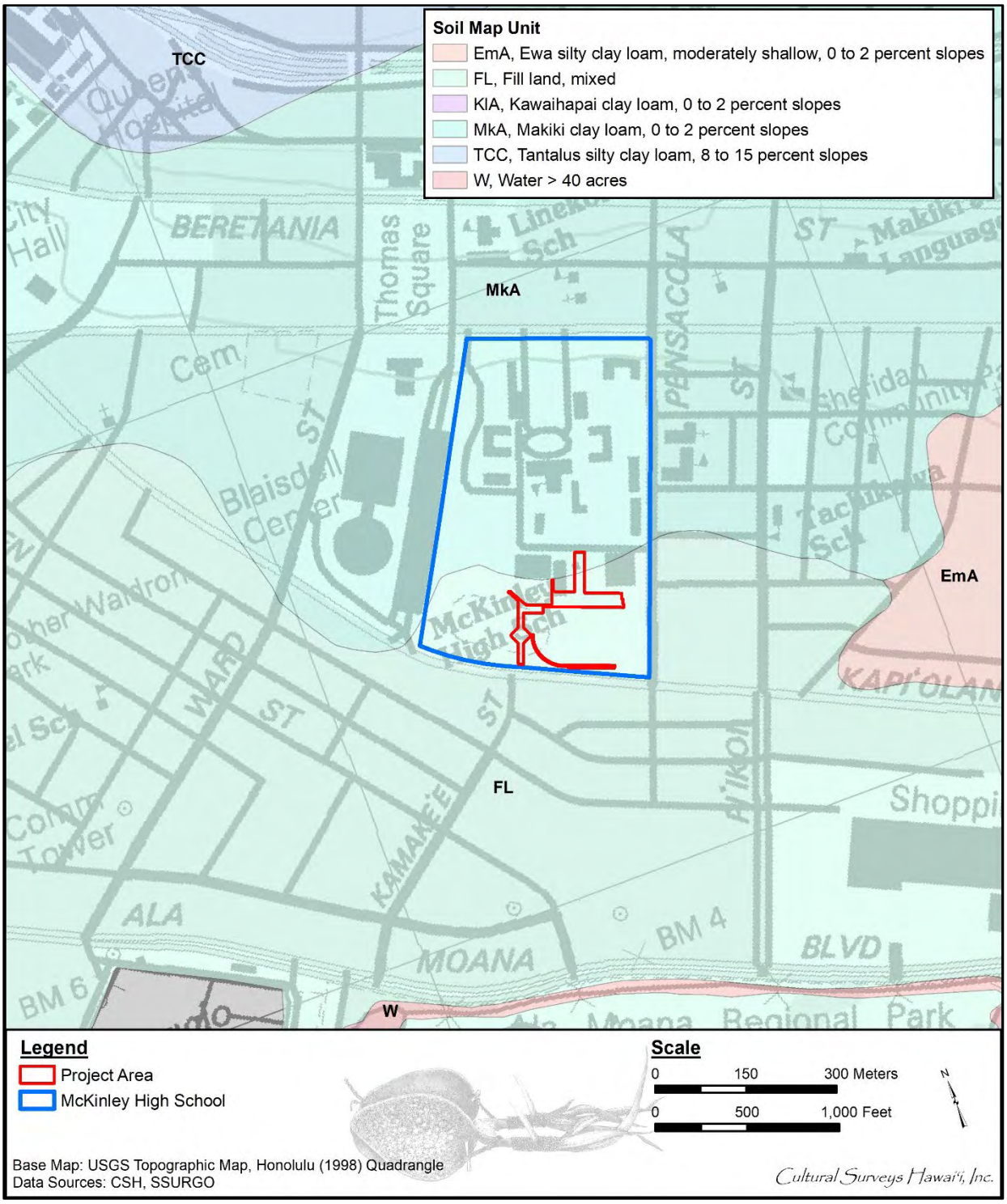


Figure 6. Overlay of *Soil Survey of the State of Hawaii* (Foote et al. 1972), indicating soil types within and surrounding McKinley High School and the project area (U.S. Department of Agriculture Soils Survey Geographic Database [USDA SSURGO] 2001); most of the project area is within “Fill Land, mixed” (FL) land, with the northernmost portion within “Makiki clay loam, 0 to 2 percent slopes” (MkA) soils

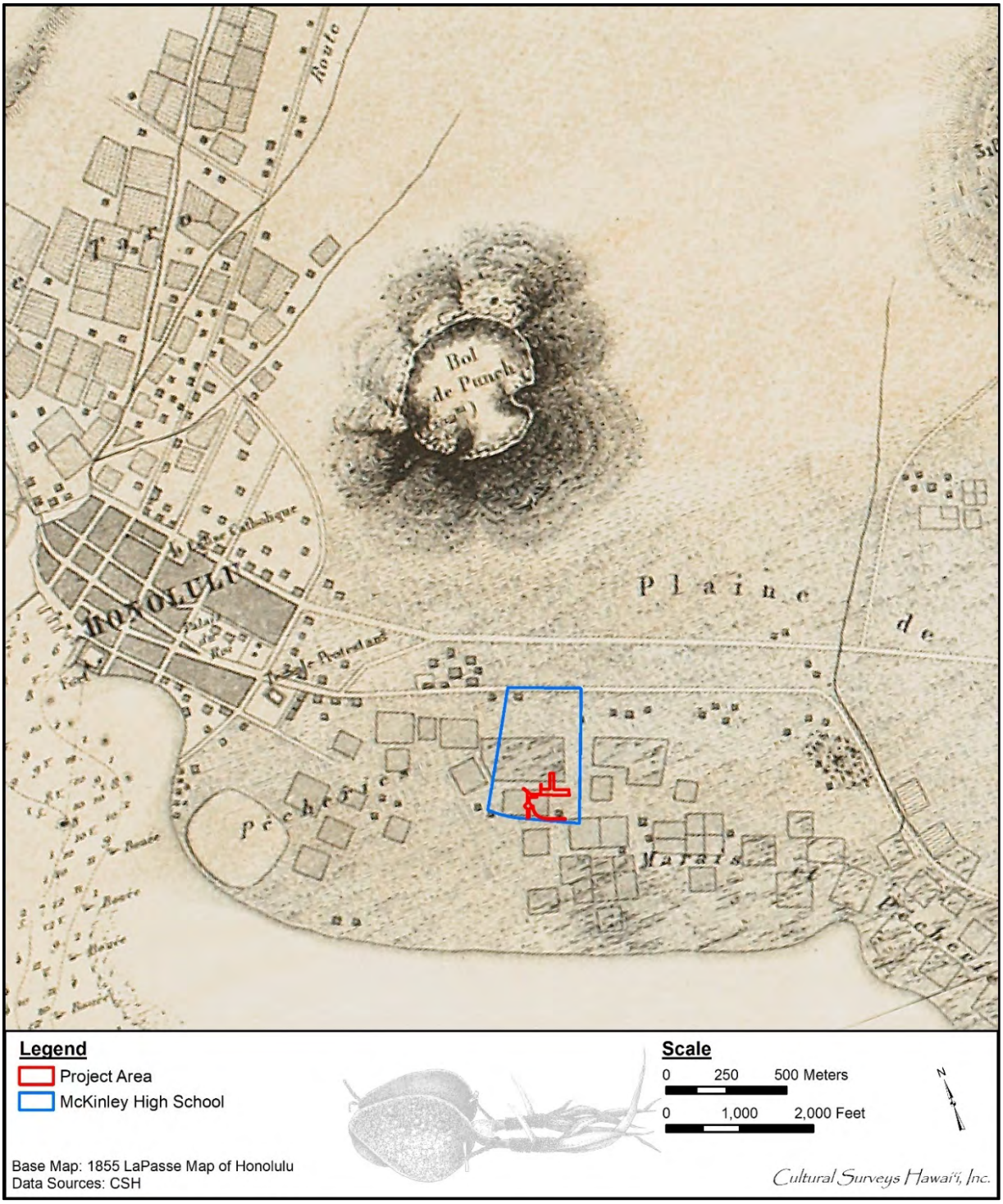


Figure 7. 1855 LaPasse map of Honolulu showing the location of McKinley High School and the project area in an area of agricultural fields and scattered houses

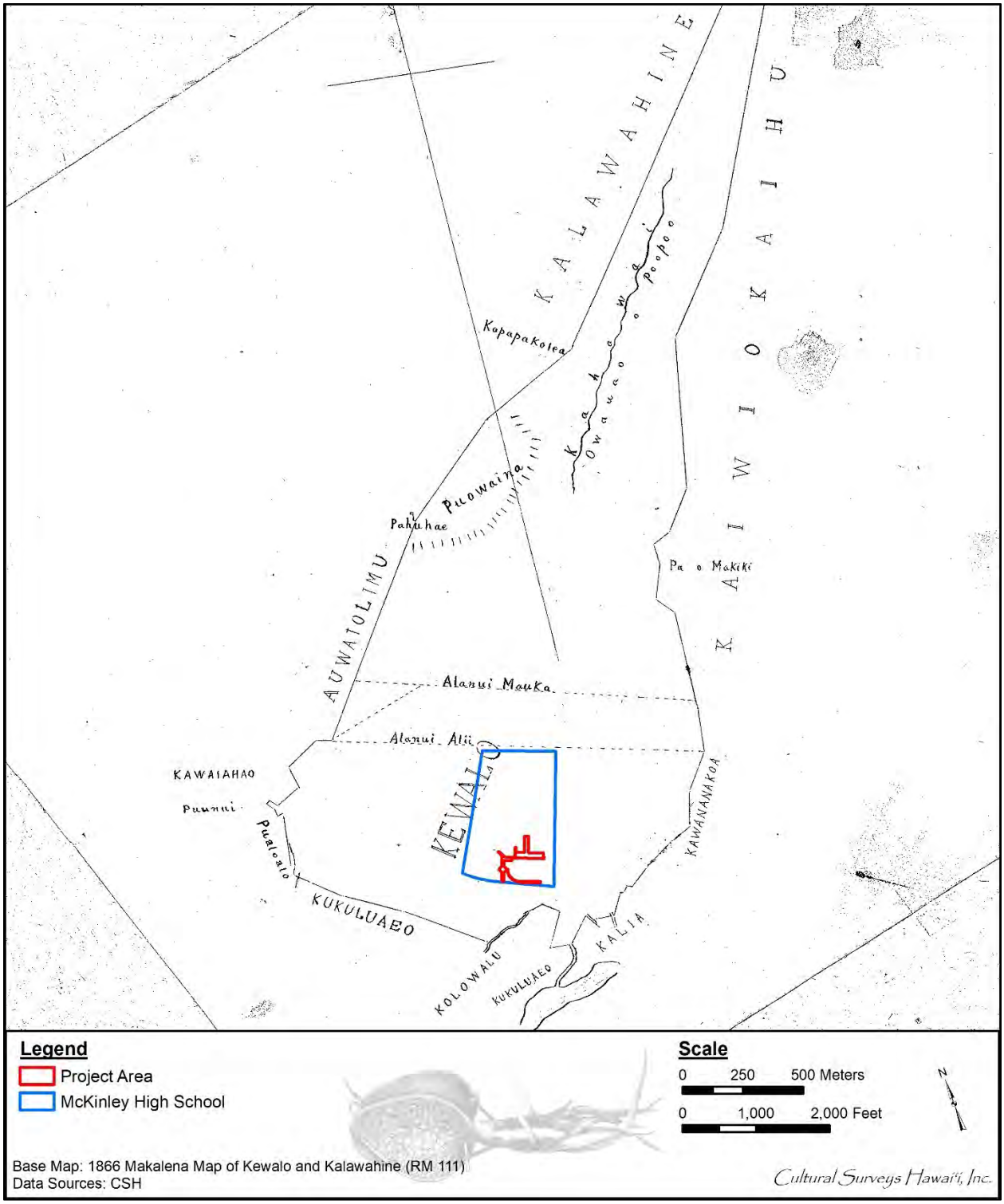


Figure 8. 1866 Makalena map of Kewalo and Kalawahine (RM 111) showing the location of McKinley High School and the project area as within the *‘ili* of “KEWALO” and just *makai* of a main trail (“Alanui Alii”)

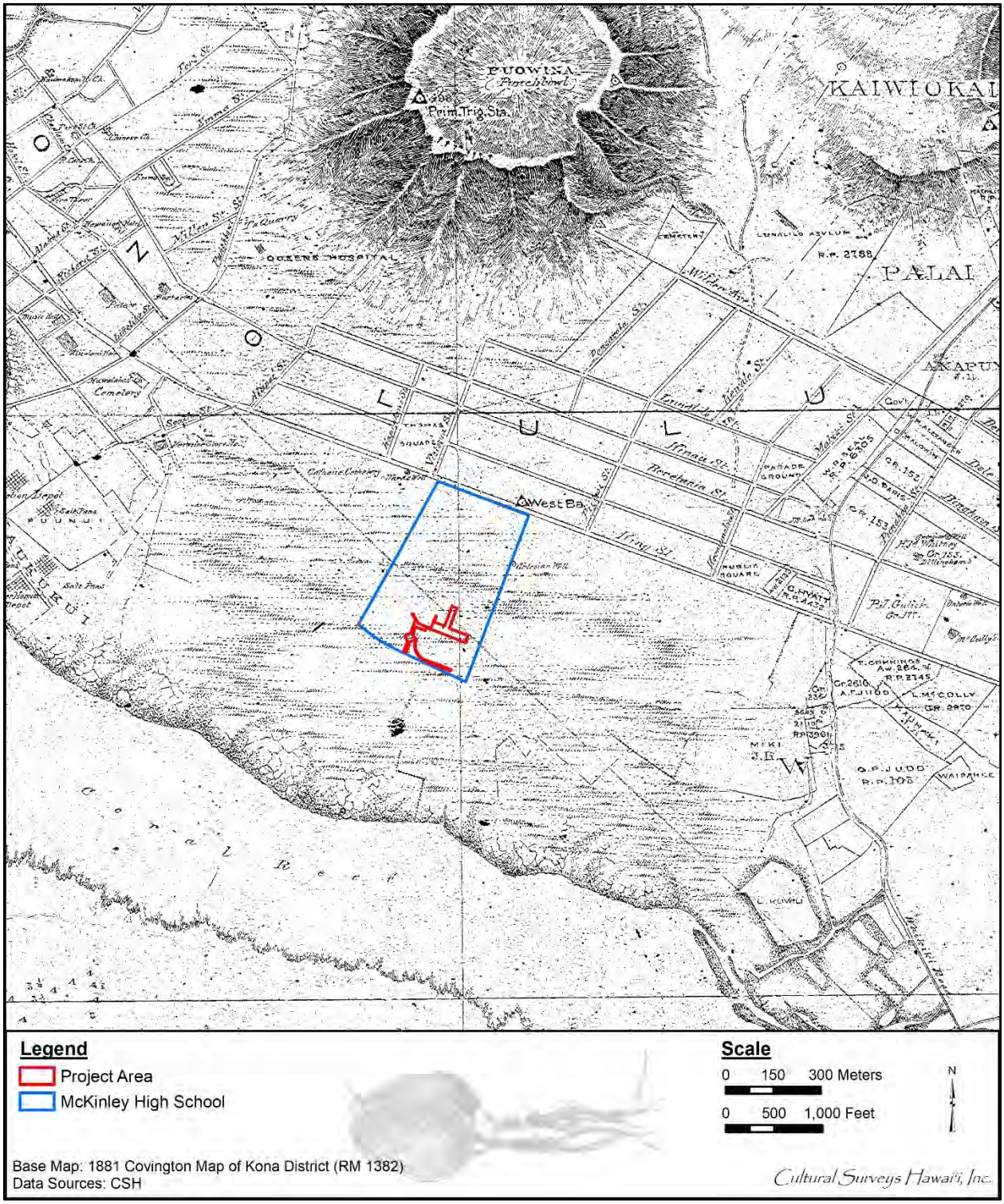


Figure 9. 1881 Covington map of Kona District (RM 1382) showing the location of McKinley High School and the project area as undeveloped marsh

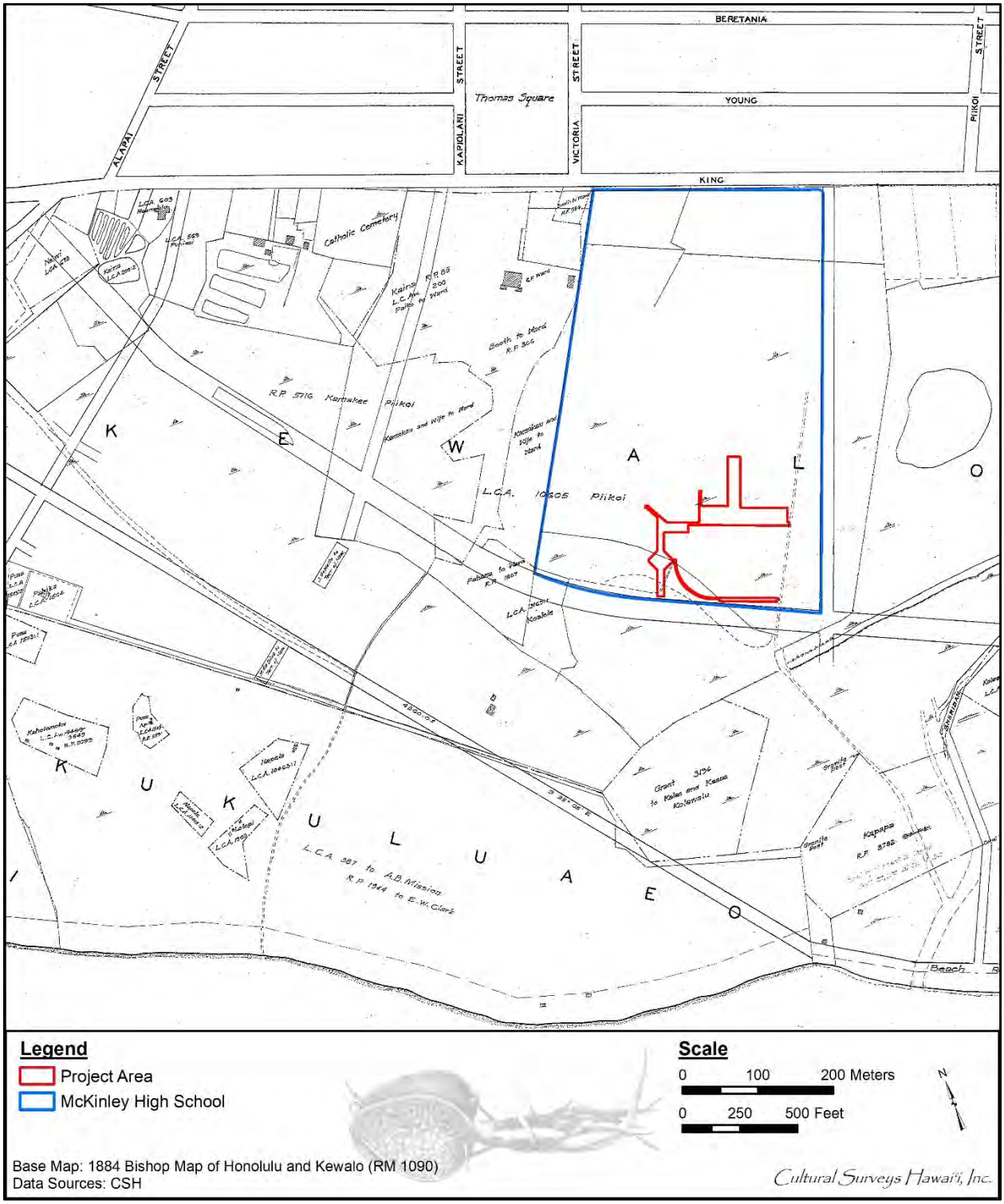


Figure 10. 1884 S.E. Bishop map of Honolulu and Kewalo Section (portion) (RM 1090) showing the location of McKinley High School and the project area within marshy lands within LCA 10605 to Jonah Pi‘ikoi in the *‘ili* of Kewalo

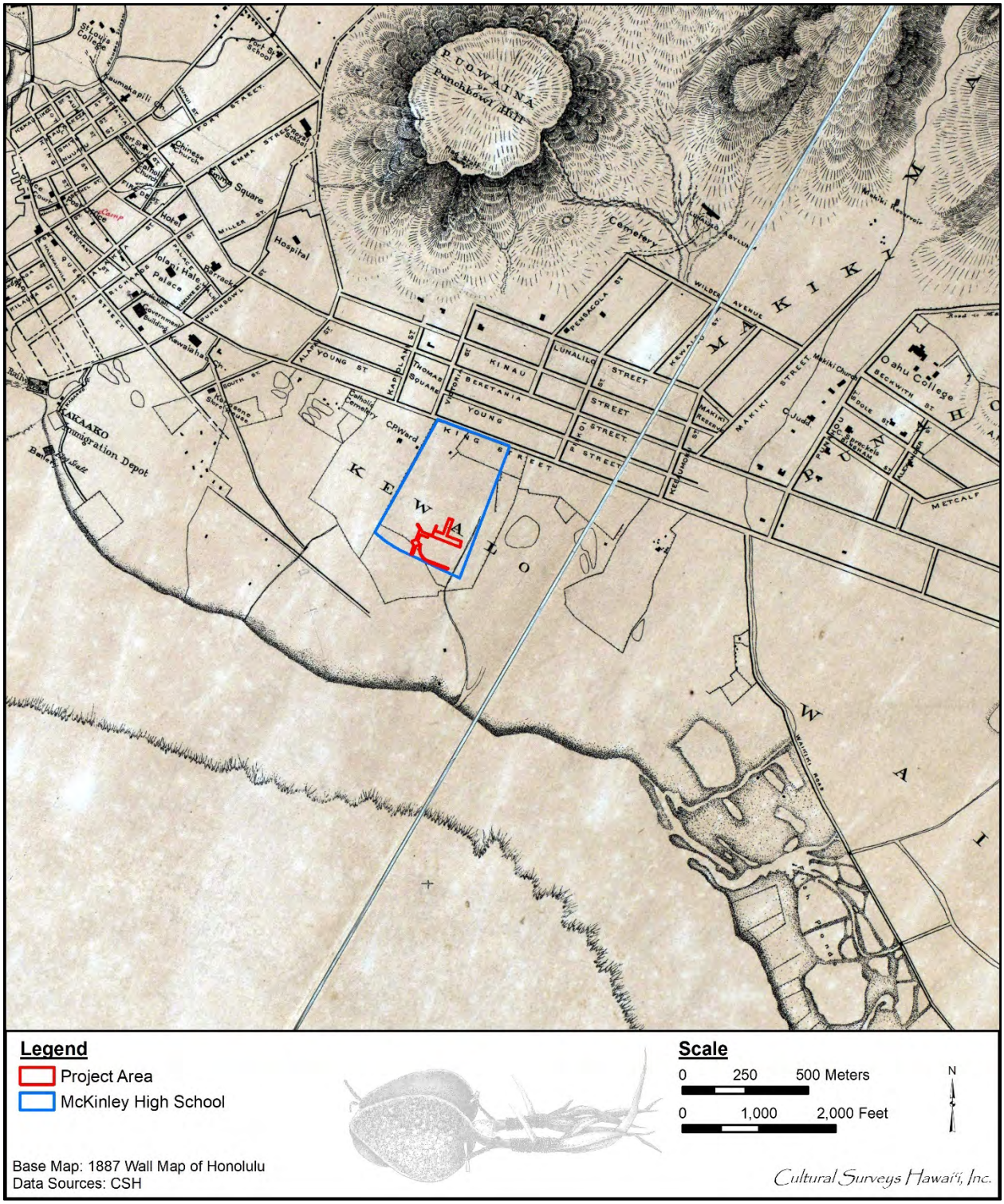


Figure 11. 1887 Wall map of Honolulu showing the location of McKinley High School and the project area within undeveloped lands; possible draining channels are visible originating within the *makai* portion of the McKinley High School campus area

Figure 12. 1888 photograph of fence on east side of Ward Estate; the land in the background is the future location of the project area and the *makai* portion of McKinley High School (Catherine Isobel Hustace Collection; photograph reprinted in Hustace 2000:36)

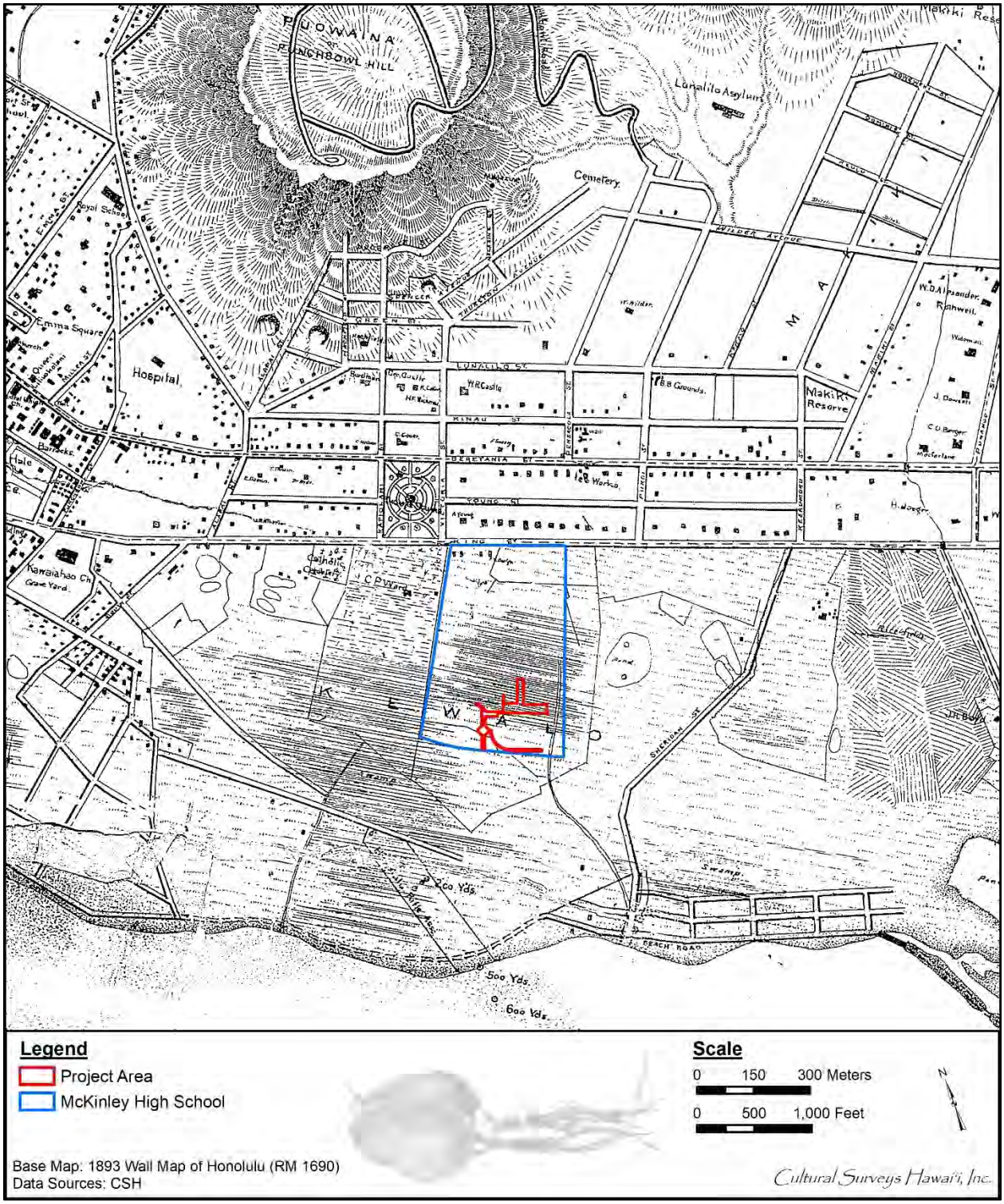


Figure 13. 1893 Wall map of Honolulu (RM 1690) showing the location of McKinley High School and the project area as within undeveloped “swamp” land of Kewalo

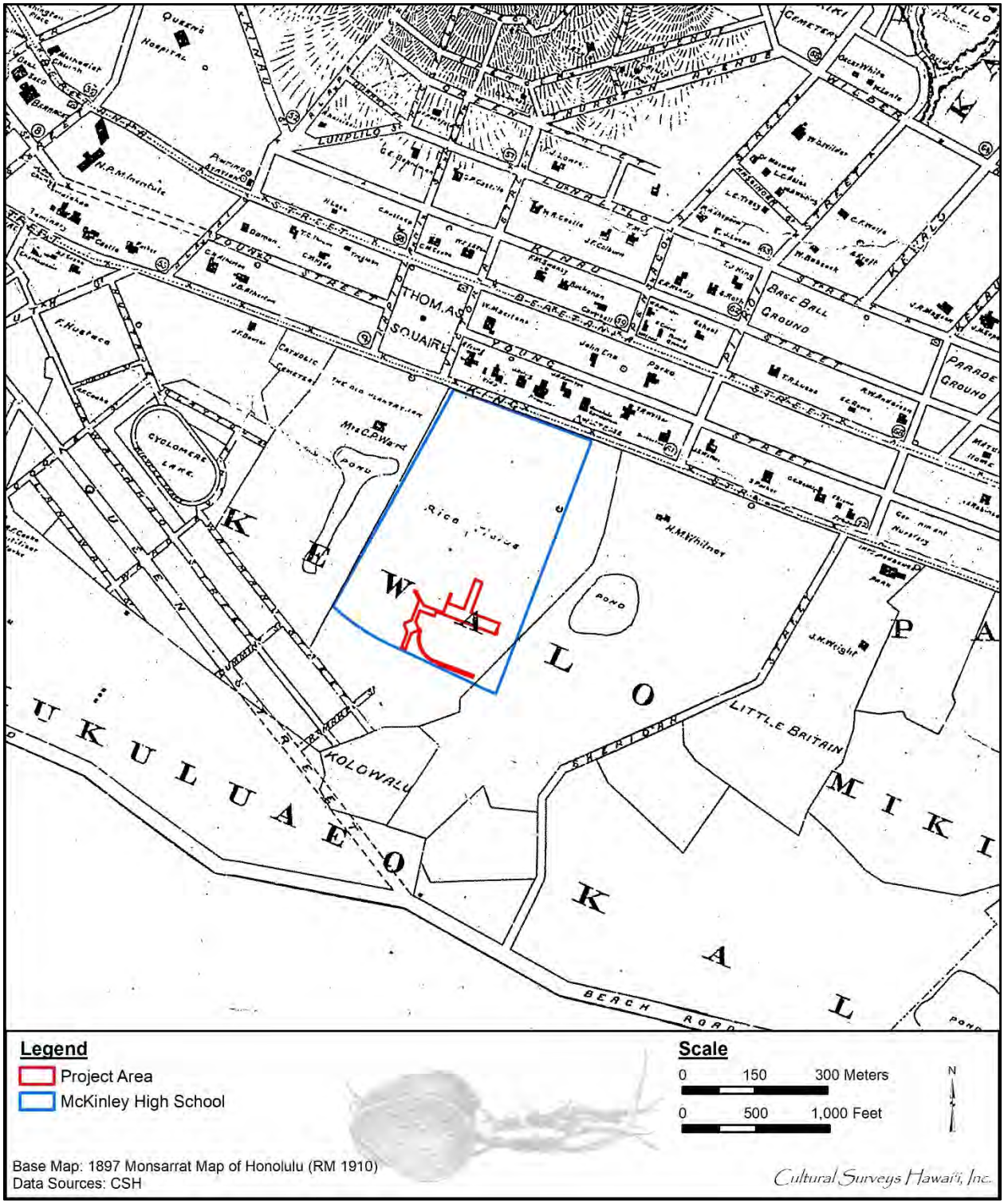


Figure 14. 1897 M.D. Monsarrat map of Honolulu (RM 1910) (portion) showing the location of McKinley High School and the project area with “Rice Fields” indicated in the central portion of the school campus

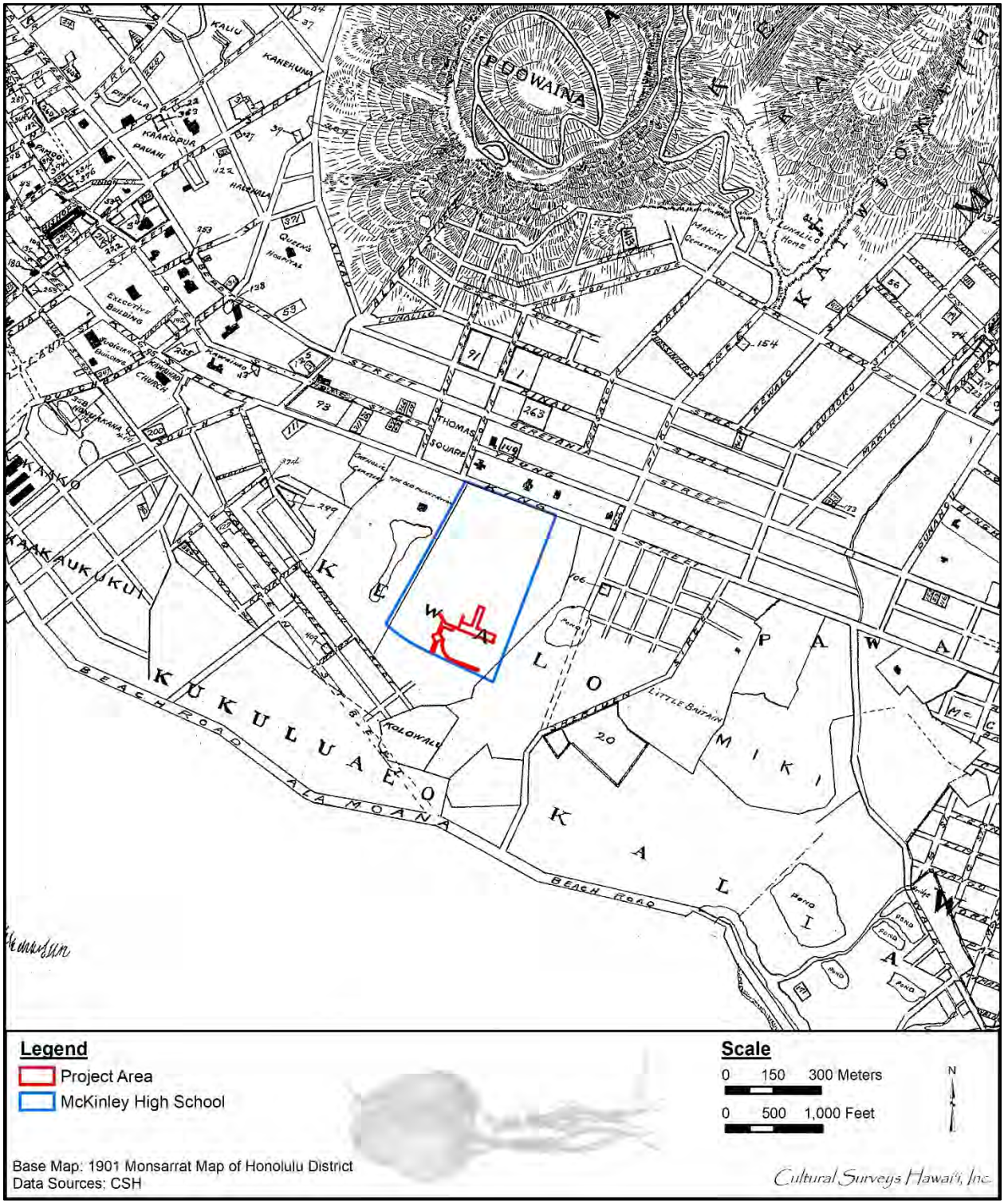


Figure 15. 1901 Monsarrat map of Honolulu District showing the location of McKinley High School and the project area as undeveloped, although land development is moving forward all around the future school campus

Figure 16. 1903 U.S. Engineers map of Kaka‘ako showing the location of McKinley High School and the project area as still remarkably undeveloped, at a time when the lands north of King Street are now well populated

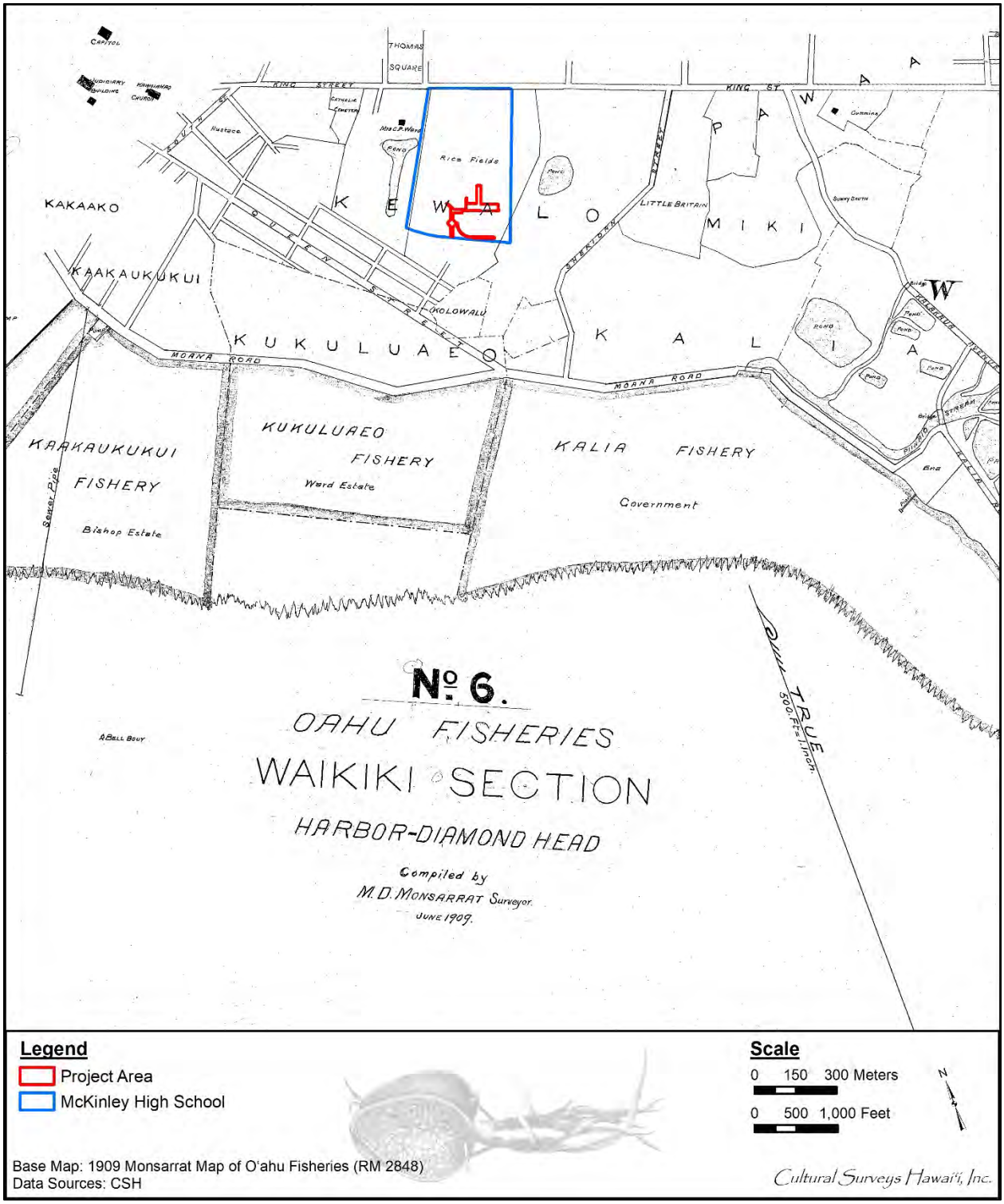


Figure 17. 1909 Monsarrat map of O‘ahu Fisheries (RM 2848) showing the location of McKinley High School and the project area within undeveloped lands of Kewalo with “Rice Fields” prominent in the central portion of the future campus

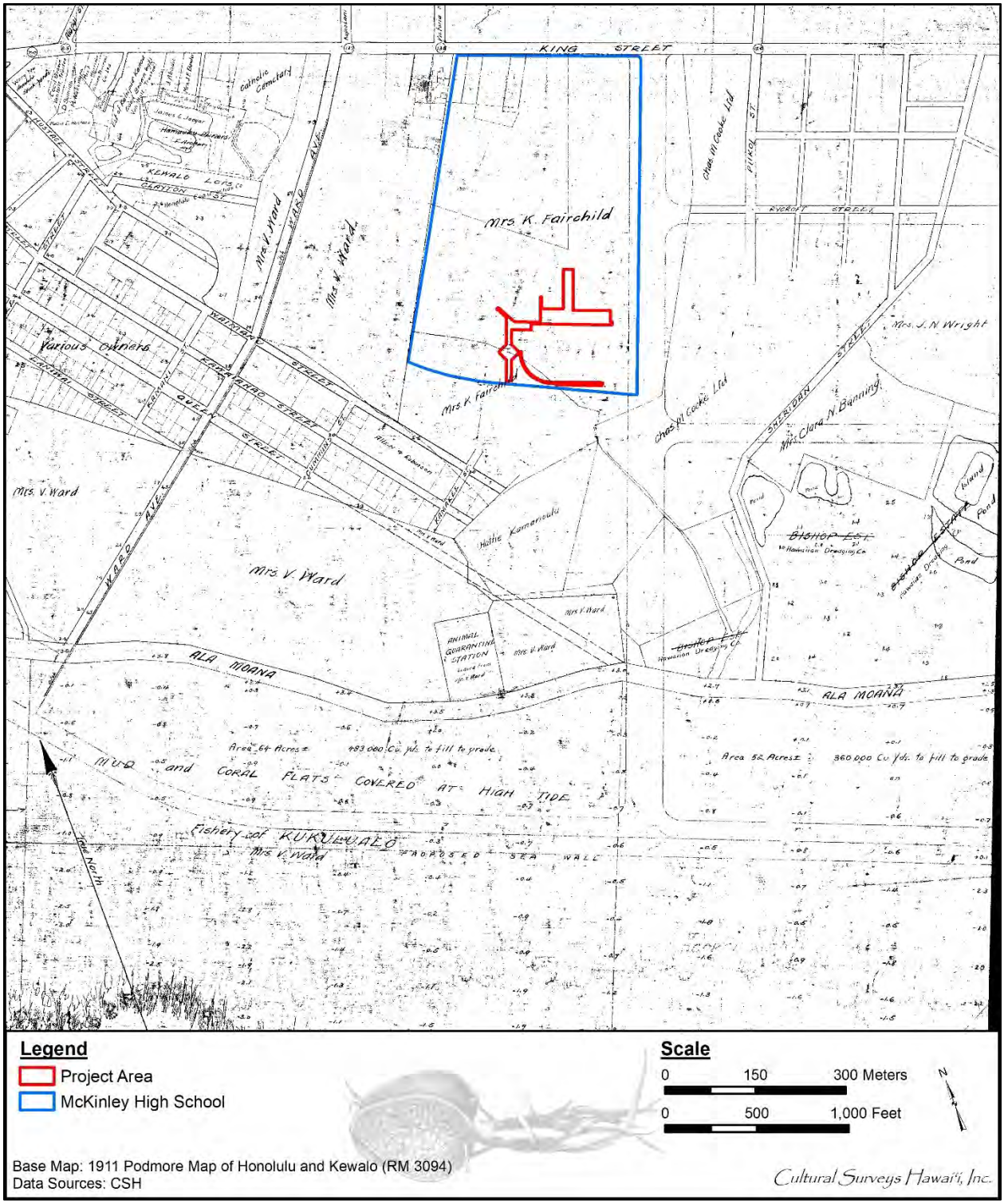


Figure 18. 1911 Podmore map of Honolulu and Kewalo (RM 3094) showing the location of McKinley High School and the project area as within undeveloped lands owned by Mrs. K. Fairchild

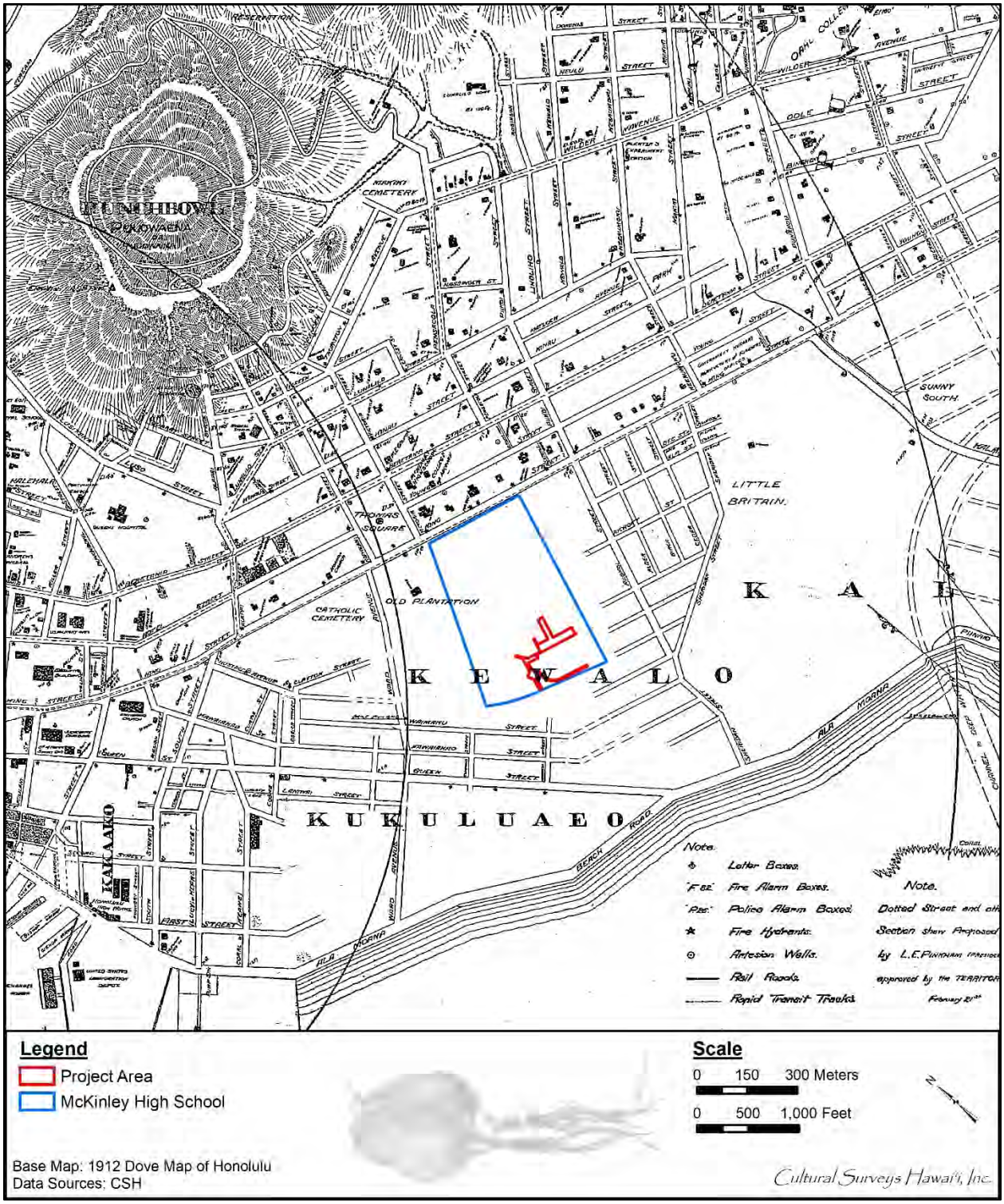


Figure 19. 1912 Dove map of Honolulu (portion) showing the location of McKinley High School and the project area within undeveloped lands of Kewalo, now almost encircled by roads and houses

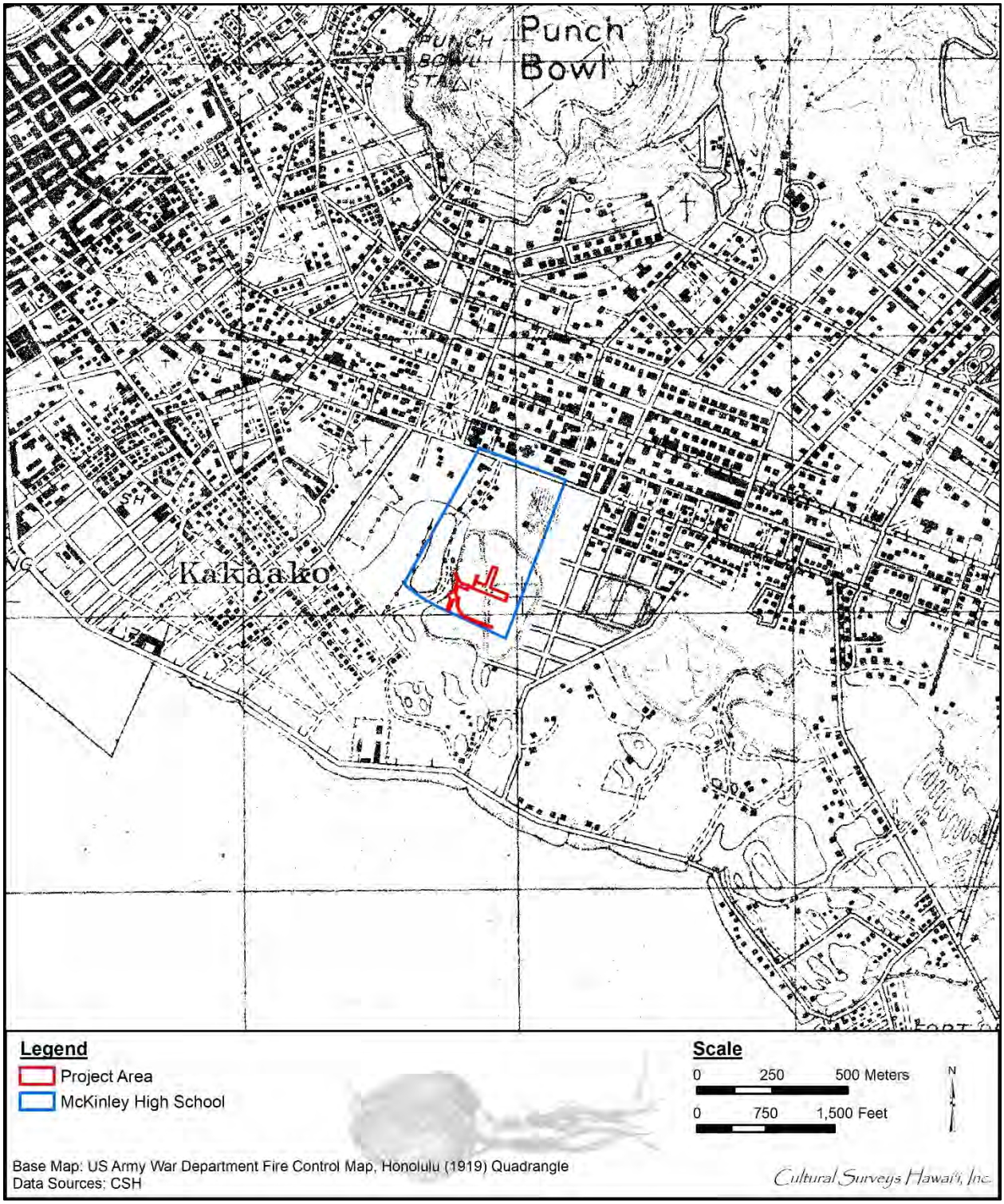


Figure 20. 1919 U.S. Army War Department fire control map, Honolulu quadrangle (portion) showing the location of McKinley High School and the project area within and surrounded by ponds; an unimproved road and seven houses are now indicated in the northwest portion of the future school campus

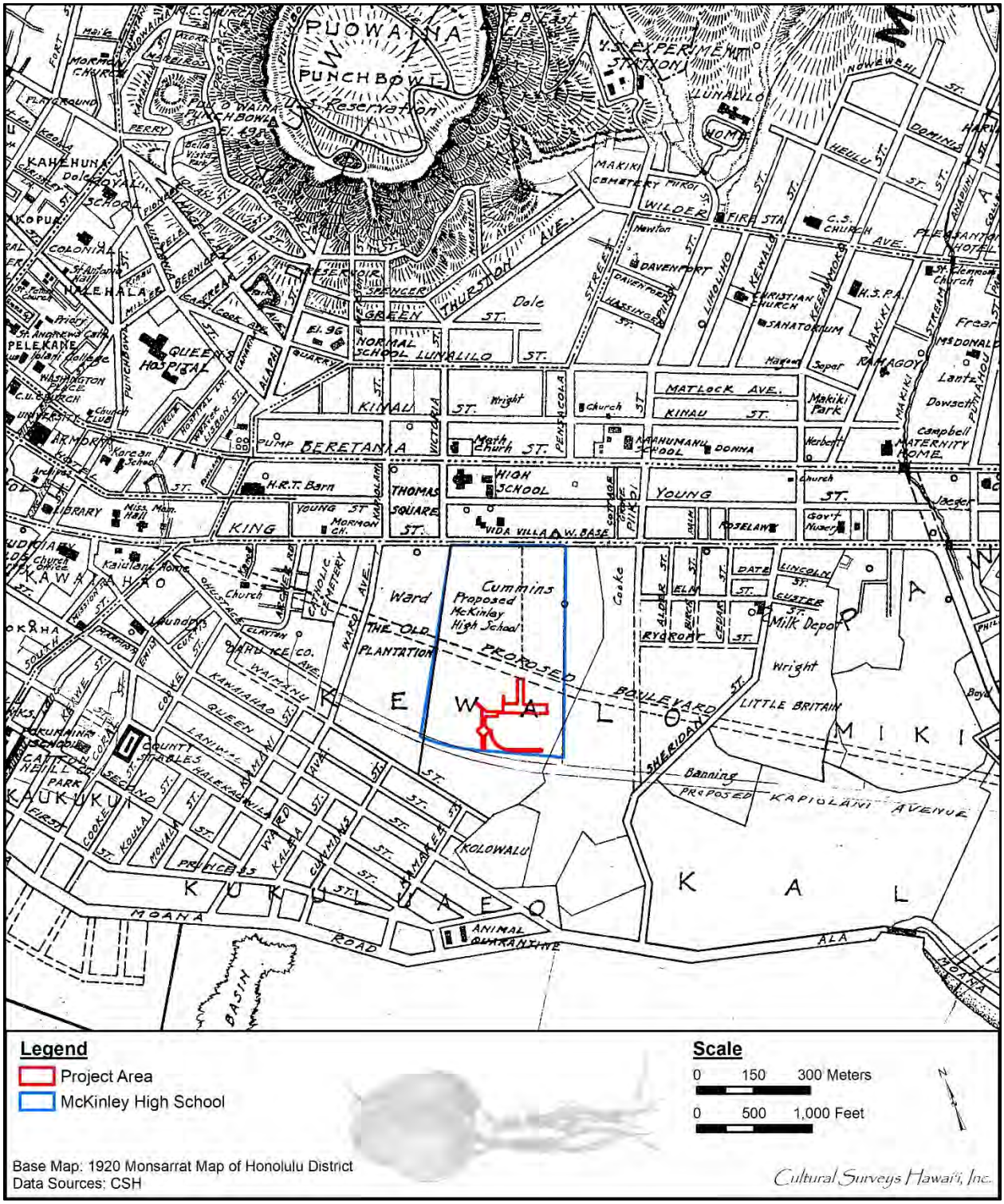


Figure 21. 1920 Monsarrat map of Honolulu District showing the location of McKinley High School and the project area within undeveloped lands owned by Cummins and as a “Proposed McKinley High School” bounded on the south by a “Proposed Kapiolani Avenue”

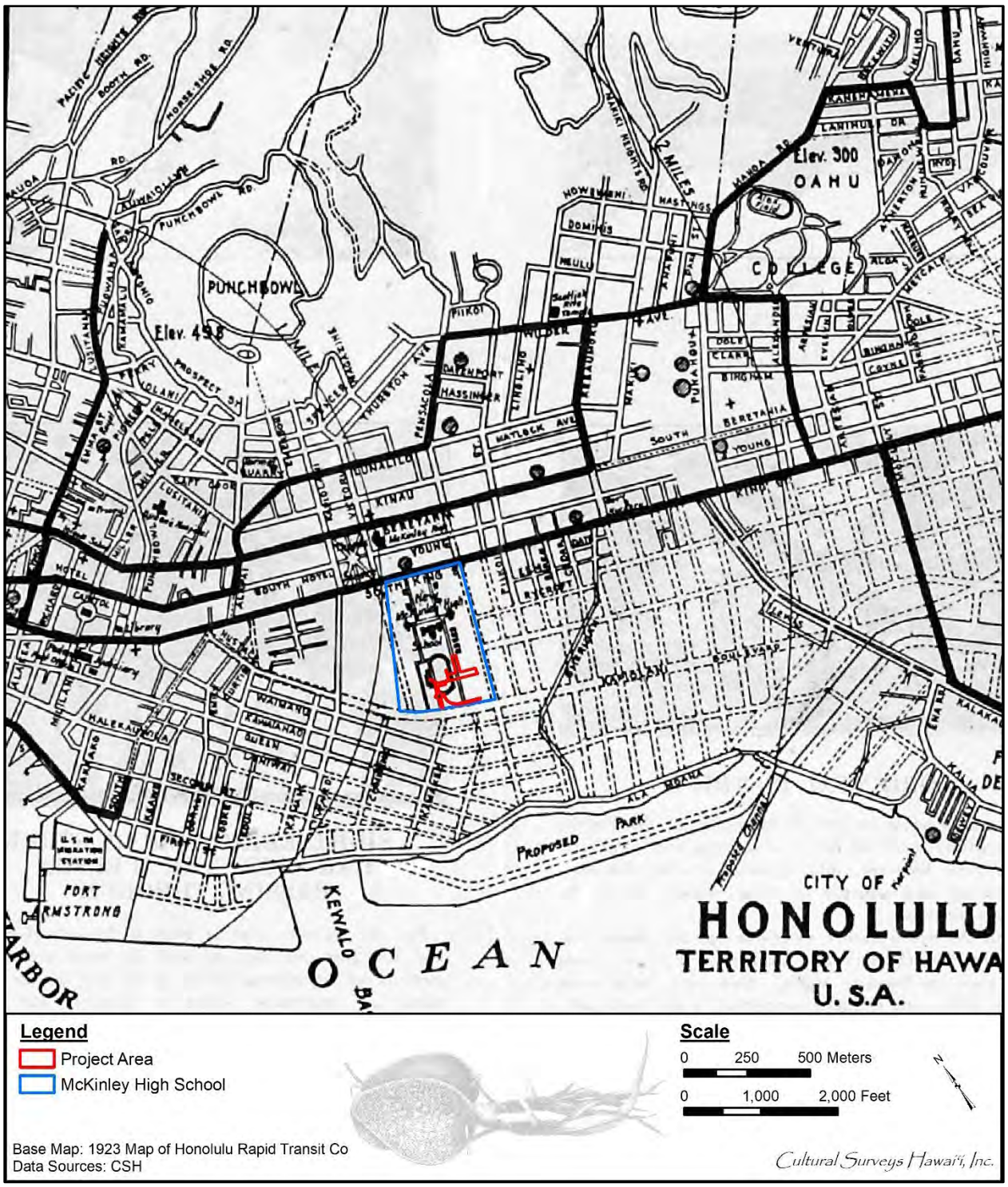


Figure 22. 1923 Honolulu Rapid Transit Company map showing the location of McKinley High School and the project area; the “New McKinley High School” has been substantially built up in the north/central portion of the campus with an oval track with a *mauka*/*makai* axis indicated in the present project area just north of a sketched in Kapi‘olani Boulevard

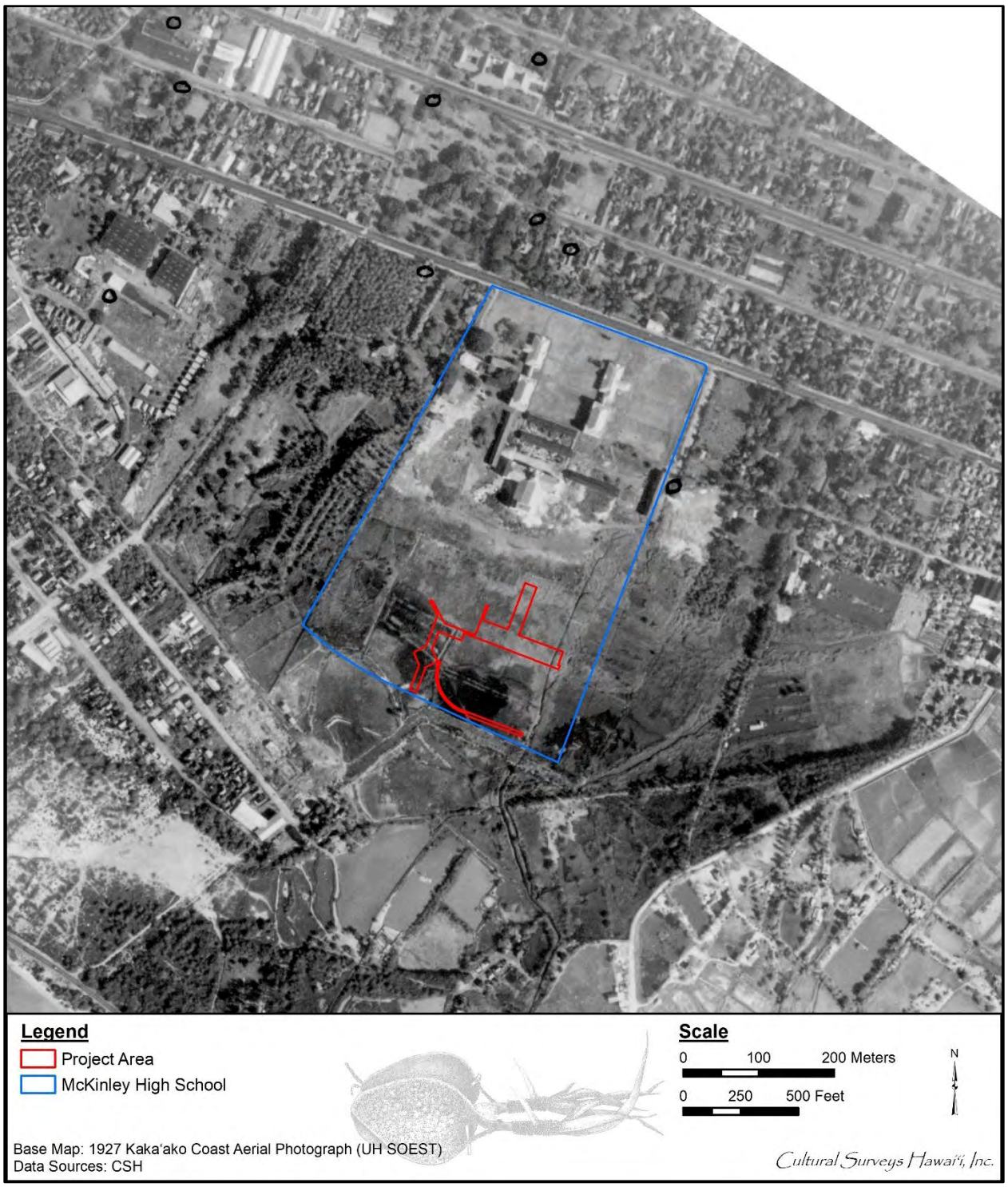


Figure 23. 1927 aerial photograph showing the location of McKinley High School and the project area (UH SOEST); note old partitioned rice fields in the southwestern corner of the campus. The *makai* portion of the campus appears undeveloped and there is no indication of a road at the Kapi‘olani Boulevard alignment that had been proposed seven years earlier.

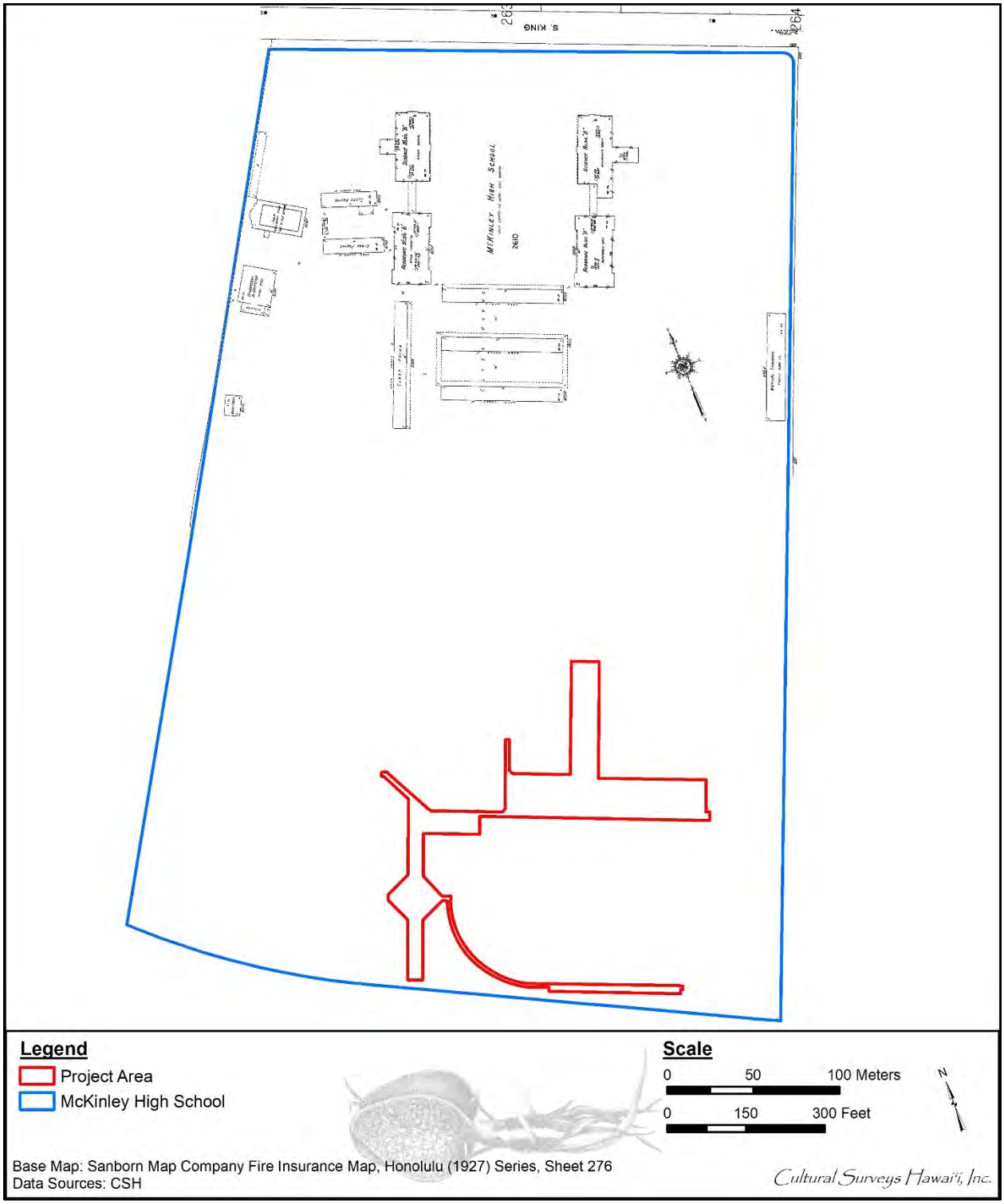


Figure 24. 1927 Sanborn Map Company fire insurance map, Honolulu (1927) Series (Sheet 276), showing the location of McKinley High School and the project area; school construction is in the north central portion of the campus with no development indicated in the present project area

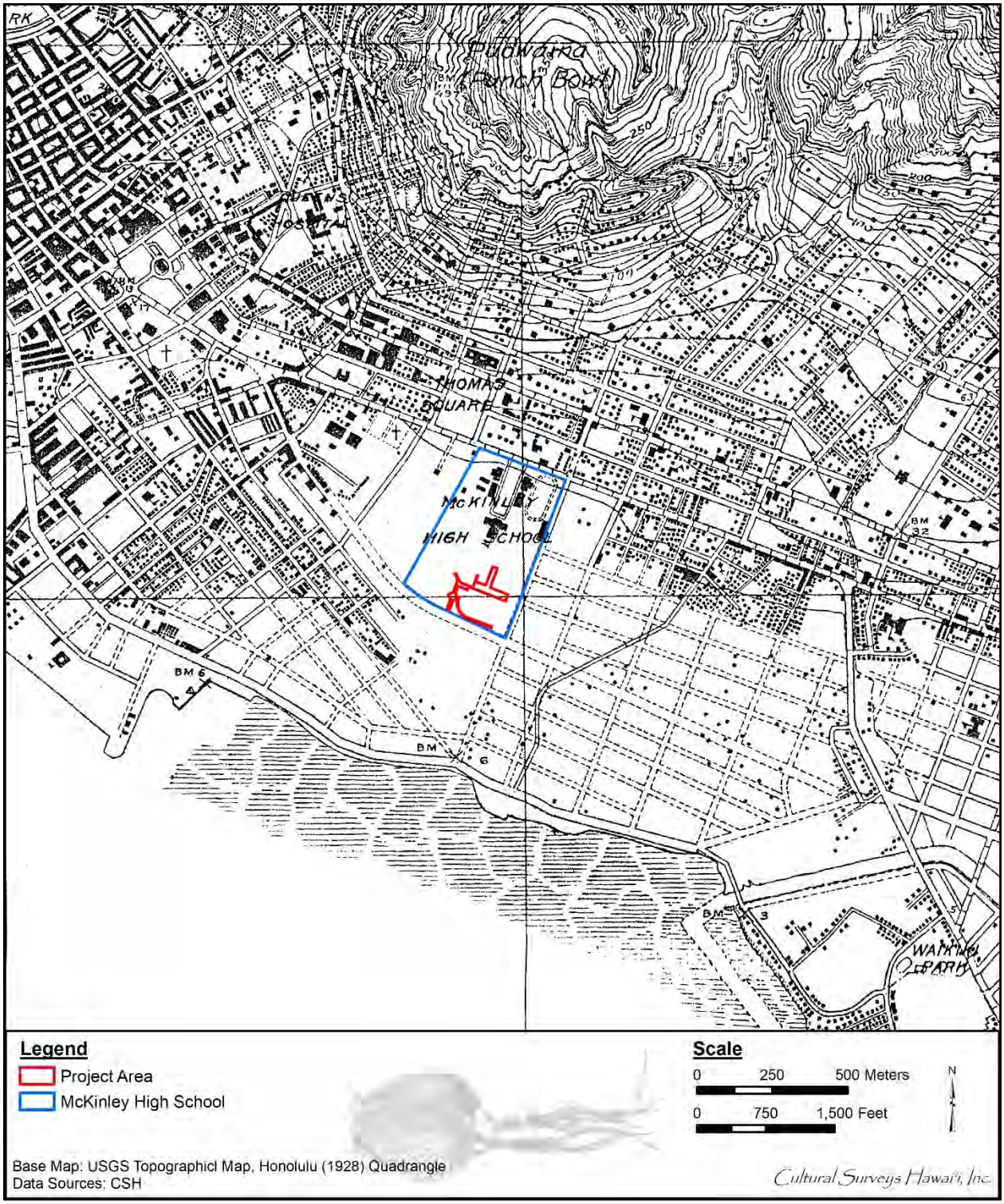


Figure 25. 1928 Honolulu USGS topographic quadrangle showing the location of McKinley High School and the project area; school construction is in the north central portion of the campus with no development indicated in the present project area adjacent to a still sketched in Kapi‘olani Boulevard alignment

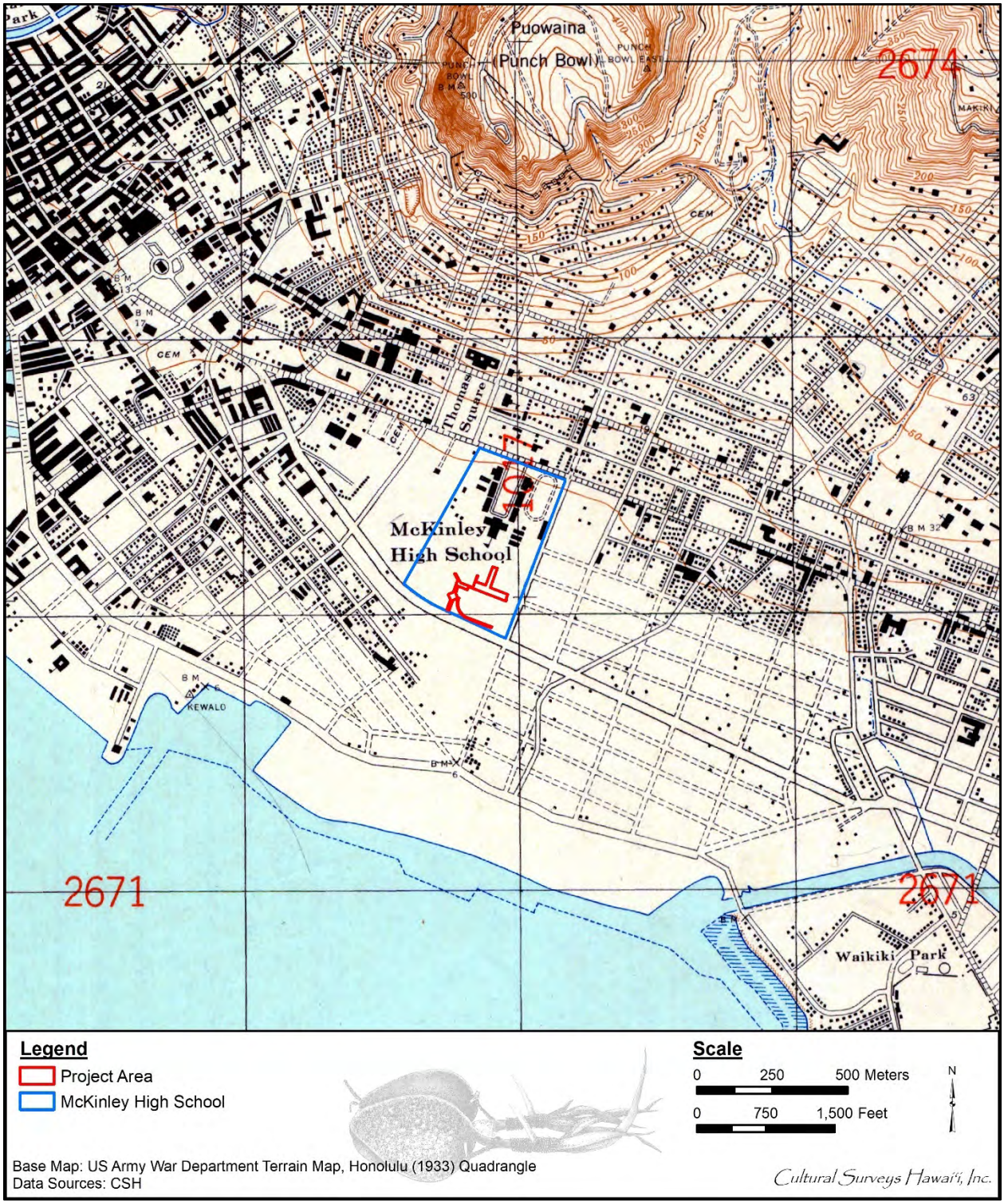


Figure 26. 1933 U.S. Army War Department terrain map, Honolulu quadrangle (portion) showing the location of the McKinley High School campus with newly expanded infrastructure and the project area as still undeveloped but now seemingly adjacent to a paved Kapi‘olani Boulevard

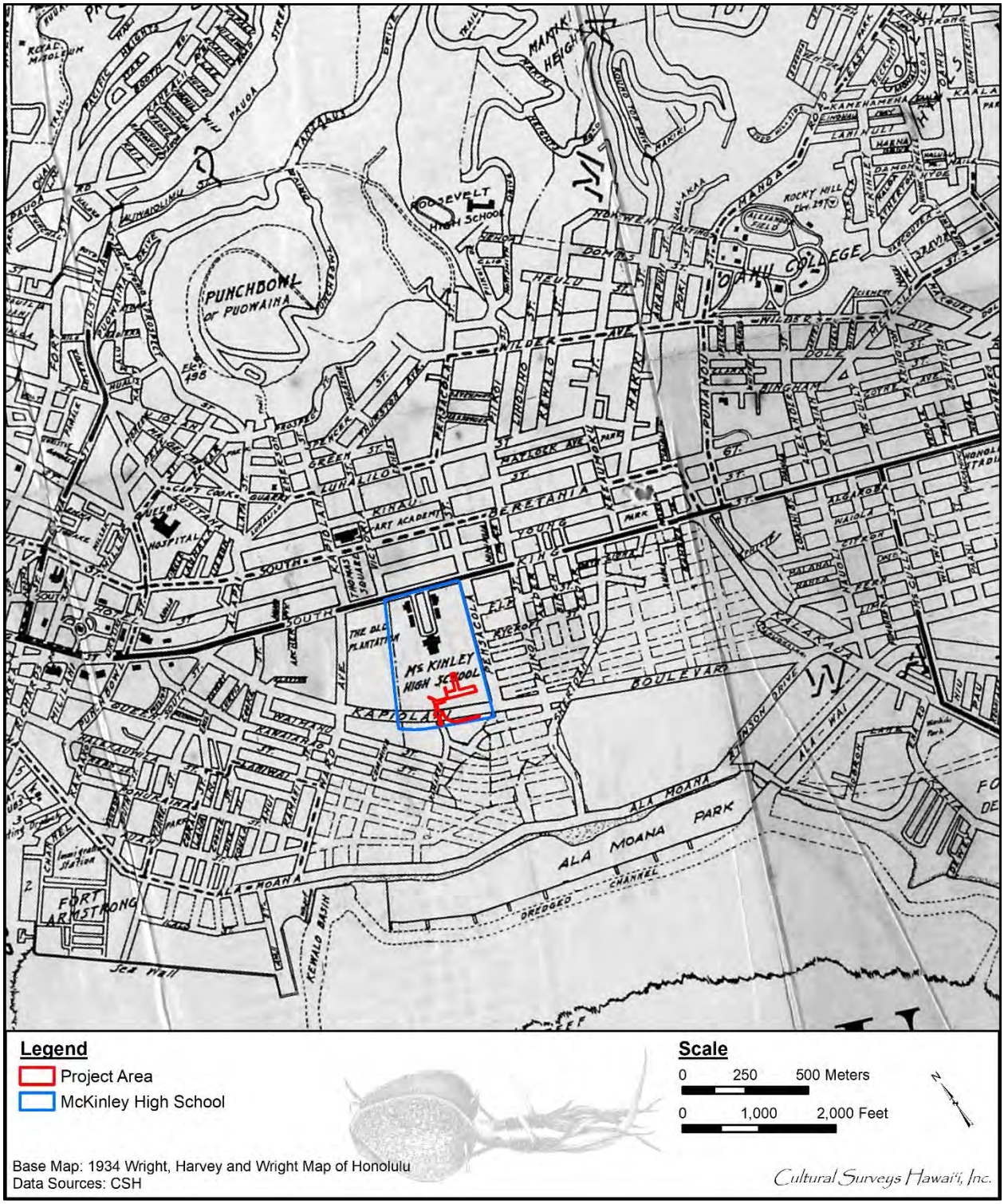


Figure 27. 1934 Wright, Harvey and Wright map of Honolulu showing the location of McKinley High School and the undeveloped project area adjacent to Kapi‘olani Boulevard which is shown as a major vehicular artery

Figure 28. 1938 photograph of McKinley High School Campus with an athletic field and an oval track with a *mauka*/*makai* axis indicated in the present project area just north of Kapi‘olani Boulevard (U.S. Army Museum-Hawai‘i)

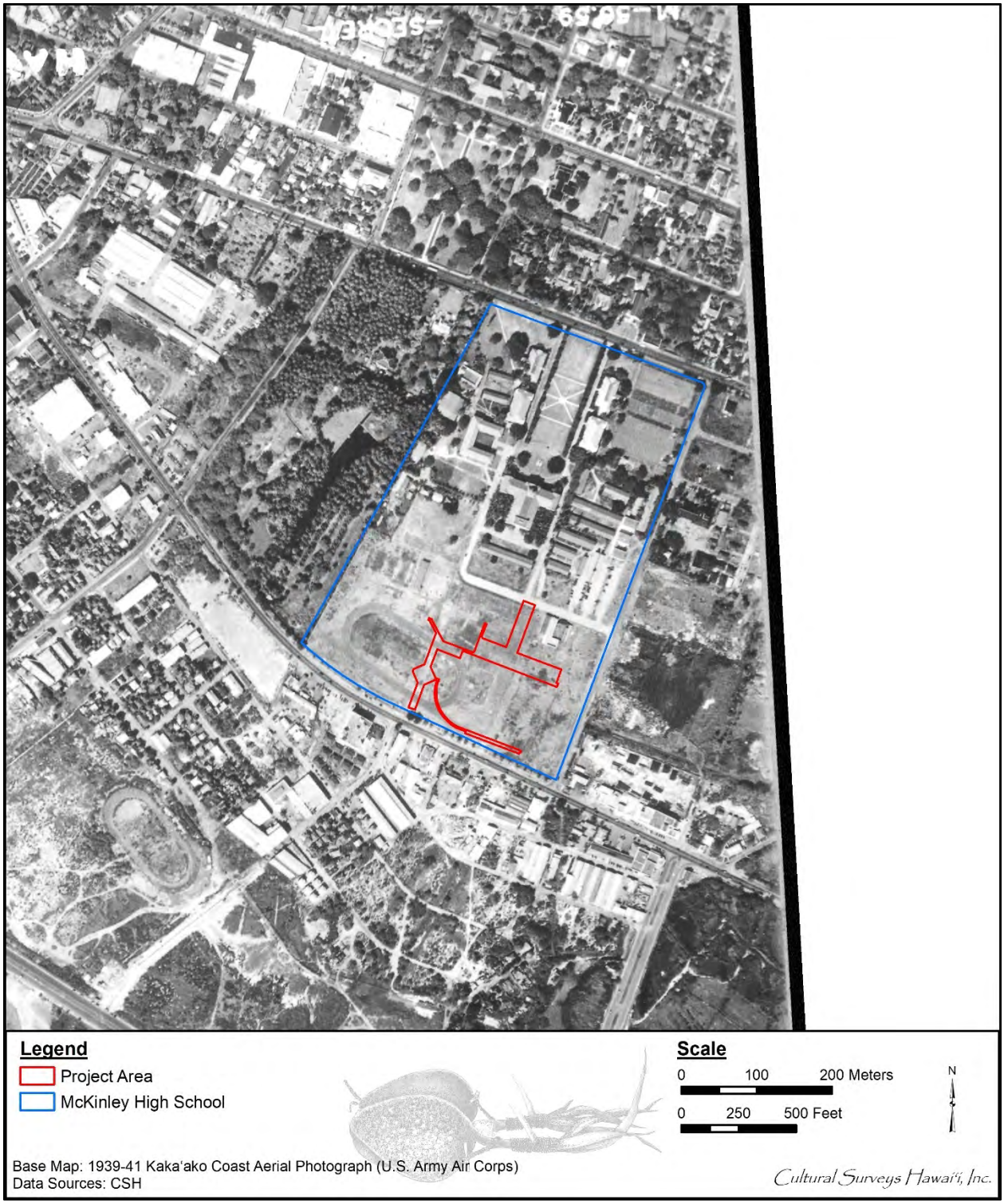


Figure 29. 1939-41 Kaka’ako Coast aerial photograph (U.S. Army Air Corps) showing the location of McKinley High School and the project area; an oval track (long axis roughly parallel to Kapi‘olani Boulevard) is shown in the southwest portion of the project area but no other development is indicated

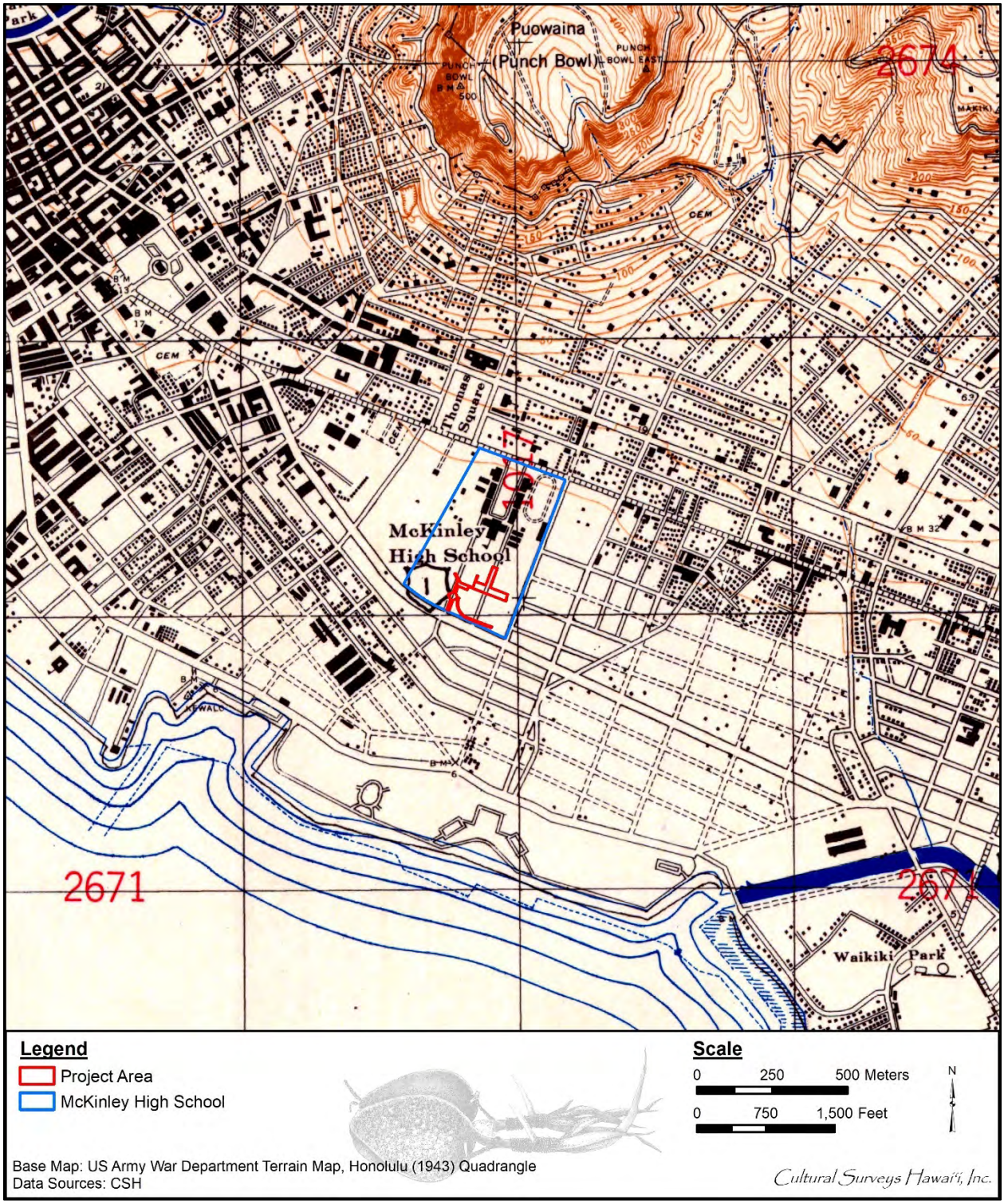


Figure 30. 1943 U.S. Army War Department terrain map, Honolulu quadrangle (portion), showing the location of McKinley High School, with the southeast portion (the location of the project area) as undeveloped; an oval track is shown on the northeast corner of the campus

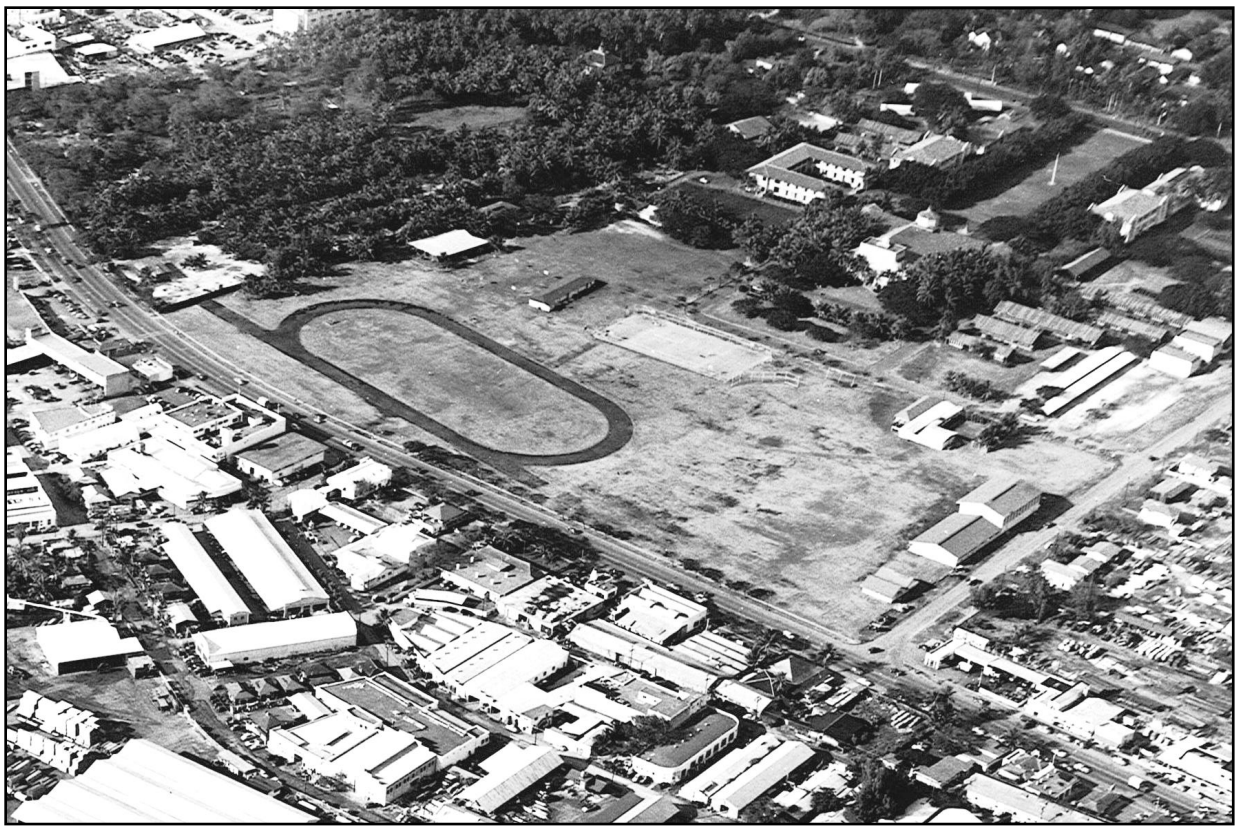

Figure 31. 1949 aerial photograph of McKinley High School with athletic field and track in the southwestern corner of the campus, roughly parallel to Kapi‘olani Boulevard (Hawai‘i State Archives); the south corner (location of the current project area) is undeveloped

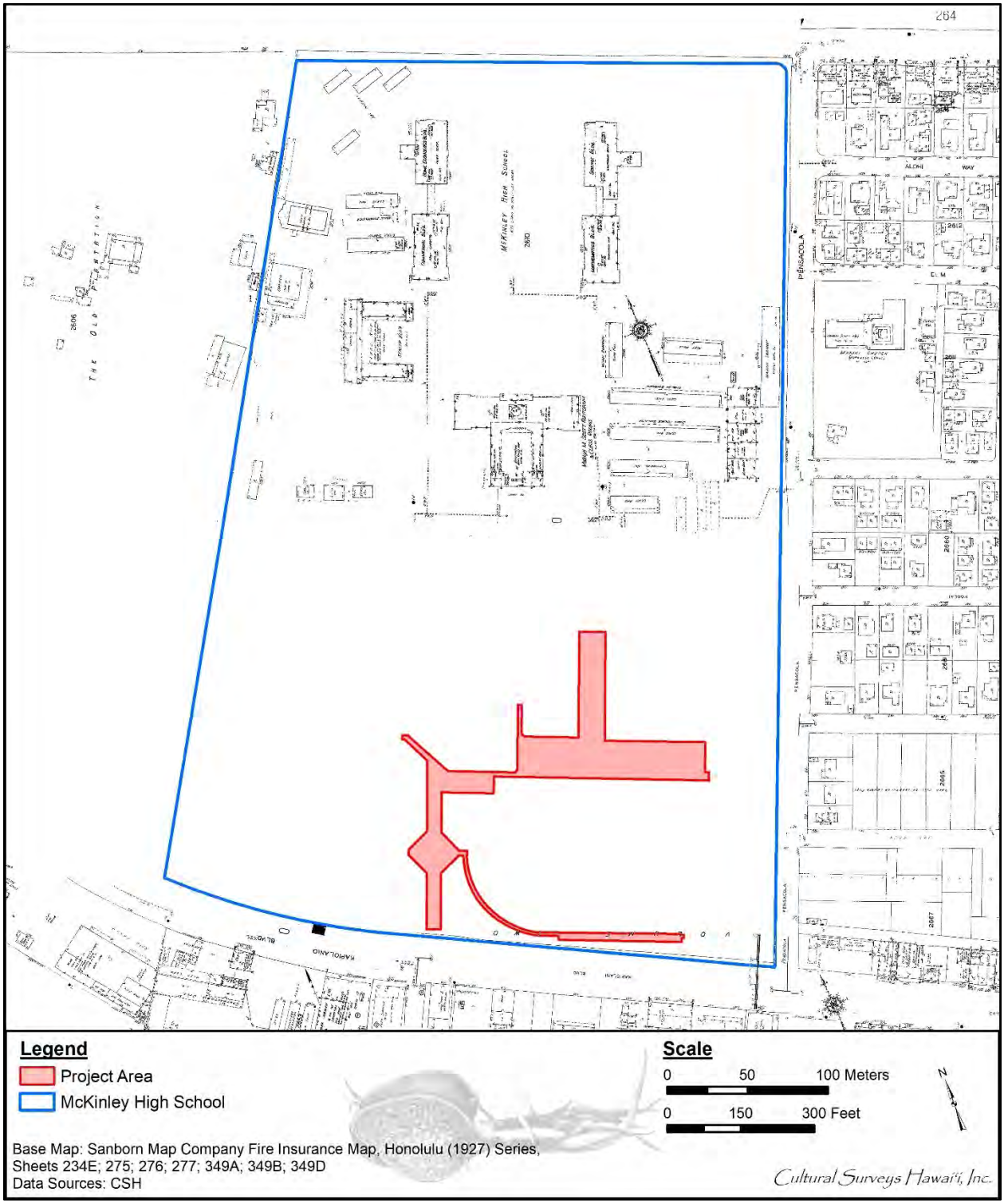


Figure 32. 1950 Sanborn Map Company fire insurance map, Honolulu (1927) Series (Sheets 234E, 275, 276, 277, 349A, 349B, and 349D), showing the location of the project area within McKinley High School as undeveloped

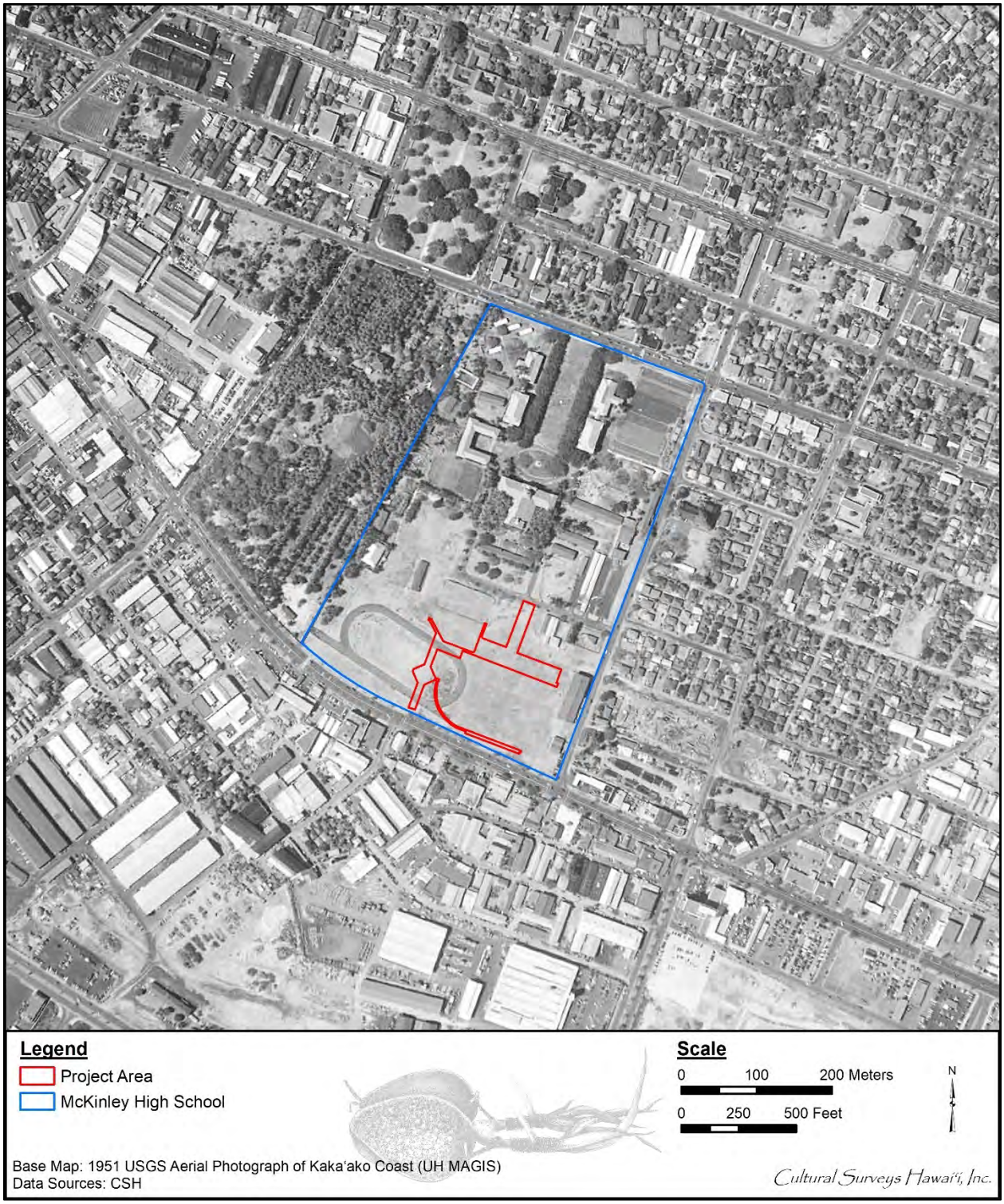


Figure 33. 1951 USGS Aerial photograph of Kaka‘ako Coast (UH MAGIS) showing McKinley High School campus (the northeastern two-thirds of which is now quite developed) and the project area which remains undeveloped except for the track in the southwest portion of the campus and athletic fields

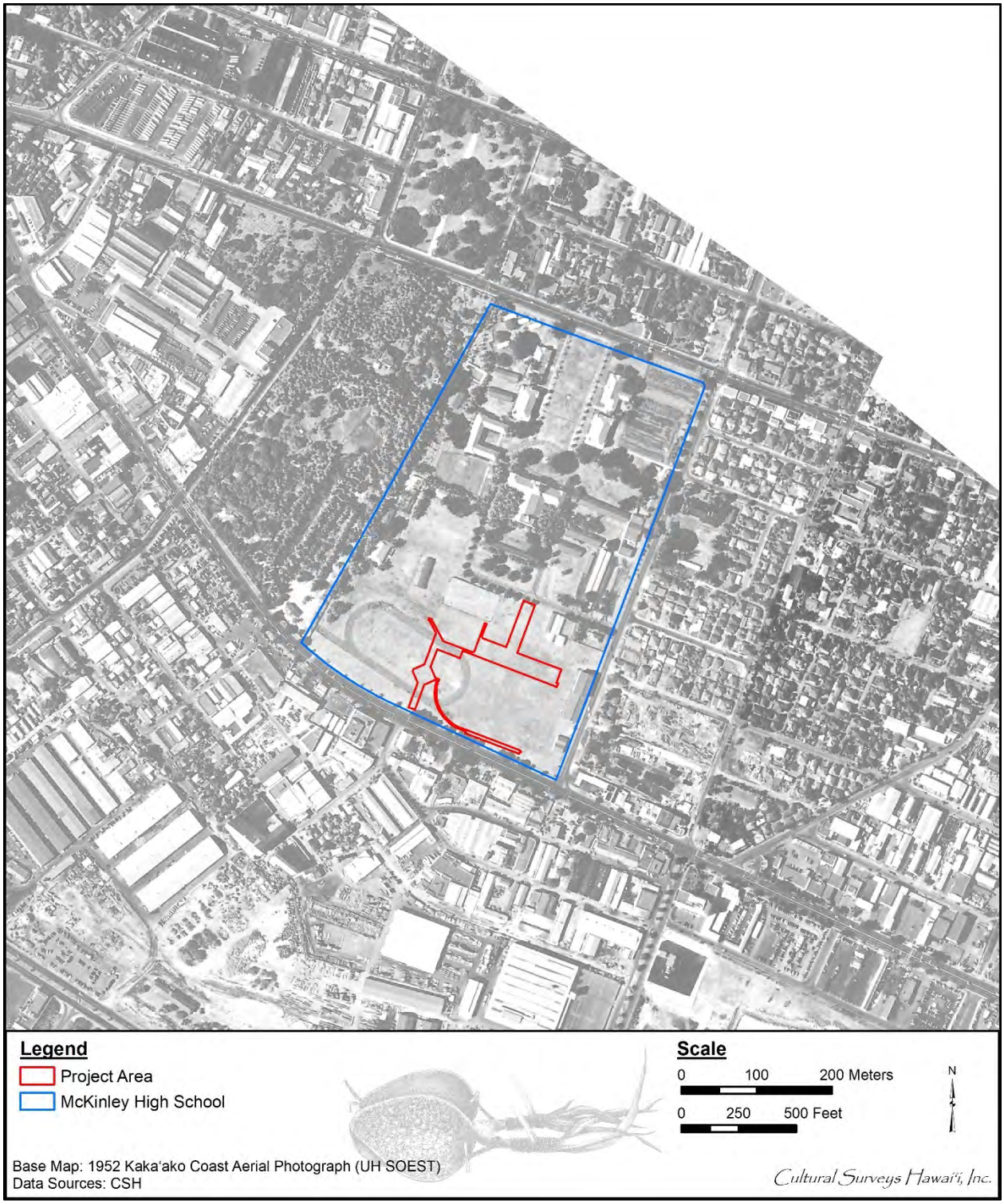


Figure 34. 1952 Kaka‘ako Coast aerial photograph (UH SOEST) showing the location of McKinley High School and the project area which remains undeveloped except for the track in the southwest portion of the campus and athletic fields

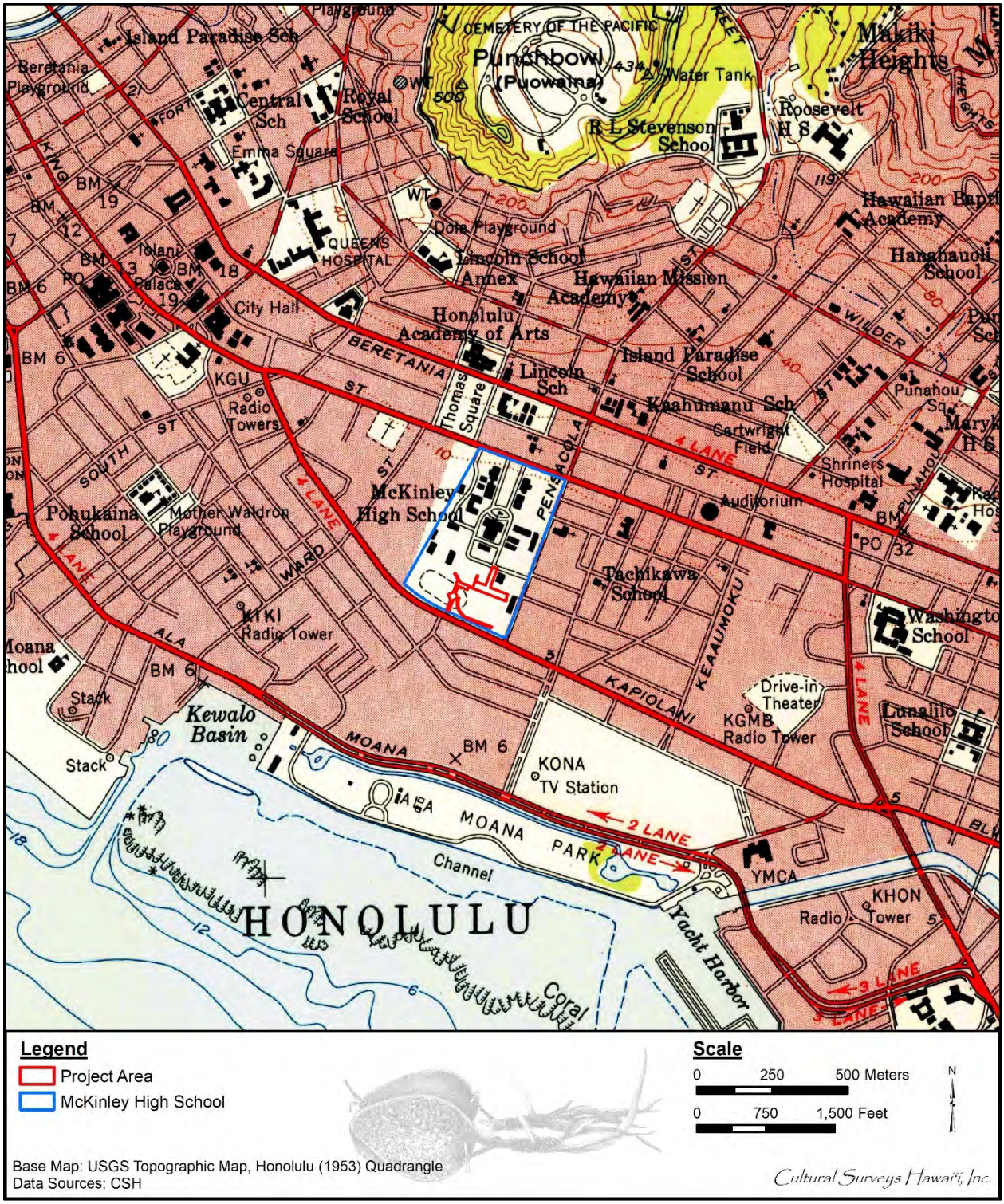


Figure 35. 1953 Honolulu USGS topographic quadrangle (portion) showing development of improved roads and building additions to McKinley High School; the project area remains undeveloped except for the track in the southwest portion of the campus and athletic fields

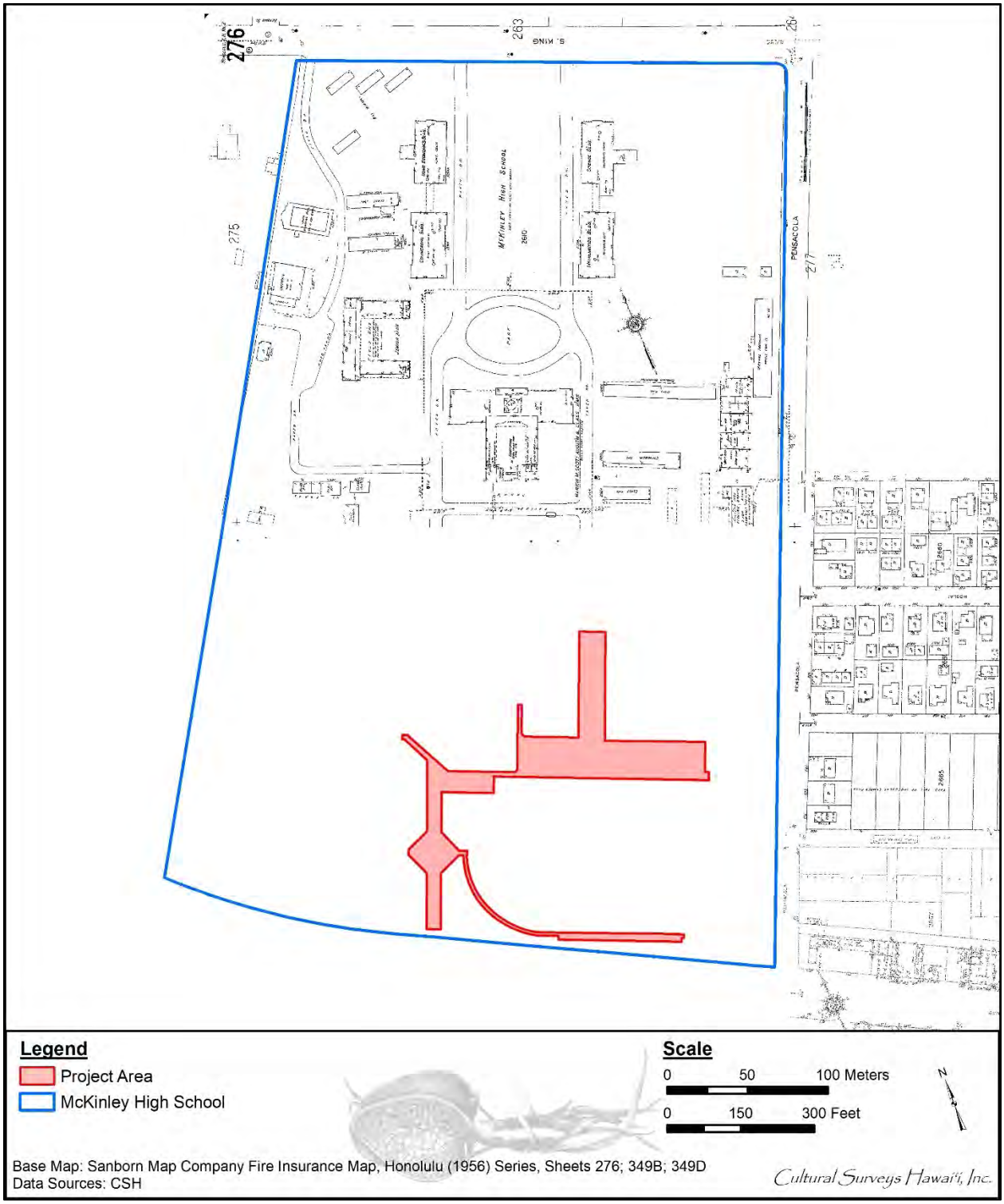


Figure 36. 1956 Sanborn Map Company fire insurance map, Honolulu (1956) Series (Sheets 276, 349B, and 349D), showing the location of McKinley High School and the undeveloped project area

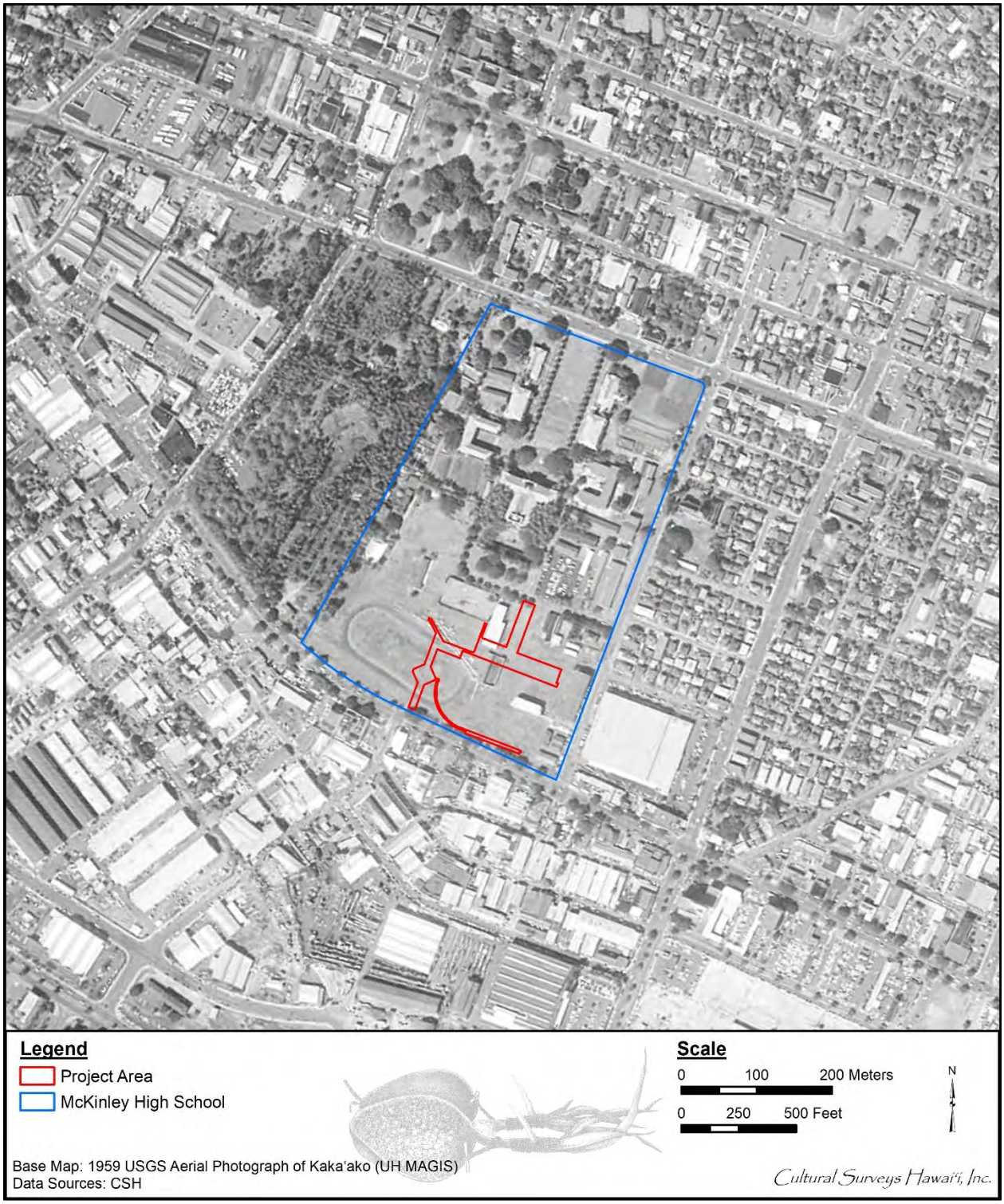


Figure 37. 1959 USGS aerial photograph of Kaka‘ako (UH MAGIS) showing the location of McKinley High School and the project area with a couple of new buildings indicated nearby, but one marginally within the project area (currently utilized as the Boys PE/Locker Room and Weight Room)

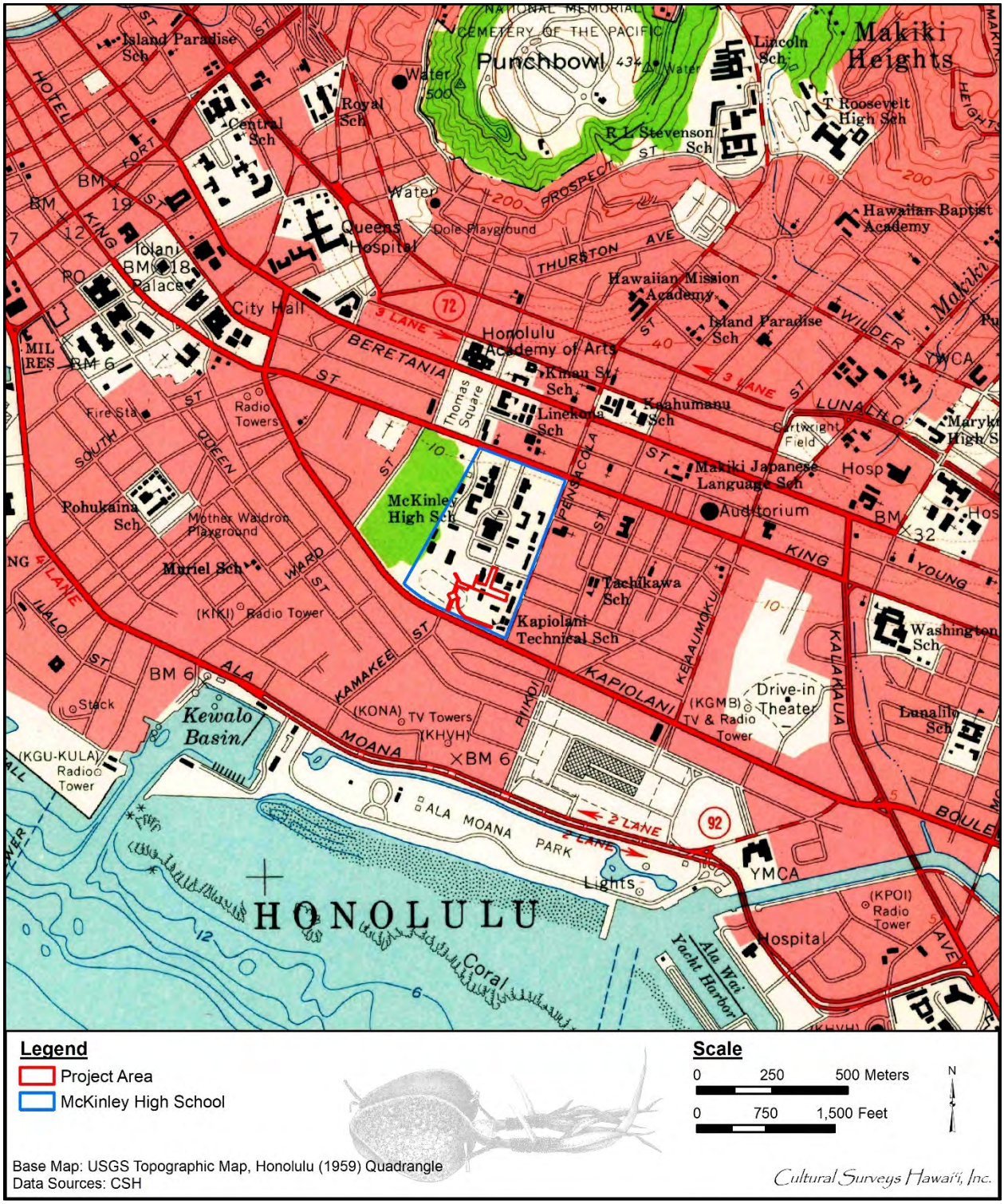


Figure 38. 1959 Honolulu USGS topographic quadrangle showing the location of McKinley High School; the project area is within the most undeveloped portion of the campus

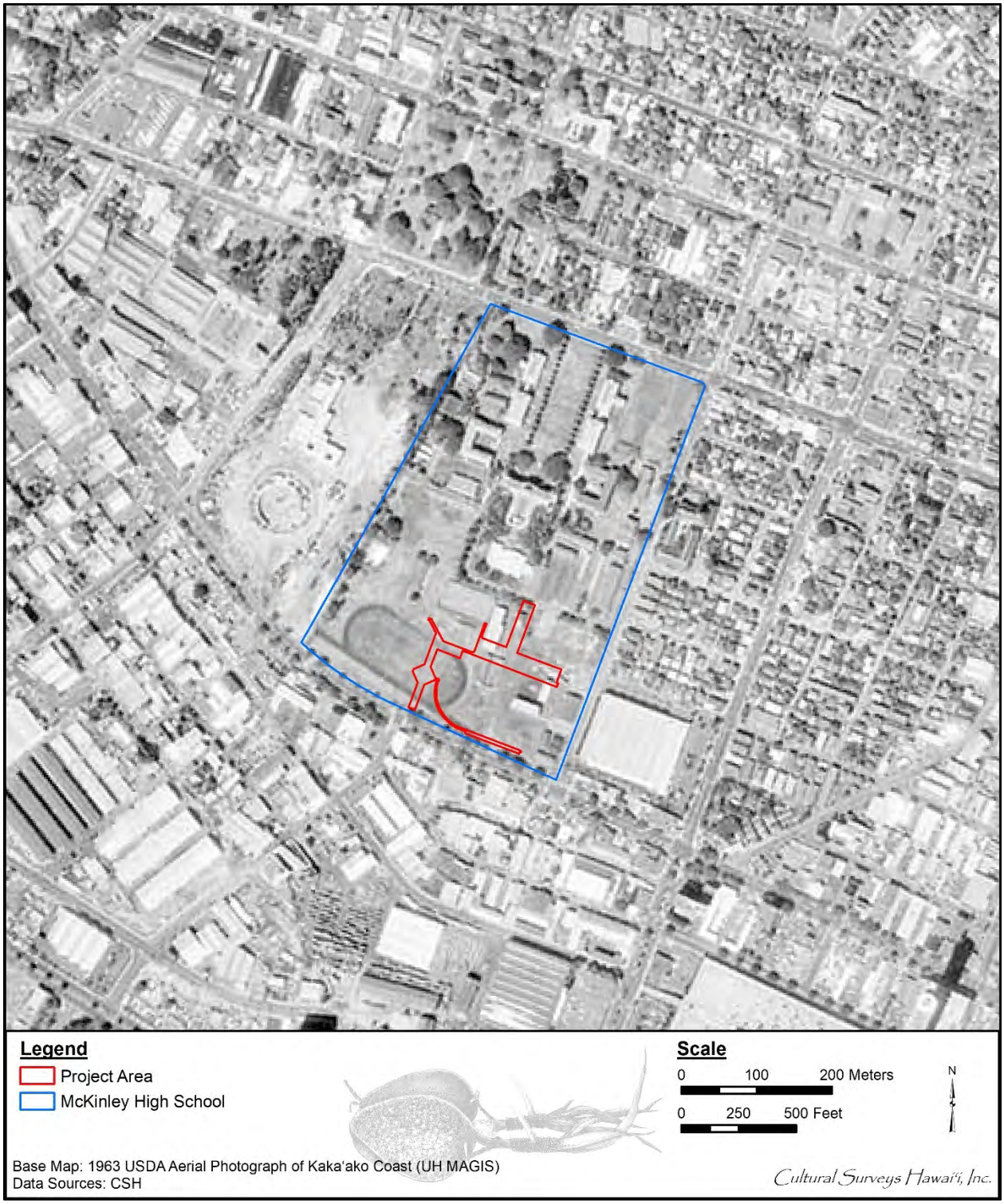


Figure 39. 1963 USDA aerial photograph of Kaka‘ako Coast (UH MAGIS) showing the location of the project area within a less developed portion of the McKinley High School campus; a small structure is now visible within the *mauka* “arm” of the project area

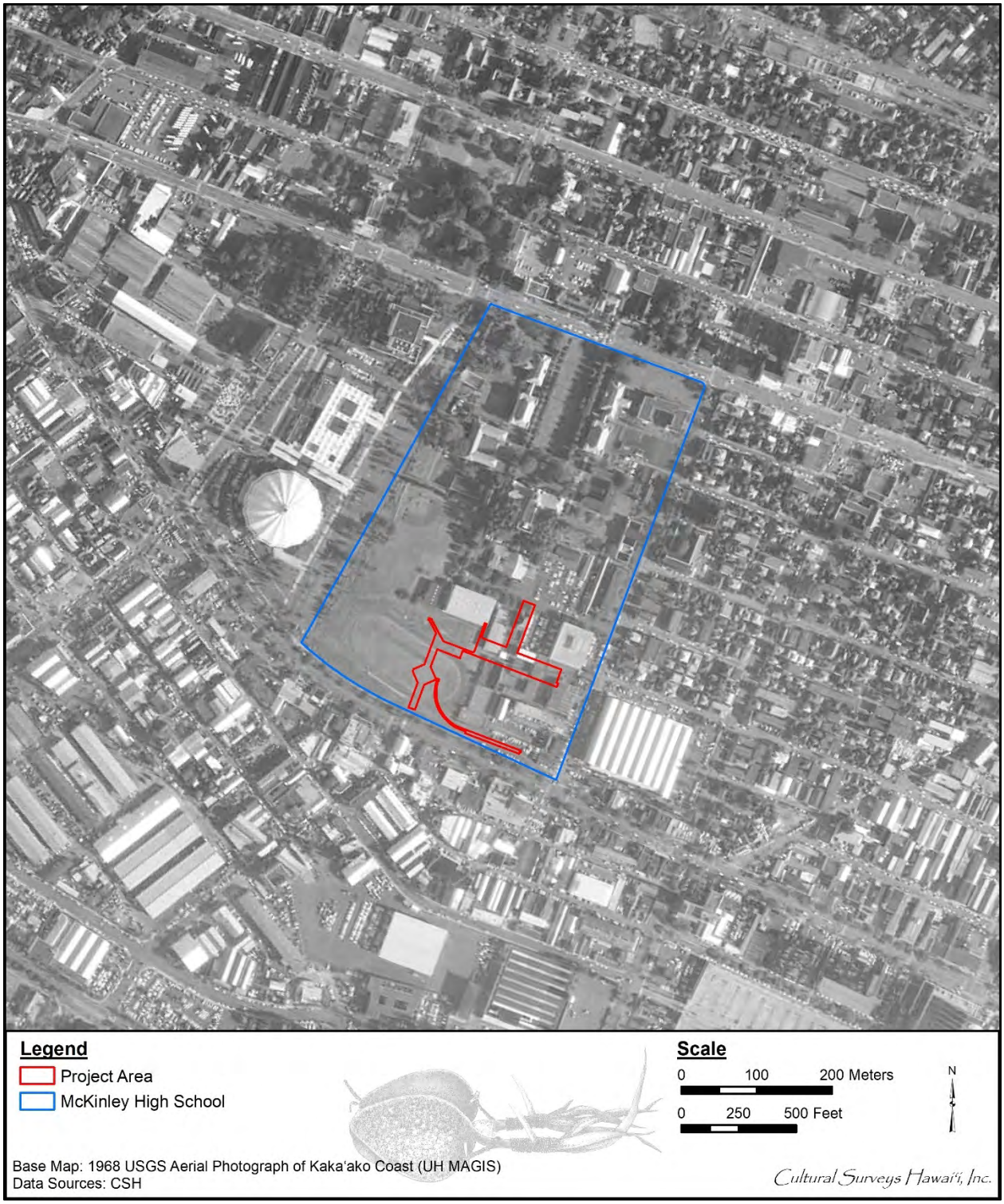


Figure 40. 1968 USGS aerial photograph of Kaka‘ako Coast (UH MAGIS) showing the location of McKinley High School and with new construction in the northeast portion of the project area

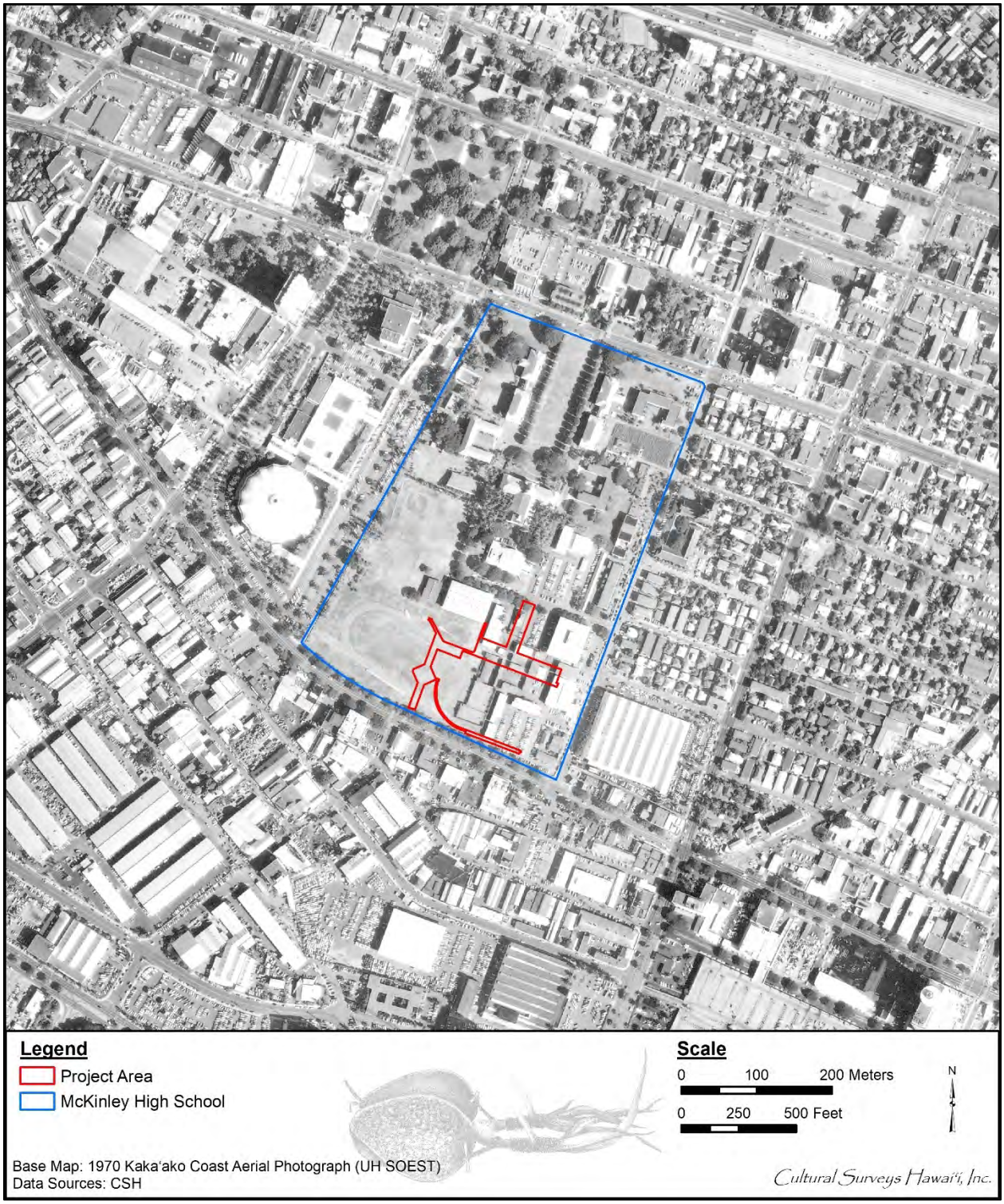


Figure 41. 1970 Kakaako Coast aerial photograph (UH SOEST) showing the location of McKinley High School and with a complex of buildings in the east portion of the project area; the majority of these buildings are no longer present within the project area

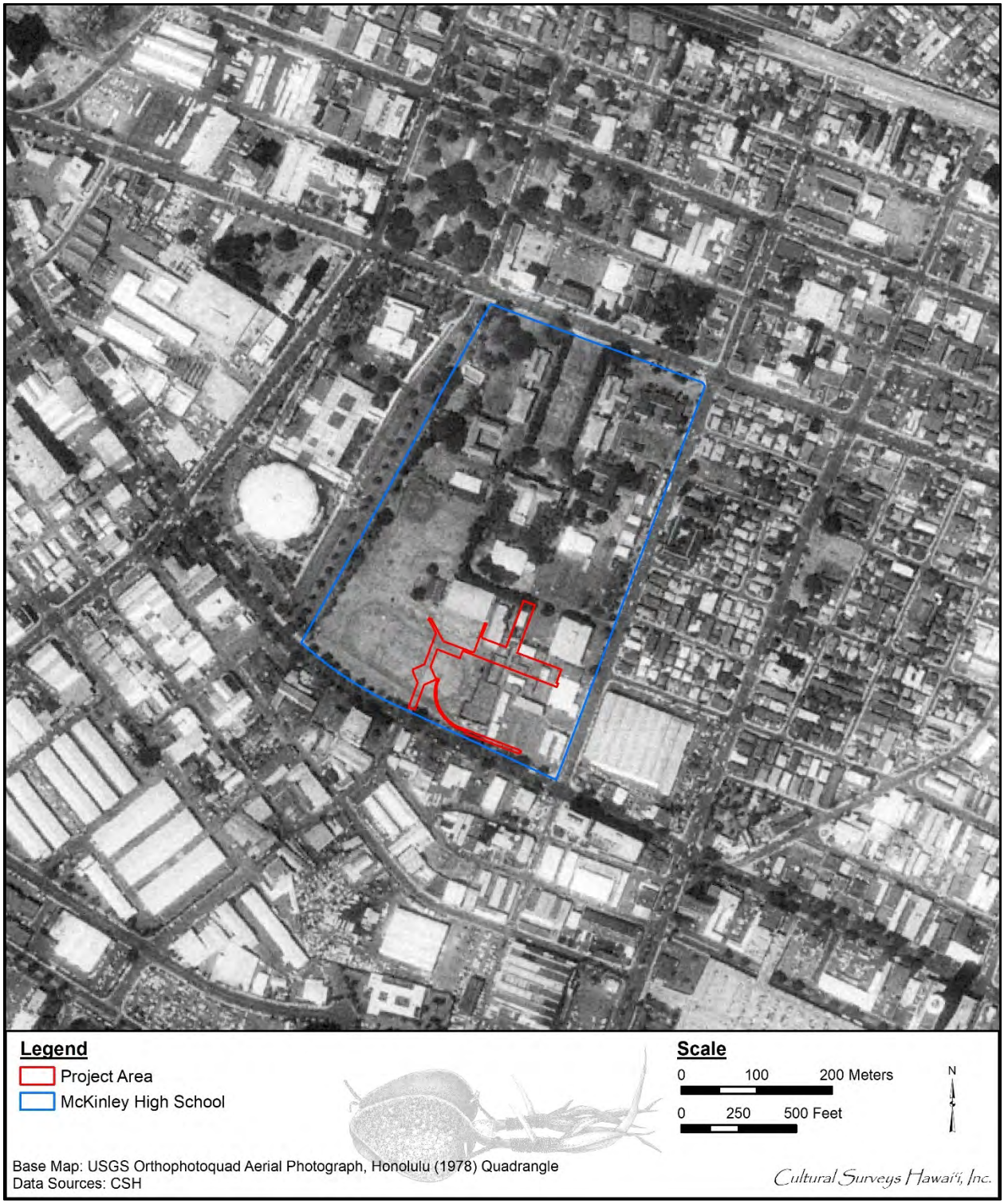


Figure 42. 1978 USGS orthophotoquad aerial photograph showing the location of McKinley High School and with a complex of buildings in the east portion of the project area

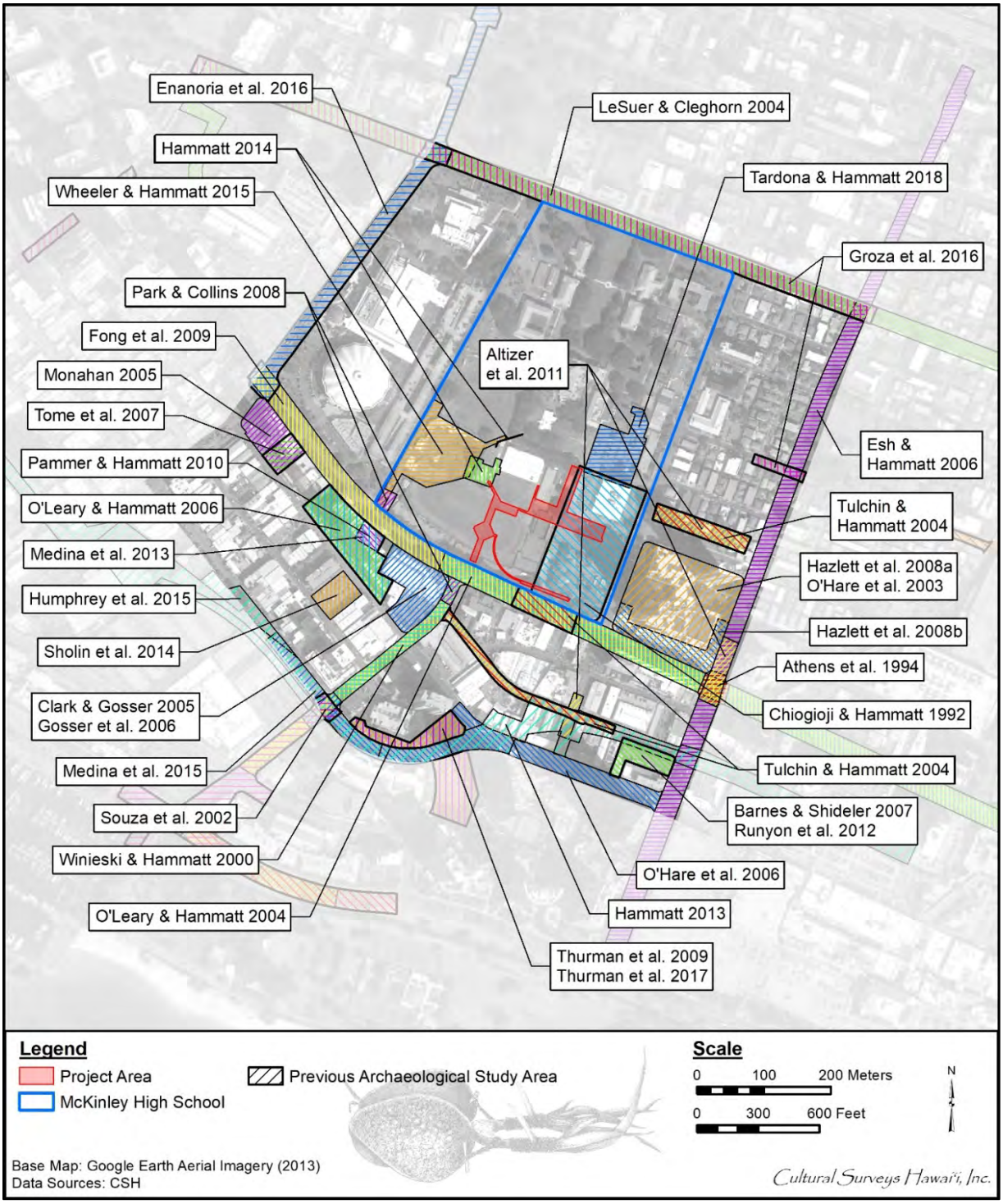


Figure 43. Location of previous archaeological studies conducted within and in the vicinity of the project area (Base map: Google Earth 2013)

Table 1. Previous archaeological studies within and in the vicinity of the project area

| Reference | Type of Study | Location | Results (SIHP # 50-80-14****) |
|---|---|---|---|
| Chiogioji and Hammatt 1992 | Archaeological assessment (literature review and field inspection) | 5.3-acre parcel at ‘Ewa/*mauka* corner of intersection of Pensacola St and Kapi‘olani Blvd, TMK: [1] 2-3-09: 01 por. | Included an eastern portion of present project area; recommended archaeological testing by coring with pollen and dating analysis with particular reference to possible presence of wetland deposits which may contain information on paleoenvironments and Hawaiian archaeology |
| Athens et al. 1994 | Archaeological investigation of inadvertently discovered human remains | Corner of Kapi‘olani Blvd and Pi‘ikoi St | Inadvertent in situ burial find within wetland deposit: one individual (SIHP # -4847); radiocarbon analysis indicated date of death between AD 1295-1473; however, per the report “there are reasons to believe that presence of the skeletal remains at this location was not the result of an intentional burial.” |
| Winieski and Hammatt 2000 | Archaeological monitoring | Kamake‘e St *makai* of Kapi‘olani Blvd (Kaka‘ako Improvements District 4), TMKs: [1] 2-3-002–005 | No pre-Contact cultural layer, materials, burials, or historical trash pits discovered; however, two historical period coffin burials recovered fronting 433 Kamake‘e St. within Jaucas sand (SIHP # -5598) |
| Souza et al. 2002 | Archaeological monitoring | Kamake‘e St between Queen St and Ala Moana Blvd, TMKs: [1] 2-1-058, 2-3-001 through 005 | Identified three human burials (not shown on Figure 44); SIHP # -6376 inadvertently discovered in base yard backdirt pile; SIHP # -6377 within an undisturbed beach sand deposit near Ala Moana Blvd; SIHP # -6378 recovered in base yard; although project area had been heavily impacted by previous filling, grading, and infrastructural development, portions of original natural beach sand deposits and remnants of A horizon documented to still be present |
| O’Hare et al. 2003 | Archaeological inventory survey | Block on corner of Kapi‘olani Blvd and Pi‘ikoi St, TMKs: [1] 2-3-010:028, 048, 050, 052–056 | Twenty-four trenches excavated in a lot on east side of Pi‘ikoi St; two historic properties identified: several historical trash pits (SIHP # -6637) and Kewalo wetland stratum with defined sand berm (SIHP # -6636), which can be seen on late nineteenth century maps |

| Reference | Type of Study | Location | Results (SIHP # 50-80-14****) |
|---|---|---|---|
| LeSeur and Cleghorn 2004 | Archaeological assessment (literature review and field inspection) | Along King St near present project area (East O‘ahu Transmission project) | King St section near current project area; noted proximity of six historic properties including McKinley H.S., Thomas Square, Linekona School, fishponds near HECO Ward Ave complex, King St Catholic Cemetery, and traditional pond near HECO Makaloa substation |
| O’Leary and Hammatt 2004 | Archaeological monitoring | Included Kapi‘olani Blvd from Kalākaua Ave to Kamake‘e St (Unit 9 Phase 1 streets) | No historic properties identified (but shallow trenches dug directly on top of locations previously excavated |
| Tulchin and Hammatt 2004 | Archaeological literature review and field inspection | Kapi‘olani Area Revised Sewer System project including portions of Kapi‘olani Blvd, Pensacola St, and Kona St near present project area, TMKs: [1] 2-3-004, 005, 007, 009, 010, 013, 014, 017, 018, 022, 035, 036, and 038 | Concluded high probability of encountering human skeletal remains (in very large study area addressed |
| Clark and Gosser 2005 | Archaeological inventory survey | On southwest corner of Kapi‘olani Blvd and Kamake‘e St, TMKs: [1] 2-3-003:075, 085, and 086 | Wetland soils interpreted as subsurface remnant of small pond, and designated part of SIHP # -6636, present in northern portions of project area |
| Monahan 2005 | Archaeological inventory survey (archaeological assessment in the absence of finds) | Three parcels (1.35 acres) on *makai* side of Kapi‘olani Blvd across from Blaisdell Center | No historic properties identified |
| Esh and Hammatt 2006 | Archaeological monitoring | Pi‘ikoi St, Ala Moana Blvd to Matlock St | No historic properties identified |

| Reference | Type of Study | Location | Results (SIHP # 50-80-14****) |
|---|---|---|---|
| Gosser et al. 2006 | Archaeological monitoring | West (*makai*/‘Ewa) corner of Kapi‘olani Blvd and Kamake‘e St, TMKs: [1] 2-3-003:075, 085, and 086 | SIHP # -6636, subsurface remnant of small pond present in northern portions of project area and interpreted as modified Kewalo wetlands; in southern portion of project area observed buried A horizon, Layer II, previously identified during subsurface testing |
| O’Hare et al. 2006 | Archaeological monitoring | Kaka‘ako ID 10 (Queen St Extension from Kamake‘e St to Waimanu St) | Recorded cluster of 28 historical burials (SIHP # -6658) within berm associated with Kolowalu Pond, two isolated disturbed burials in disturbed stratigraphic context (SIHP # -6659), and historical trash dump (SIHP # -6660, not shown on Figure 44); weak A horizon noted; some fishpond sediments |
| O’Leary and Hammatt 2006 | Archaeological inventory survey | Moana Vista in block bounded by Kapi‘olani Blvd, Kamake‘e St, Waimanu St, and Ward Ave, TMKs: [1] 2-3-003:072, 088, 102 | No historic properties identified |
| Barnes and Shideler 2007 | Archaeological literature review and field inspection | Proposed 1235 Kona St/1226 Waimanu St project, TMKs: [1] 2-3-007:026 and 049 | Evaluates likelihood of historic properties, no historic properties identified in project area |
| Tome et al. 2007 | Archaeological monitoring | 0.48-acre parcel on south side of intersection of Kapi‘olani Blvd and Ward Ave, TMK: [1] 2-3-003:096 | No historic properties identified |

| Reference | Type of Study | Location | Results (SIHP # 50-80-14****) |
|---|---|---|---|
| Hazlett et al. 2008 a/b | Archaeological monitoring | Honolulu Design Center Phase III, bounded by Kapiolani Blvd, Pensacola St, Kamaile St, and Pi‘ikoi St, TMKs: [1] 2-3-010:048, 050, and 052 through 056 | No historic properties identified |
| Park and Collins 2008 | Archaeological monitoring | New siren installation site on SW corner of McKinley High School (HS), within TMK: [1] 2-3-009:001 | Recorded organic, saturated soil interpreted as part of previously identified SIHP # -6636, Kewalo wetlands |
| Fong et al. 2009 | Archaeological monitoring | Rehabilitation of Streets: Kapi‘olani Blvd from Kalākaua Ave to Ward Ave, Kamake‘e St from Kapi‘olani Blvd to Auahi St and Atkinson Dr from Kapi‘olani Blvd to Ala Moana Blvd | No human remains or historic properties identified; several historical items encountered, all post-dating 1890, indicative of conversion of this area from agriculture land to residential suburbs; fill material also found at various locations in project area, deposited during reclamation activities that occurred in 1920s and 1930s |
| Thurman et al. 2009 | Archaeological inventory survey | Queen Street Parks, two lots separated by Queen St within block bound by Kamake‘e, Auahi, Waimanu, and Pi‘ikoi streets, TMKs: [1] 2-3-004:075 and 076 | One previously recorded historic property encountered during subsurface investigation, SIHP # -6856, historical fishpond remnant, part of Land Commission Grant 3194, “Kolowalu” |

| Reference | Type of Study | Location | Results (SIHP # 50-80-14****) |
|---|---|---|---|
| Pammer and Hammatt 2010 | Archaeological inventory survey (archeological assessment in the absence of finds) | Approx. 0.26-acre Moana Vista project area in block bounded by Kapi‘olani Blvd, Kamake‘e St, Waimanu St, and Ward Ave, TMK: [1] 2-3-003:084 | No historic properties identified |
| Altizer et al. 2011 | Archaeological monitoring | Kapi‘olani Area Revised Sewer System, 12 street segments in greater vicinity of Ala Moana Shopping Center, TMKs: [1] 2-3-004, 005, 007, 009, 010, 013, 014, 017, 018, 022, 035, 036, 038, and 041 | Previously documented SIHP # -6636, Kewalo wetland deposit, documented in Sewer Line G off Pensacola St between Ho‘ola‘i and Kamaile streets |
| Runyon et al. 2012 | Archaeological inventory survey | Senior Residence at 1235 Kona St/1226 Waimanu St/ 450 Pi‘ikoi St, TMKs: [1] 2-3-007:026 and 049 | One identified historic property documented within project area, SIHP # -6636, Kewalo wetland deposit |
| Hammatt 2013 | Archaeological inventory survey | Honolulu Rapid Transit Project (HRTP) Section 4 (City Center), TMKs: [1] 1-2, 1-5, 1-7, 2-1, 2-3 | Identified 19 historic properties, four relatively close to Pensacola St: SIHP # -6636, Kewalo wetland deposit; SIHP # -7429, subsurface sand cultural deposits; SIHP # -7430, subsurface privy remnant (not shown on Figure 44); and SIHP # -7193, subsurface trash deposit (not shown on Figure 44) |
| Medina et al. 2013 | Archaeological monitoring | Pacifica/ Honolulu Moana Vista Condominium project at 1015 Kapi‘olani Blvd, TMKs: [1] 2-3-003:072, 084, 088 and 102 | No historic properties identified |

| Reference | Type of Study | Location | Results (SIHP # 50-80-14****) |
|---|---|---|---|
| Hammatt 2014 | Archaeological monitoring | Two neighboring discrete areas of SW/central portion of McKinley HS Campus | Observed additional exposures of SIHP # -6636, Kewalo wetlands deposit |
| Pammer et al. 2014 | Archaeological inventory survey | Ward Block B East project, between Auahi St and Ala Moana Blvd, TMK: [1] 2-3-001:005 por. | Although located well southwest of present project area (and hence not depicted on Figure 43), identified one historic property, SIHP # -7659, concretized Ward Estate *‘auwai* (ditch), which extends far inland to within 200 m west of present project area. |
| Sholin et al. 2014 | Archaeological inventory survey | Ola Ka ‘Ilima Artspace Lofts, TMK: [1] 2-3-003:040 | No historic properties identified; absence of beach berm indicated traditional Hawaiian burials unlikely to be present |
| Humphrey et al. 2015 | Supplemental archaeological inventory survey | HRTP Section 4 (City Center), TMKs: [1] 2-3:002, 003, and 004 | Identified additional features of SIHP # -7429, subsurface sand cultural deposits, including a human burial site |
| Medina et al. 2015 | Archaeological monitoring | Queen and Kamake‘e Traffic Signal project, TMKs: [1] 2-3-002:001; 2-3-003:087, 103, and 2-3-004:080 por. | No historic properties identified; observed stratigraphy consisted of various fill layers overlying buried sand A horizon and Jaucas sand |
| Wheeler and Hammatt 2015 | Archaeological monitoring | SW portion of McKinley HS Campus, TMK: [1] 2-3-009:001 | Two historic properties identified: SIHP # -7754, stone and mortar (ditch) wall oriented northeast-southwest, and SIHP # -7755, historical trash layer including several domestic alcohol, milk, glass, and medical bottles and ceramic and metal fragments in layer about 25 to 30 cm thick overlying gleyed silty clay |

| Reference | Type of Study | Location | Results (SIHP # 50-80-14****) |
|---|---|---|---|
| Enanoria et al. 2016 | Archaeological monitoring | Board of Water Supply (BWS) Water Main Replacement project at Ward Ave, TMKs: [1] 2-1-040:001; 2-1-041:024, 026, 028; 2-1-042:018, 024; 2-1-044:001, 003, 005, 032, 033; 2-1-049:080; 2-3-003:001; 2-3-008:001, 002; 2-4-001:001; 2-4-014:021 and 024 | No historic properties identified |
| Groza et al. 2016 | Archaeological literature review and field inspection | Addresses 50 locations for an Ala Moana Tributary Basin Sewer I/I Relief and Rehabilitation project | Addressed South King St north of McKinley H.S. (recommending on-call archaeological monitoring for most of this area) and Rycroft St to SE (recommending no further work) |
| Thurman et al. 2017 | Archaeological monitoring | Queen Street Parks, two lots separated by Queen St within block bound by Kamake‘e, Auahi, Waimanu, and Pi‘ikoi streets, TMKs: [1] 2-3-004:075 and 076 | Sediments exposed during this project consisted of 20th century land reclamation fill layers and underlying “Kolowalu” fishpond sediments (SIHP # -6856) |
| Tardona and Hammatt 2018 | Archaeological monitoring | McKinley HS, east central campus (photovoltaic system installation project) | Additional exposures of Kewalo wetlands (SIHP # -6636) identified |

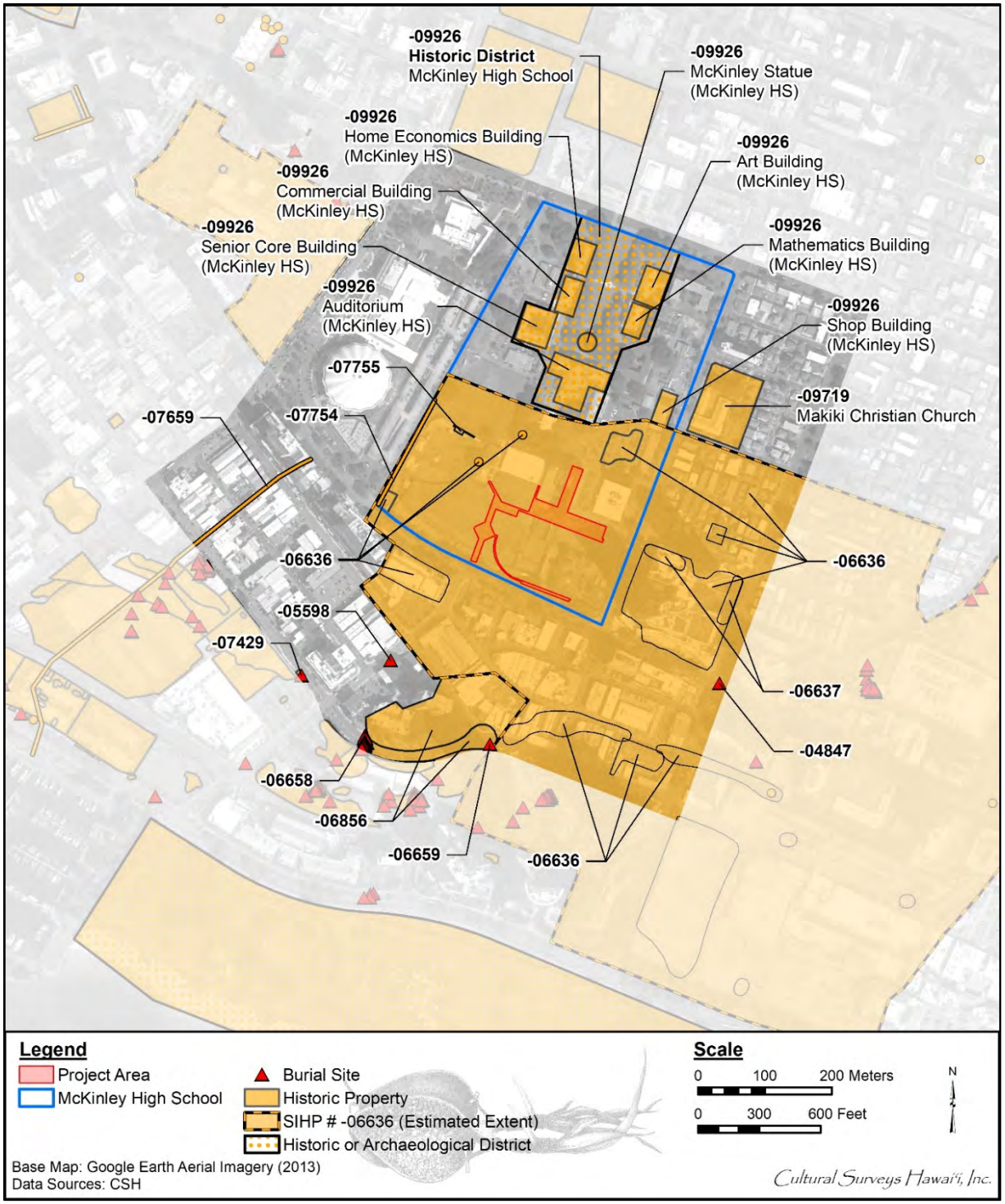


Figure 44. Location of historic properties in the vicinity of the project area (Base map: Google Earth 2013); note SIHP # -9926, the Historic District of the McKinley High School, encompasses the entirety of the 45.6-acre campus (demarcated in blue); however, the initial NRHP nomination identified the core portion of the early campus as the Historic District (defined by the stippled swatch)

Table 2. Previously identified historic properties in the vicinity of the project area

| SIHP # (50-80-14-) | Description of Historic Property | General Location | Source* |
|---|---|---|---|
| 4847 | Inadvertently discovered human remains at Pi‘ikoi St and Kapi‘olani Blvd intersection; one individual within a wetland deposit (within boundaries of SIHP # -6636), radiocarbon dated to the 13th-15th centuries) | 220 m SE of project area | Athens et al. 1994 |
| 5598 | Burials (2); historical coffin burials within natural Jaucas sand deposit | 200 m SW of project area | Winieski and Hammatt 2000 |
| 6636 | Subsurface wetland sediments (estimated extent) | Extensive area around present project area and extending SE, S, and SW | O’Hare et al. 2003; Clark and Gosser 2005; Gosser et al. 2006; Park and Collins 2008; Altizer et al. 2011; Runyon et al. 2012; Hammatt 2013 and 2014; Tardona and Hammatt 2018 |
| 6637 | Historical trash pit | 100 m SE of project area | O’Hare et al. 2003 |
| 6658 | Burials (28); cluster of historical burials within berm of Kolowalu Pond | 300 m south of project area | O’Hare et al. 2006 |
| 6659 | Burial (2); isolated human remains within disturbed stratigraphic context | 200 m south of project area | O’Hare et al. 2006 |
| 6856 | Kolowalu Fishpond | Large area from 150 m south of project area | Thurman et al. 2009 |
| 7429 | Subsurface sand cultural deposits, including human burial sites | 300 m SW of the project area | Hammatt 2013; Humphrey et al. 2015 |
| 7659 | Concretized Ward Estate *‘auwai* | Extends far inland from where it was described to within 200 m west of present project area | Pammer et al. 2014 |

| SIHP # (50-80-14-) | Description of Historic Property | General Location | Source* |
|---|---|---|---|
| 7754 | Drainage ditch | McKinley HS Campus, 150 m west of current project area along western border of campus | Wheeler and Hammatt 2015 |
| 7755 | Historical trash layer | McKinley HS Campus, 80 m NW of current project area | Wheeler and Hammatt 2015 |
| 9719 | Makiki Christian Church | 150 m NE of project area | NRHP Registration Form 1988 |
| 9926 | Commercial Building (McKinley HS) | McKinley HS Campus, 220 m north of current project area | NRHP Registration Form 1993 |
| | Home Economics Building (McKinley HS) | McKinley HS Campus, 300 m north of current project area | NRHP Registration Form 1993 |
| | Art Building (McKinley HS) | McKinley HS Campus, 300 m north of current project area | NRHP Registration Form 1993 |
| | Mathematics Building (McKinley HS) | McKinley HS Campus, 200 m north of current project area | NRHP Registration Form 1993 |
| | Auditorium (McKinley HS) | McKinley HS Campus, 100 m north of current project area | NRHP Registration Form 1993 |
| | Senior Core Building (McKinley HS) | McKinley HS Campus, 200 m north of current project area | NRHP Registration Form 1993 |
| | Shop Building (McKinley HS) | McKinley HS Campus, 150 m NE of current project area | NRHP Registration Form 1993 |
| | McKinley Statue (McKinley HS) | McKinley HS Campus, 200 m north of current project area | NRHP Registration Form 1993 |

*References listed are only those shown within Figure 43 and Figure 44; studies outside the immediate vicinity of the project area on not included

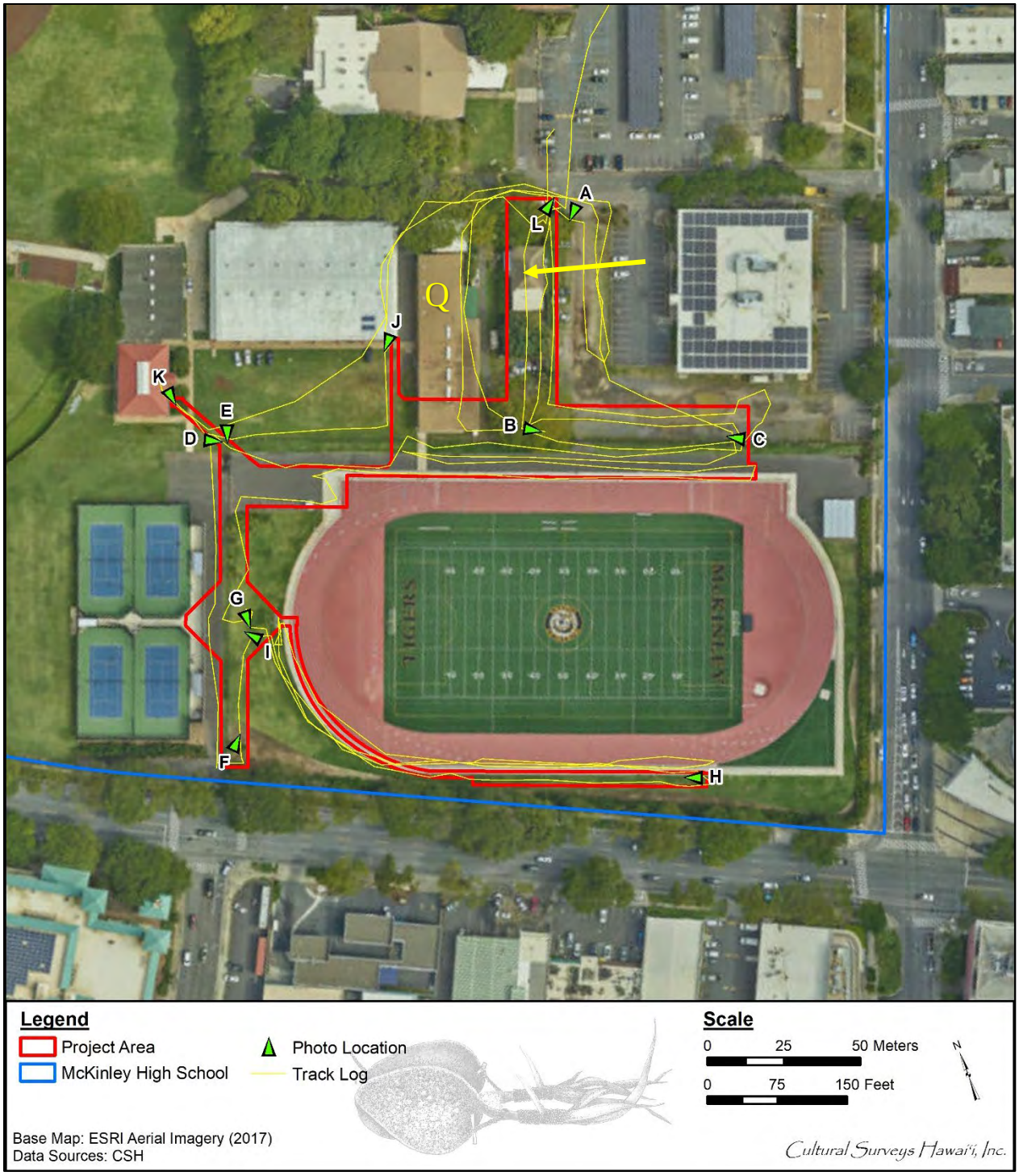


Figure 45. Archaeologist’s tracklog with a lettered key to the location of the following photographs (Base map: ESRI 2017); Building Q is denoted with a “Q” while the wooden maintenance cottage is denoted with a yellow arrow

Figure 46. General view “A” of northern access corridor of the project area, looking *makai* toward the track, view to south

Figure 47. General view “B” of the west portion of the project area on the north side of the track (track to right), looking toward Pensacola Street, view to east

Figure 48. General view “C” of the west portion of the project area on the north side of the track (track to left), view to west

Figure 49. General view “D” of the northwest portion of the project area with the track at upper right, view to east

Figure 50. General view “E” of the west side of the project area with the track at upper left, view to south (*makai*)

Figure 51. General view “F” of the west side of the project area with the track at upper right, view to north (*mauka*)

Figure 52. General view “G” of the south (*makai*) side of the project area wrapping around the southwest edge of the track, view to southeast

Figure 53. General view “H” of the south (*makai*) side of the project area extending along the south edge of the track (at upper right), view to west

Figure 54. View “I”: Plaque at west end of track reading “William S. Wise Field, Educator, Coach, Friend, Gift of 1965 Junior Class 30 April 1965”, view to west

Figure 55. General view “J” of a northern utility corridor of the project area, view to south toward the track

Figure 56. General view “K” of the northwestern utility corridor of the project area, view to southeast toward the track

Figure 57. View “L” from the northernmost portion of the project area toward the Auditorium (at upper left) and the Shop Building (upper right), contributing elements of SIHP # -9926 specified in the NRHP Form, view to northeast

Figure 58. View looking south of Building Q, the current Boy’s PE/Locker Room and Weight Room; based on the 1959 aerial photograph (see Figure 38) this building is older than 50 years

Figure 59. Close-up of a memorial plaque on Building Q (visible in the center of the building in Figure 58) dedicated to “Leroy A Mendonca / 1932 / 1951/ Class of 1950” who served in the Korean War

Figure 60. View looking west from the *mauka* “arm” of the project area toward a small wooden cottage, currently utilized for maintenance; based on the 1963 aerial photograph (see Figure 39) this building is older than 50 years

Figure 61. View looking southwest from the *mauka* “arm” of the project area toward the maintenance cottage (see Figure 60)

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# Appendix A NRHP Registration Form

NPS Form 10-900
(Oct. 1990)

United States Department of the Interior
National Park Service

## National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in *How to Complete the National Register of Historic Places Registration Form* (National Register Bulletin 16A). Complete each item by marking "x" in the appropriate box or by entering the information requested. If an item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions. Place additional entries and narrative items on continuation sheets (NPS Form 10-900a). Use a typewriter, word processor, or computer, to complete all items.

### 1. Name of Property

historic name McKinley High School

other names/site number N/A

### 2. Location

street & number 1039 South King Street ☐ not for publication

city or town Honolulu ☐ vicinity

state Hawaii code HI county Honolulu code 003 zip code 96814

### 3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, as amended, I hereby certify that this ☐ nomination ☐ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property ☐ meets ☐ does not meet the National Register criteria. I recommend that this property be considered significant ☐ nationally ☐ statewide ☐ locally. (☐ See continuation sheet for additional comments.)

Signature of certifying official/Title Date

State of Federal agency and bureau

In my opinion, the property ☐ meets ☐ does not meet the National Register criteria. (☐ See continuation sheet for additional comments.)

Signature of certifying official/Title Date

State or Federal agency and bureau

### 4. National Park Service Certification

I hereby certify that the property is: Signature of the Keeper Date of Action

☐ entered in the National Register.
☐ See continuation sheet.

☐ determined eligible for the National Register
☐ See continuation sheet.

☐ determined not eligible for the National Register.

☐ removed from the National Register.

☐ other, (explain.)

McKinley High School
Name of Property

Honolulu, HI
County and State

## 5. Classification

**Ownership of Property**
(Check as many boxes as apply)

- ☐ private
- ☐ public-local
- ☒ public-State
- ☐ public-Federal

**Category of Property**
(Check only one box)

- ☐ building(s)
- ☒ district
- ☐ site
- ☐ structure
- ☐ object

**Number of Resources within Property**
(Do not include previously listed resources in the count.)

| Contributing | Noncontributing | |
|---|---|---|
| 1 | 33 | buildings |
| 1 | | sites |
| | 1 | structures |
| | | objects |
| | | Total |

Name of related multiple property listing
(Enter "N/A" if property is not part of a multiple property listing.)

Number of contributing resources previously listed in the National Register
6 buildings, 1 site, 1 object

## 6. Function or Use

**Historic Functions**
(Enter categories from instructions)

Education: school

**Current Functions**
(Enter categories from instructions)

Education: school (McKinley)
Not in Use (former Kapiolani Community College site)

## 7. Description

**Architectural Classification**
(Enter categories from instructions)

20th Century Spanish Colonial Revival

**Materials**
(Enter categories from instructions)

foundation
walls Concrete
roof Terra Cotta Tiles
other

**Narrative Description**
(Describe the historic and current condition of the property on one or more continuation sheets.)

McKinley High School
Name of Property

Honolulu, HI
County and State

## 8. Statement of Significance

**Applicable National Register Criteria**
(Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing.)

- [x] **A** Property is associated with events that have made a significant contribution to the broad patterns of our history
- [ ] **B** Property is associated with the lives of persons significant in our past.
- [x] **C** Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.
- [ ] **D** Property has yielded, or is likely to yield, information important in prehistory or history.

**Areas of Significance**
(Enter categories from instructions)

Education

Architecture

Landscape Architecture

**Period of Significance**

1922-1943

**Significant Dates**

N/A

**Significant Person**
(Complete if Criterion B is marked above)

N/A

**Cultural Affiliation**

N/A

**Architect/Builder**

Various

**Criteria Considerations**
(Mark "x" in all the boxes that apply.)

Property is:

- [ ] **A** owned by a religious institution or used for religious purposes.
- [ ] **B** removed from its original location.
- [ ] **C** a birthplace or grave.
- [ ] **D** a cemetery.
- [ ] **E** a reconstructed building, object, or structure.
- [ ] **F** a commemorative property.
- [ ] **G** less than 50 years of age or achieved significance within the past 50 years.

**Narrative Statement of Significance**
(Explain the significance of the property on one or more continuation sheets.)

## 9. Major Bibliographical References

**Bibliography**
(Cite the books, articles, and other sources used in preparing this form on one or more continuation sheets.)

**Previous documentation on file (NPS):**

- [ ] preliminary determination of individual listing (36 CFR 67) has been requested
- [x] previously listed in the National Register
- [ ] previously determined eligible by the National Register
- [ ] designated a National Historic Landmark
- [ ] recorded by Historic American Buildings Survey # _____
- [ ] recorded by Historic American Engineering Record # _____

**Primary location of additional data:**

- [x] State Historic Preservation Office
- [ ] Other State agency
- [ ] Federal agency
- [ ] Local government
- [ ] University
- [x] Other

Name of repository:
State Library (King Street)

McKinley High School
Name of Property

Honolulu, HI
County and State

**10. Geographical Data**

Acreage of Property 45.6 acres

**UTM References**
(Place additional UTM references on a continuation sheet.)

1 Zone Easting Northing
2
3 Zone Easting Northing
4
See continuation sheet

**Verbal Boundary Description**
(Describe the boundaries of the property on a continuation sheet.) Tax Map Key 2-3-09:1 bounded by South King Street, Pensacola Street, Kapiolani Boulevard, and the City and County of Honolulu Neil Blaisdell Center

**Boundary Justification**
(Explain why the boundaries were selected on a continuation sheet.) This is the historic 1922 McKinley campus.

**11. Form Prepared By**

name/title Rev. Neal MacPherson

organization Church of the Crossroads date June 4, 1993

street & number 1212 University Avenue telephone 949-2220

city or town Honolulu state Hawaii zip code 96826

**Additional Documentation**
Submit the following items with the completed form:

**Continuation Sheets**

**Maps**

A USGS map (7.5 or 15 minute series) indicating the property's location.

A Sketch map for historic districts and properties having large acreage or numerous resources.

**Photographs**

Representative black and white photographs of the property.

**Additional Items**
(Check with the SHPO or FPO for any additional items)

**Property Owner**
(Complete this item at the request of SHPO or FPO.)

name State of Hawaii Department of Education (DOE) and ~~Hawaii Community Development Authority (HCDA)~~

street & number (DOE) 1390 Miller Street (HCDA) 677 Ala Moana #1001 telephone (DOE) 586-3230 ~~(HCDA) 587-2870~~

city or town Honolulu state Hawaii zip code 96813

Paperwork Reduction Act Statement: This information is being collected for applications to the National Register of Historic Places to nominate properties for listing or determine eligibility for listing, to list properties, and to amend existing listings. Response to this request is required to obtain a benefit in accordance with the National Historic Preservation Act, as amended (16 U.S.C. 470 *et seq.*).

Estimated Burden Statement: Public reporting burden for this form is estimated to average 18.1 hours per response including time for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. Direct comments regarding this burden estimate or any aspect of this form to the Chief, Administrative Services Division, National Park Service, P.O. Box 37127, Washington, DC 20013-7127; and the Office of Management and Budget Paperwork Reductions Projects (1024-0018), Washington DC 20503

NPS Form 10-900-a
(8-86)

OMB Approval No. 1024-0018

United States Department of the Interior
National Park Service

# National Register of Historic Places Continuation Sheet

Section number 5,6 Page 1

A tax map showing the historic 45.6 acre McKinley High School campus is attached. A site plan for the existing school campus is also attached. The area and buildings labeled Kapiolani Technical School Site on the tax map and labeled Kapiolani Community College on the site plan are currently unused. The remainder of the McKinley campus is still used as a high school.

Six buildings, 1 site (a quandrangle), and 1 object (a statue) are already listed on the National Register of Historic Places. These buildings are listed on the site plan as:

A - Marion McCarrell Scott Auditorium (built 1927)

B - Commercial Building (built 1923)

C - Home Economics Building (built 1923)

D - Science Building (now the Art Building) (built 1923)

E - Mathematics Building (now Beckwith Hall) (built 1923)

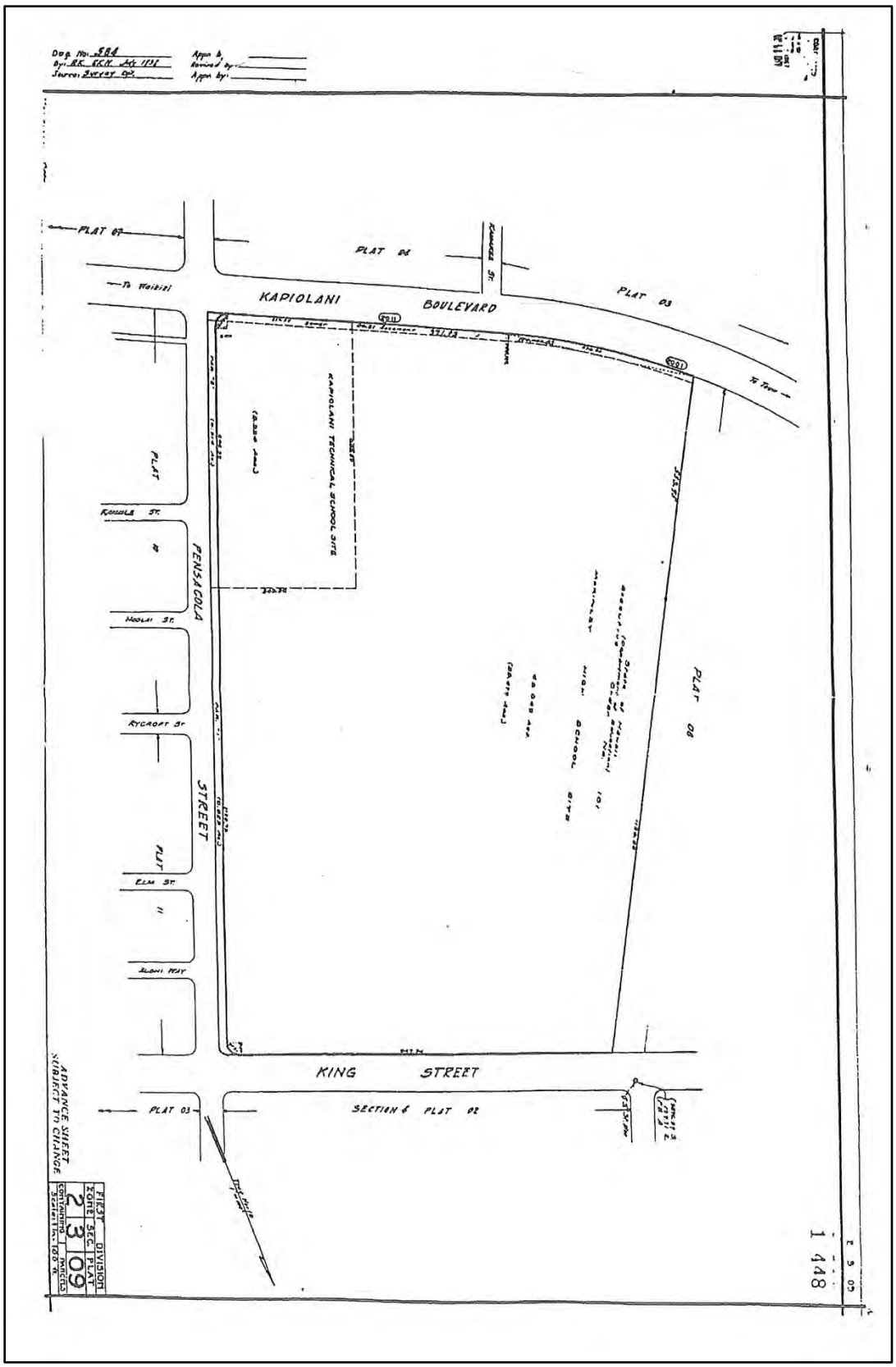
W - Senior Core Building (now English Building) (built 1939)

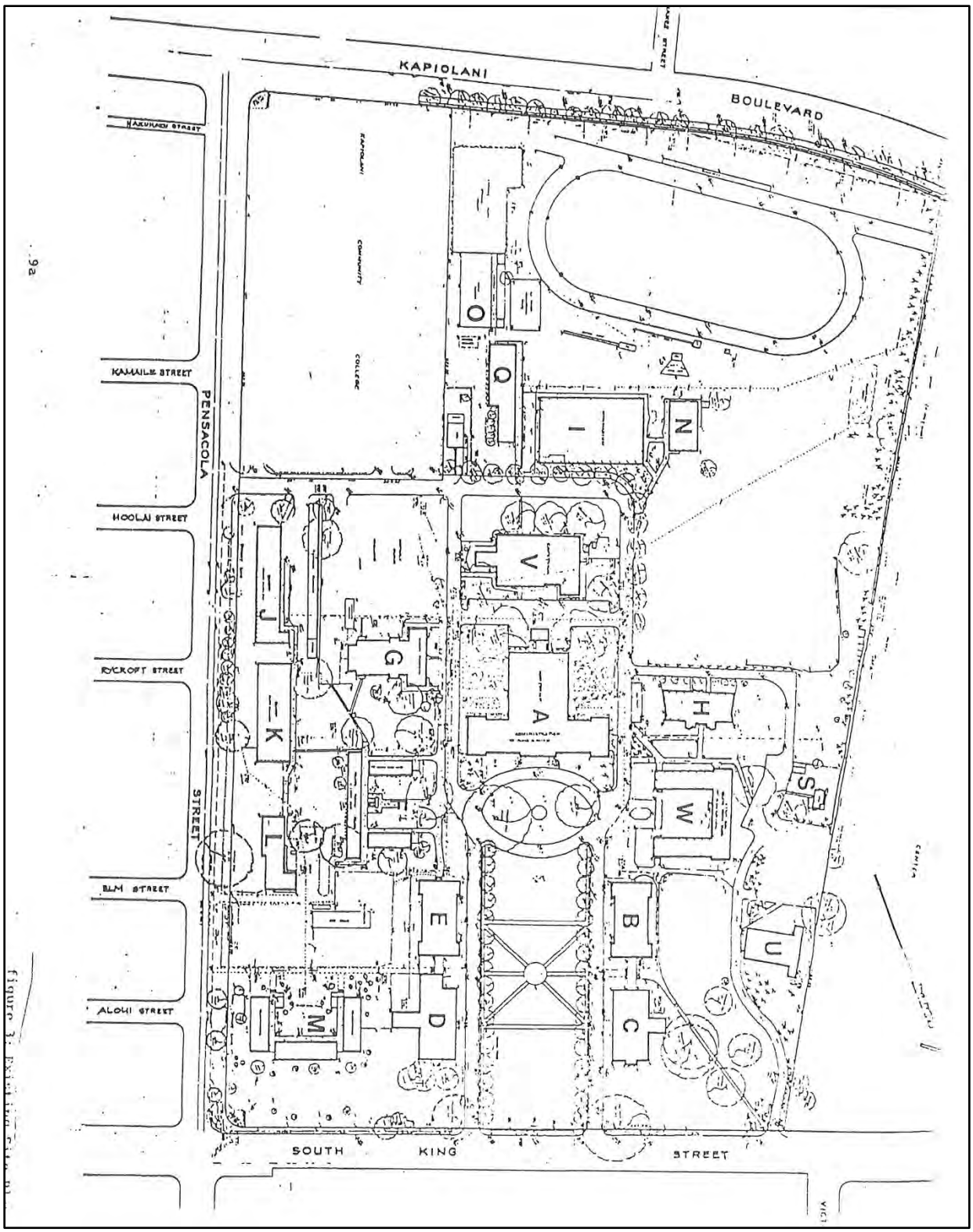
These buildings all feature Spanish Colonial Revival architecture and face a landscaped quadrangle (listed on the National Register).

One structure formerly listed on the National Register, a swimming pool designated U on the site plan, was demolished early in 1991.

Based on its age (built in 1939), architectural style (Spanish Colonial Revival), and historic use by The Daily Pinion (the oldest daily high school newspaper in Hawaii), the Shop Building (K on the site plan) appears eligible for listing on the National Register.

About 13 other buildings on the site plan are used by McKinley High School, but were built within the last 36 years using modern architectural styles. About 20 unused building and 1 unused aluminum shed on the former Kapiolani Community College site were also built using modern architectural styles.


PLAT 07
PLAT 06
PLAT 03
KAPIOLANI BOULEVARD
KAPIOLANI TECHNICAL SCHOOL SITE
PENSACOLA STREET
KONAWAI ST.
HOOLAI ST.
RYCROFT ST.
ELM ST.
KING STREET
PLAT 03
SECTION 6 PLAT 02
PLAT 08
ADVANCE SHEET
SUBJECT TO CHANGE.
FIRST DIVISION
ZONE SEC PLAT
2 3 09
CONTAINING PARCELS
SCALE: 1" = 100' ft.
1 448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NPS Form 10-900-a
(8-86)

OMB Approval No. 1024-0018

United States Department of the Interior
National Park Service

# National Register of Historic Places Continuation Sheet

Section number 7,8 Page 1

DESCRIPTION AND SIGNIFICANCE

McKinley High School is historically significant as the oldest public high school in Hawaii. Through the 1920s, more than half of the high school students in Hawaii attended McKinley. During this decade McKinley offered the primarily non-white general public a level of education which in Hawaii could only be obtained at then white-dominated private schools.

Attendance at McKinley was a stepping stone for several generations of Hawaii's political leaders including a governor and several U.S. Senators and Congressmen. The school's existence significantly contributed to assimilation of Hawaii's large oriental population into positions of community leadership.

McKinley's student newspaper, now The Daily Pinion, was started as a bi-weekly in 1920, and became a daily in 1935. Except for part of 1982, when the paper's advisor confronted health problems, it has continued as a daily. As such it is the oldest daily high school paper in Hawaii and may be the only remaining daily student paper in the United States. For more than the last four decades, The Daily Pinion has been published in the McKinley Shop Building.

Seven buildings on the historic 45.6 acre McKinley campus were built between 1922 and 1939 in Spanish Colonial Revival style. Six already listed on the National Register are thoroughly described and documented. One other, the Shop Building, deserves similar treatment. The Shop Building was initially a one-story concrete structure with red tile roofs, decorative facades, and two open courtyards facing Pensacola Street. One of the Shop Building's courtyards was filled with a now-delapidated 2-story hollow tile and wood loft building. The other Shop Building courtyard was gated and partly enclosed with a corrugated aluminum roof about 1981. Despite these alterations, the Shop Building has excellent potential for restoration to its original 1939 design.

Other buildings on the McKinley campus do not exhibit Spanish Colonial Revival style architecture. However, they are suitable for inclusion in a historic district because they are or were continuously used for public educational purposes.

NPS Form 10-900-a
(8-86)

OMB Approval No. 1024-0018

United States Department of the Interior
National Park Service

# National Register of Historic Places
# Continuation Sheet

Section number 9 Page 1

Sources used in preparing this form include:

The Daily Pinion, Honolulu. (McKinley's student newspaper)

The Black and Gold, Honolulu. (McKinley's student annual)

A Hundred Year's McKinley High School 1865-1965, McKinley High School Publications Department, Honolulu.

nomination papers prepared by Don Hibbart and Nathan Napoka for the National Register of Historic Places, Honolulu, December 1979.

# Appendix B Description of SIHP # 50-80-14-6636 (from Tardona and Hammatt 2018:80-84 and 86)

| | |
|---|---|
| **FORMAL TYPE:** | Subsurface Kewalo wetland remnants |
| **FUNCTION:** | Agriculture, aquaculture, and habitation |
| **PREVIOUS DOCUMENTATION:** | Allen 1997, O’Hare et al. 2003, O’Hare et al. 2004, Clark and Gosser 2005, Tulchin and Hammatt 2005, Hammatt 2008, Altizer et al. 2011, Runyon et al. 2011, Hammatt 2013, Hunkin et al. 2013, Mintmier et al. 2013, Morriss et al. 2013, Pammer and McDermott 2014, Enanoria et al. 2015, Bellluomini et al. 2016 |
| **AGE:** | Pre-Contact to early twentieth century, approximately AD 340-600 (earliest radiocarbon date) to 1920s and 1930s (land reclamation) |
| **NUMBER OF FEATURES:** | One |
| **TYPES OF FEATURES:** | Single feature consisting of a berm, associated coral wall and wooden post (O’Hare et al. 2003) |
| **DISTRIBUTION:** | Approximately 0.5 acres (within current project area), 133 acres (total interpolated area) |
| **LOCATION:** | Interpolated boundaries are generally bounded by Ke‘eaumoku St to the east, Ala Moana Blvd and Waimano St to the south, and Ho‘ola‘i St and Kapiolani Blvd to the north and the Neal S. Blaisdell Center to the west; the west portion is generally bounded by Kapi‘olani Blvd to the south, Ward Ave to the east, King St to the north and Cooke St to the west |

SIHP # -6636, the previously identified subsurface Kewalo Wetlands, includes pond sediments, berm(s), and possible associated coral retaining wall and wooden post. The subsurface deposit has been identified in numerous previous archaeological studies. The interpolated boundaries of SIHP # -6636 is primarily bounded by Ke‘eaumoku Street to the east, Ala Moana Boulevard and Waimano Street to the south, and Ho‘ola‘i Street and Kapiolani Boulevard to the north and the Neal S. Blaisdell Center to the west; he west portion is generally bounded by Kapi‘olani Boulevard to the south, Ward Avenue to the east, King Street to the north and Cooke Street to the west. Numerous studies have been conducted on SIHP # -6636 including Allen 1997, O’Hare et al. 2003, O’Hare et al. 2004, Clark and Gosser 2005, Tulchin and Hammatt 2005, Hammatt 2008, Altizer et al. 2011, Runyon et al. 2011, Hammatt 2013, Hunkin et al. 2013, Mintmier et al. 2013, Morriss et al. 2013, Pammer and McDermott 2014, Enanoria et al. 2015, Bellluomini et al. 2016, and the current [Tardona and Hammatt 2018] study [see Figure 62].

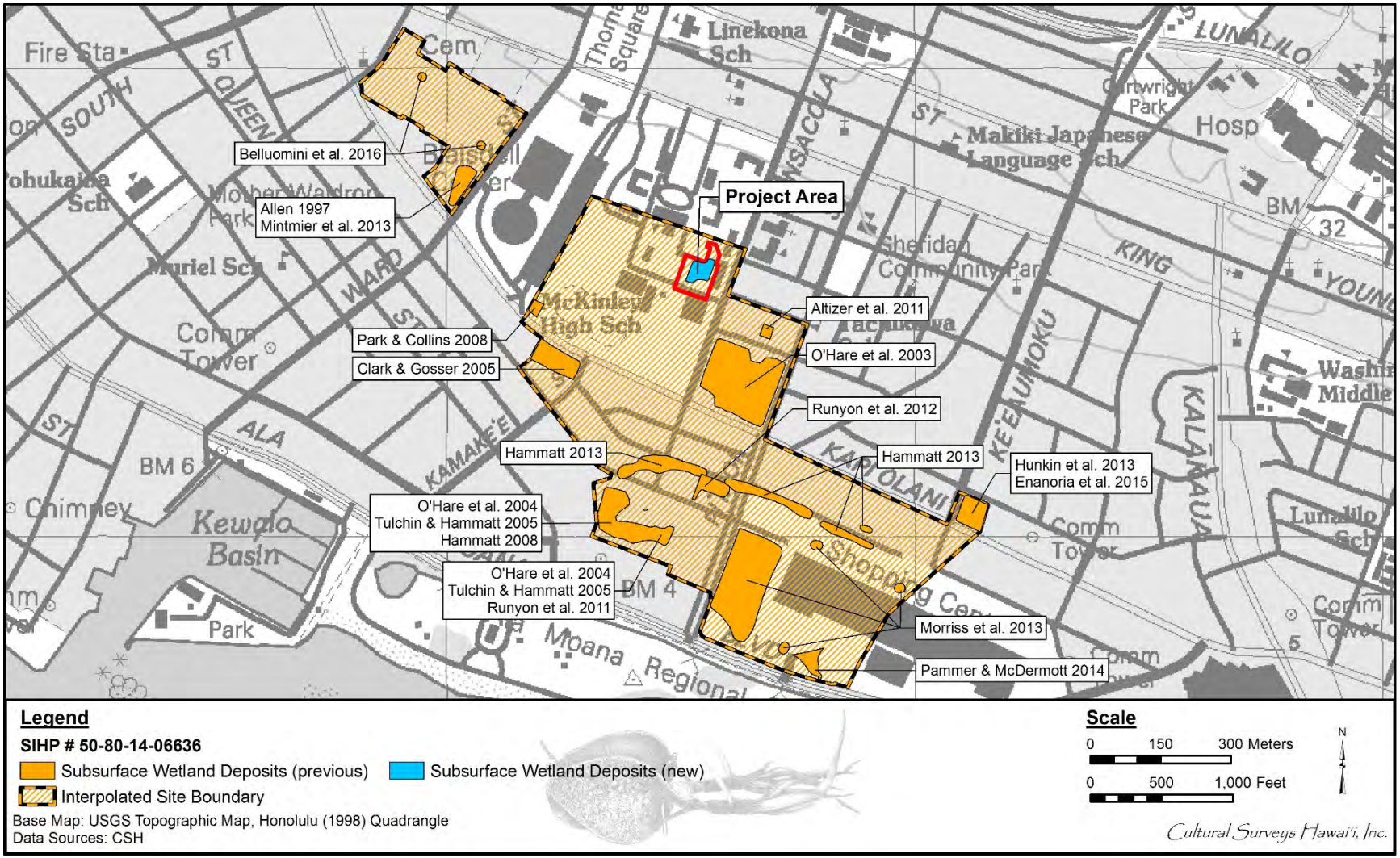


Figure 62. Portion of the 1998 Honolulu USGS topographic quadrangle showing the known and interpolated site boundaries of the Kewalo Wetlands, SIHP # -6636

SIHP # -6636 consists of a buried wetland deposit (known as the Kewalo Wetlands), which is typically present at or very near the water table. The Kewalo Wetlands were naturally deposited and formed on top of marine, primarily lagoonal deposits and/or the coral shelf. Land reclamation activities in the 1920s and 1930s were some of the first depositional events atop the wetlands. These are often characterized by hydraulic pump-dredged sandy clay fill layers directly overlying the wetlands. The hydraulic pump-dredged material is often capped by a crushed coral fill, usually the final step in the initial land reclamation activity. In some instances, historic trash deposits directly overlie the wetlands and were utilized to initially fill in the inundated areas, much like the dredged material. The deposits described in previous studies as SIHP # -6636 are similar in texture, color, and content, although some variation does occur; however, this may be due to human error, conditions of the deposit, and variation in methodology. The color of SIHP # -6636 sediments include brown, gray, and black with textures including silty clay, sandy clay, clay loam, and silt loam. The wetlands were often observed disturbed or truncated.

Presently, historic and/or modern fill deposits of various origin and composition overlie the initial land reclamation deposits. The lagoonal and marine sediments that underlie the wetlands were extensively documented in Allen 1997. Allen (1997) suggests the wetlands are the result of gradual change of the environment on the Honolulu Plain. As sea levels receded, the Honolulu Plain saw an accumulation of sand, creating a lagoonal environment. This lagoonal environment slowly developed into the Kewalo Wetlands, until extensive land modification for salt pans, fishponds, *lo‘i*, etc. and the land reclamation activities of the early 1900s disturbed and capped the wetlands.

Analyses such as palynology, malacology, radiocarbon dating, artifact analysis, Energy Dispersive X-ray Fluoresence (EDXRF), and wood taxa identification were conducted during various studies. It should also be noted that several additional studies are currently being conducted by CSH in regards to SIHP # -6636.

The most extensive palynological study was conducted by Allen (1997). In this study, stratigraphic sequences ranging from 125 to 453 cmbs were analyzed to better determine the depositional events that occurred prior to SIHP # -6636. The pollen analysis of many of these layers suggest the area was dominated by the *loulu* (*pritchcardia* sp.) that slowly declined in number. Dramatic changes occurred in the first millennia AD. These changes, according to Allen (1997) include an increase in sedges, coconut, and Cheno-ams in concert with the decline of the *loulu*. This may represent the development of the Kewalo Wetlands. Other previous studies narrowed the development of the Kewalo Wetlands to as early as ca. AD 340 to 600, prior to Polynesian habitation.

Many interpretations and a range of terminology have been applied to the Kewalo Wetlands. Many of the previous studies of SIHP # -6636 have documented that within the boundaries of the Kewalo Wetlands, land modification has occurred spanning from the pre-Contact era to the early twentieth century. This likely accounts for much of the disparity in interpretations. Fishponds, salt pans, *lo‘i*, and rice cultivation are some of the varied uses of the wetlands. Hammatt 2008, Morriss et al. 2013, O’Hare et al. 2003, O’Hare et al. 2004, Runyon et al. 2011, and Tulchin and Hammatt 2005 identified SIHP # -6636 as buried wetland sediments. Clark and Gosser (2005) identified SIHP # -6636 as pond sediments based on historic maps and research. Altizer et al. (2011) also indicated an unnamed pond in the vicinity, but only found evidence of agricultural sediment. Fish

scales were identified in Kewalo Wetland deposits in two previous studies (Clark and Gosser 2005 and O’Hare et al. 2004).

SIHP # -6636 includes one archaeological feature, a sediment berm identified within Waikīkī by O’Hare et al. (2003) as Feature 4. It was designated Feature 1 during the Hammatt 2013 study. SIHP # -6636 Feature 1 was identified within Trenches 12 and 23 (O’Hare et al. 2003). The sand berm is described as dark grayish-brown sandy clay, 67 cm in thickness, and containing marine gastropods. O’Hare et al. (2003) also described the berm in a different location as dark gray clay loam with microstratigraphy of sand lenses. In addition, it appeared to be associated with a concentration of coral boulders, interpreted as a possible berm retaining wall, and a wooden fence post, suggestive of a possible fence lining. Radiocarbon analysis of the sand berm produced a two-sigma calibrated date of AD 1660 to 1890 (78.1% probability) (O’Hare et al. 2003).

SIHP # -6636 was observed in the photovoltaic foothold excavations located in the eastern and western portions of the project area. Excavations in this area were limited to the drilling of 12 0.86 by 0.86 cm foothold excavations for the new parking structure. A silty clay material was observed from the backdirt pile at all foothold locations at approximately 3.0 mbs. One photograph was taken within Profile 2 [Figure 63]. Due to the presence of large basalt cobbles and boulders along with the water table, SIHP # -6636 was not physically seen or recorded in situ; however, it was observed in the backdirt. Additionally, sediment samples were not collected due to the contamination from other strata during the drilling process. Except for an expanded known and interpolated extent of the Kewalo Wetlands, no new information was gathered during this archaeological monitoring. The following is a brief summary of major findings from previous studies of the Kewalo Wetlands.

SIHP # -6636 is a pre-Contact to early twentieth century natural wetland deposit with culturally modified components, likely associated with agriculture, aquaculture, and habitation. It has been documented in different portions of the Kewalo area, and was previously determined significant under Hawai‘i state historic property Criteria “a” (associated with events that have made an important contribution to the broad patterns of our history) and “d” (have yielded, or may be likely to yield information important for research on prehistory or history) pursuant to HAR §13-284-6 (O’Hare et al. 2003:69). Hammatt (2013:1:824) posited that SIHP # -6636 did not retain its integrity to be determined significant under Hawai‘i state historic property Criterion “a.” This was based on the extensive disturbance and altering of SIHP # -6636 and its associated features during modern development. Hammatt (2013) assessed SIHP # -6636 as significant under only Hawai‘i state historic property Criterion “d” for its information potential. The historic property reflects land use activities in the Honolulu Plain during the pre- and post-Contact period (i.e., wetland agriculture, fishpond aquaculture, and salt pans) and has the potential to offer insight into these practices. Pammer and McDermott 2014, Enanoria et al. 2015, and the current study concur with the determination of SIHP # -6636 being significant solely under Criterion “d.” SIHP # -6636 retains its integrity of location and materials. SIHP # -6636 has provided, and can potentially provide, additional information on pre-Contact to early twentieth century habitation, agricultural, and aquacultural use of the former Kewalo wetland surface.

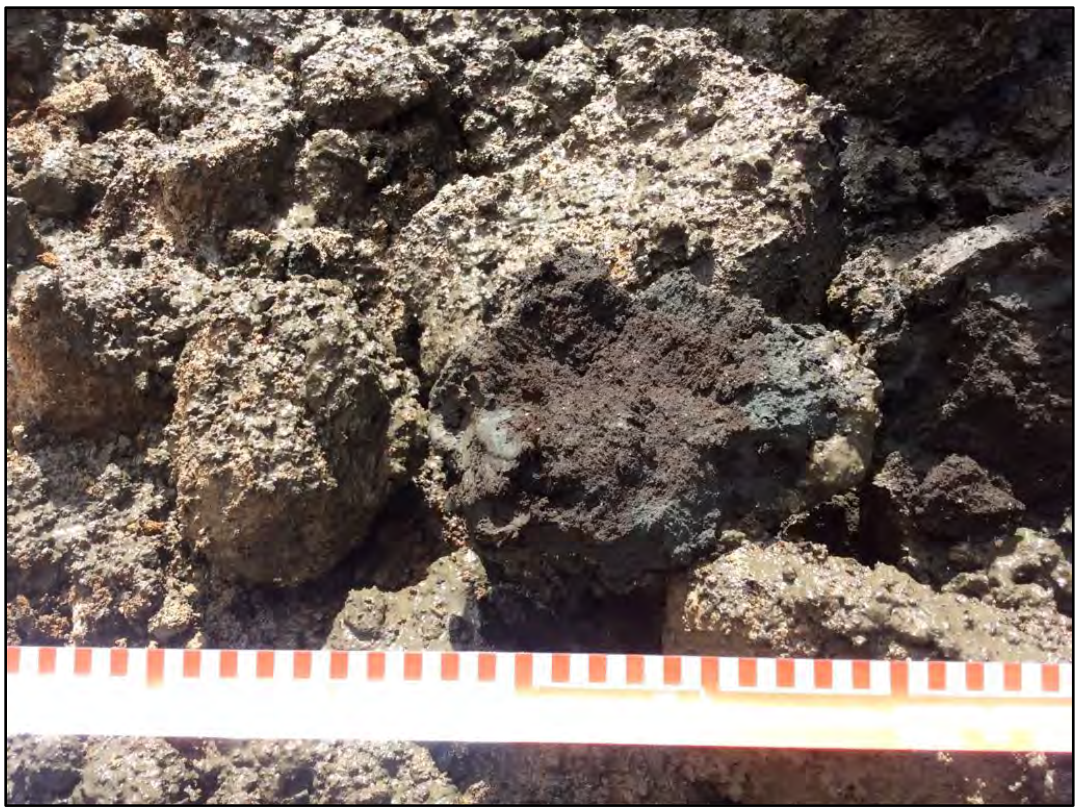

Figure 63. Photograph of SIHP # -6636 sediments observed in the backdirt pile of Profile 2

**Significance Assessment for SIHP # 50-80-14-6636 (from Tardona and Hammatt 2018:86)**

SIHP # -6636 is a pre-Contact to early twentieth century natural wetland deposit with culturally modified components, likely associated with agriculture, aquaculture, and habitation. It has been documented in different portions of the Kewalo area, and was previously determined significant under Hawai‘i state historic property Criteria “a” (associated with events that have made an important contribution to the broad patterns of our history) and “d” (have yielded, or may be likely to yield information important for research on prehistory or history) pursuant to HAR §13-284-6 (O’Hare et al. 2003:69). Hammatt (2013:1:824) posited that SIHP # -6636 did not retain its integrity to be determined significant under Hawai‘i state historic property Criterion “a.” This was based on the extensive disturbance and altering of SIHP # -6636 and its associated features during modern development. Hammatt (2013) assessed SIHP # -6636 as significant under only Hawai‘i state historic property Criterion “d” for its information potential. The historic property reflects land use activities in the Honolulu Plain during the pre- and post-Contact period (i.e., wetland agriculture, fishpond aquaculture, and salt pans) and has the potential to offer insight into these practices. Pammer and McDermott 2014, Enanoria et al. 2015, and the current study concur with the determination of SIHP # -6636 being significant solely under Criterion “d.” SIHP # -6636 retains its integrity of location and materials. SIHP # -6636 has provided, and can potentially provide, additional information on pre-Contact to early twentieth century habitation, agricultural, and aquacultural use of the former Kewalo wetland surface.

Appendix F

# Early Consultation Package

111 S. King Street
Suite 170
Honolulu, HI 96813
808.523.5866
www.g70.design

April 21, 2020

Subject: Early Consultation Request for Draft Environmental Assessment (DEA)
McKinley High School (MHS) Athletic Complex Improvements
Honolulu, Island of O'ahu, Hawai'i
Tax Map Key: (1) 2-3-009:001 (por.)

Dear Participant:

On behalf of the State of Hawai'i, Department of Education (DOE), G70 is undertaking the preparation of a DEA, pursuant to Hawai'i Revised Statutes, Chapter 343, and Hawai'i Administrative Rules (HAR), Chapter 11-200.1 for the proposed MHS Athletic Complex Improvements Project ("Project").

Pursuant to HAR, Chapter 11-200.1-18, the DOE (proposing agency) is conducting early consultation to seek input from agencies, citizen groups, and individuals who may have an area of expertise, which might guide the scope and preparation of the DEA and / or may be affected by the Project. Enclosed in this transmittal is an Early Consultation Handout with a Project description and location map for your review and comment. Please provide comments via U. S. mail or email to the contact indicated below, no later than May 22, 2020.

G70
111 S. King Street, Suite 170
Honolulu, HI 96813
Attn: Mark Kawika McKeague
Phone: (808) 523-5866
Email: mckinleyhscomments@g70.design

Thank you in advance for your participation in the early consultation for this Project.

Sincerely,

GROUP 70 INTERNATIONAL, INC., dba G70

Mark Kawika McKeague, AICP
Principal

Enclosure: Early Consultation Handout

This Early Consultation Handout has been prepared in accordance with the requirements of Hawai‘i Revised Statutes (HRS), Chapter 343 (as amended), and Hawai‘i Administrative Rules (HAR), Chapter 11-200.1, which sets forth the requirements for the preparation of environmental assessments.

## 1.1 PROJECT INFORMATION SUMMARY

| | |
|---|---|
| **Type of Document:** | Draft Environmental Assessment |
| **Project Name:** | McKinley High School (MHS)<br>Athletic Complex Improvements |
| **Proposing and Determining Agency:** | State of Hawai‘i, Department of Education (DOE)<br>Office of Facilities and Operations<br>Facilities Development Branch<br>Project Management Section<br>3633 Waialae Ave. Rm. B-201<br>Honolulu, Hawai‘i 96816 |
| **Agent:** | G70<br>111 S. King Street, Suite 170<br>Honolulu, Hawai‘i 96813<br>Contact: Kawika McKeague, AICP, Principal<br>Phone: (808) 523-5866<br>Email: mckinleyhscomments@g70.design |
| **HRS, Ch. 343 Trigger:** | HRS §343-5(a)(1), use of State lands and funds |
| **Project Location:** | 1039 S. King Street<br>Honolulu, Hawai‘i 96814<br>*(Figure 1: Project Location)* |
| **Tax Map Key(s) (TMK) and Recorded Fee Owner(s):** | TMK: (1) 2-3-009:001 (por.) – State of Hawai‘i, DOE |
| **Project Area:** | Approximately 1.56 acres |
| **State Land Use District:** | Urban |
| **Development Plan and Land Use:** | Primary Urban Center – Institutional |
| **Kaka‘ako Community Development District Mauka Area Plan (2011) Neighborhood Zone:** | Thomas Square (Hawai‘i Community Development Authority [HCDA] Improvement Permit Approval) |
| **Special Management Area (SMA):** | Not inside the SMA |
| **Flood Zone:** | Zone X (area outside floodplain)<br>Zone AE (area within the 100-year floodplain) |
| **Anticipated Determination:** | Finding of No Significant Impact (FONSI) |

## 1.2 OVERVIEW OF PROPOSED PROJECT

The State of Hawai‘i, DOE is proposing to undertake the MHS Athletic Complex Improvements Project (“Project”), which involves the following improvements to the existing athletic complex:

*Demolition*

- Existing maintenance cottage (complete demolition);
- Existing Athletic Physical Education (P.E.) complex (partial or complete demolition);

*Construction*

- New two-story Athletic P.E. complex with locker/shower rooms (15,900 square feet [SF]);
- Stadium lighting and bleachers (with 3,444 seats) at the track and field;
- Storage facility under the bleachers (1,800 SF);
- Plaza with gathering areas; and
- Replacement gravel parking area with space for 41 unmarked parking stalls.

An improved athletic complex will provide MHS students and community members access to quality athletic facilities. MHS athletic teams have participated as a member of the O‘ahu Interscholastic Association for many decades, despite having inadequate athletic facilities. Upon completion of the Project, the improvements will provide quality athletic facilities for MHS’ PE program, athletic team practices, and games. MHS campus contains the most significant public-owned outdoor recreation facilities in the Mauka Area as part of the school’s physical education and athletic programs. These facilities are available during evenings, weekends and summer months for general community use.

The proposed improvements for this Project are independent from those proposed as part of the MHS Athletic Complex Master Plan (ACMP). A Final EA was prepared for the MHS ACMP and a FONSI was issued on April 25, 2011. The 2011 MHS ACMP components consisted of relocation and replacement of the existing track/football field and bleachers (approximately 2,500 seats); three existing tennis courts and addition of three new tennis courts; the existing outdoor rifle range with a new semi-enclosed facility; and the existing baseball field, bleachers (500-1,000 seats), and batting cages; replacement of the Boys P.E. locker/shower facility and Boys athletic locker/shower facility; renovation of the existing gymnasium; and construction of a new 100-stall parking lot, new 2-story YMCA wellness center with a 50-meter swimming pool, bleachers, and a 3-story parking structure (340 stalls), new gymnasium building, new access road extension, new outdoor plaza and a pedestrian boulevard, and a new open plaza at the replacement track/football field.

However, components of the 2011 MHS ACMP that were subsequently implemented are limited to relocation and replacement of four existing tennis courts and the track/football field.

## 1.3 PROJECT SITE

MHS is located on TMK: (1) 2-3-009:001 (por.) in Honolulu, on the island of O‘ahu (*Figure 1: Project Location*). The proposed improvement area is comprised of approximately 1.56 acres, located within the existing athletic complex on the southwestern portion of MHS.

MHS is in the heart of Honolulu, within walking distance of State and County offices, The Queen’s Medical Center, Neal S. Blaisdell Center, Ala Moana Center, Thomas Square and the Honolulu Museum of Arts. MHS is bordered by South King Street to the north, Pensacola Street to the east, Kapi‘olani Boulevard to the south, and Neal S. Blaisdell Center’s parking structure to the west. MHS is situated within the “Urban” State Land Use District and is considered a “Public” land use, per

HCDA's 2011 Mauka Area Plan. The neighborhoods surrounding the campus consist primarily of low-rise commercial and low- and mid-rise residential uses.

## 1.4 PURPOSE OF ENVIRONMENTAL ASSESSMENT

On behalf of the DOE, G70 is undertaking the preparation of a DEA, pursuant to HRS, Chapter 343, and HAR, Chapter 11-200.1 for the proposed Project. Under HRS, §343-5(a)(1), this Project triggers a need for an environmental review as it proposes the use of state lands and funds. The DEA will include a description of the proposed action and alternatives considered; a description of the existing environment; identification and analysis of potential impacts of the Project; and proposed mitigation measures. This DEA is expected to result in a FONSI.

**Figure 1: Project Location**

Appendix G

# Early Consultation Comments

Early Consultation Comments

# State of Hawai‘i Agencies

# HAWAII COMMUNITY DEVELOPMENT AUTHORITY

547 Queen Street, Honolulu, Hawaii 96817
Web site: http://dbedt.hawaii.gov/hcda/

DAVID Y. IGE
GOVERNOR

JOHN WHALEN
CHAIR

GARETT KAMEMOTO
INTERIM EXECUTIVE DIRECTOR

Telephone: (808) 594-0300
Fax: (808) 587-0299


Ref. No.: PL EIS 6.28

May 18, 2020

Mr. Mark Kawika McKeague
G70
111 S. King Street, Suite 170
Honolulu, Hawaii 96813

Dear Mr. McKeague:

Re: Draft Environmental Assessment ("EA")
McKinley High School Athletic Complex Improvements Project

Thank you for the opportunity to provide comments on the Early Consultation for the subject Draft EA. We have no comments to offer at this time.

Should you have any questions regarding this matter, please contact Susan Tamura of our Planning Office at (808) 594-0330 or via email susan.j.tamura@hawaii.gov.

Sincerely,

Garett Kamemoto
Interim Executive Director

GK/ST:ar

DAVID Y. IGE
GOVERNOR

JADE T. BUTAY
DIRECTOR

Deputy Director
LYNN A.S. ARAKI-REGAN
DEREK J. CHOW
ROSS M. HIGASHI
EDWIN H. SNIFFEN

**STATE OF HAWAII**
**DEPARTMENT OF TRANSPORTATION**
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:
DIR 0398
HWY-PS 2.2960

May 26, 2020

Mr. Mark Kawika McKeague
Principal
Group 70 International, Inc.
111 South King Street, Suite 170
Honolulu, Hawaii 96813

Dear Mr. McKeague:

Subject: Request for Comments
Early Consultation for Draft Environmental Assessment
McKinley High School – Athletic Complex Improvements
1039 South King Street
Tax Map Key No. (1) 2-3-009: 001 – Honolulu, Oahu

Thank you for your letter dated April 21, 2020 requesting our review of the subject project as an early consultation on the preparation of a Draft Environmental Assessment required by Chapter 343, Hawaii Revised Statutes, due to the use of State lands and State funds. The proposed project involves the demolition of an existing physical education complex and the construction of a 15,900 square-foot athletic complex, bleachers for 3,400 seating capacity for the track and field, and a plaza for large gathering and other minor improvements. According to the Applicant, the proposed work is not part of the Athletic Complex Masterplan previously reviewed in 2011.

The school is bordered by three County roadways; South King Street to the north, Pensacola Street to the east, and Kapiolani Boulevard to the south. There is no information on the project site's access points at this time.

Based on the information provided, the proposed project does not appear to significantly impact the State highway system. Therefore, Hawaii Department of Transportation (HDOT) has no comments. However, in the event there are any unexpected traffic issues attributed to the project, the applicant shall mitigate them to the satisfaction of the HDOT.

If you have any questions, please contact Jeyan Thirugnanam, Systems Planning Engineer, Highways Division, Planning Branch at (808) 587-6336 or by email at jeyan.thirugnanam@hawaii.gov. Please reference file review number PS 2020-060.

Sincerely,

JADE T. BUTAY
Director of Transportation

Early Consultation Comments

# City and County of Honolulu Agencies

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

KIRK CALDWELL
MAYOR

MANUEL P. NEVES
FIRE CHIEF

LIONEL CAMARA JR.
DEPUTY FIRE CHIEF

May 4, 2020

Mr. Mark McKeague, AICP
G70
111 South King Street, Suite 170
Honolulu, Hawaii 96813

Dear Mr. McKeague:

Subject: Early Consultation Request for Draft Environmental Assessment
McKinley High School Athletic Complex Improvements
1039 South King Street
Honolulu, Hawaii 96814
Tax Map Key: 2-3-009: 001 (por.)

In response to your letter dated April 21, 2020, regarding the abovementioned subject, the Honolulu Fire Department (HFD) reviewed the submitted information and requires that the following be complied with:

1. Fire department access roads shall be provided such that any portion of the facility or any portion of an exterior wall of the first story of the building is located not more than 150 feet (45 meters) from fire department access roads as measured by an approved route around the exterior of the building or facility. (National Fire Protection Association [NFPA] 1; 2012 Edition, Sections 18.2.3.2.2 and 18.2.3.2.2.1.)

   A fire department access road shall extend to within 50 feet (15 meters) of at least one exterior door that can be opened from the outside and that provides access to the interior of the building. (NFPA 1; 2012 Edition, Section 18.2.3.2.1.)

2. A water supply approved by the county, capable of supplying the required fire flow for fire protection, shall be provided to all premises upon which facilities or buildings, or portions thereof, are hereafter

constructed, or moved into or within the county. When any portion of the facility or building is in excess of 150 feet (45,720 millimeters) from a water supply on a fire apparatus access road, as measured by an approved route around the exterior of the facility or building, on-site fire hydrants and mains capable of supplying the required fire flow shall be provided when required by the AHJ [Authority Having Jurisdiction]. (NFPA 1; 2012 Edition, Section 18.3.1, as amended.)

3. The unobstructed width and unobstructed vertical clearance of a fire apparatus access road shall meet county requirements. (NFPA 1; 2012 Edition, Sections 18.2.3.4.1.1 and 18.2.3.4.1.2, as amended.)

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

Should you have questions, please contact Battalion Chief Wayne Masuda of our Fire Prevention Bureau at 723-7151 or wmasuda@honolulu.gov.

Sincerely,

JASON SAMALA
Assistant Chief

JS/TC:gl

**BOARD OF WATER SUPPLY**

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843
www.boardofwatersupply.com

KIRK CALDWELL, MAYOR

BRYAN P. ANDAYA, Chair
KAPUA SPROAT, Vice Chair
KAY C. MATSUI
RAY C. SOON
MAX J. SWORD

ROSS S. SASAMURA, Ex-Officio
JADE T. BUTAY, Ex-Officio

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

ELLEN E. KITAMURA, P.E.
Deputy Manager and Chief Engineer

May 7, 2020

Mr. Mark Kawika McKeague
Group 70 International, Inc.
111 South King Street, Suite 170
Honolulu, Hawaii 96813

Dear Mr. McKeague:

Subject: Your Letter Dated April 21, 2020 Requesting Comments on the Draft Environmental Assessment Early Consultation for McKinley High School Athletic Complex Improvements off King Street - Tax Map Key: 2-3-009: 001

Thank you for the opportunity to comment on the proposed athletic complex improvement project.

The existing water system is adequate to accommodate the proposed development. 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 the 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.

Water conservation measures are required for all proposed developments. These measures include utilization of nonpotable water for irrigation using rain catchment, drought tolerant plants, xeriscape landscaping, efficient irrigation systems, such as a drip system and moisture sensors, and the use of Water Sense labeled ultra-low flow water fixtures and toilets.

The developer should investigate the feasibility of using nonpotable water for irrigation of the proposed renovated athletic complex. If nonpotable water is either unavailable or infeasible, a report of the investigation including proposed irrigation demands should be submitted to us before we will consider the use of potable water.

The construction drawings should be submitted for our review, and the construction schedule should be coordinated to minimize impact to the water system.

The on-site fire protection requirements should be coordinated with the Fire Prevention Bureau of the Honolulu Fire Department.

If you have any questions, please contact Robert Chun, Project Review Branch of our Water Resources Division at 748-5443.

Very truly yours,

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

DEPARTMENT OF PLANNING AND PERMITTING
**CITY AND COUNTY OF HONOLULU**
650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
PHONE: (808) 768-8000 • FAX: (808) 768-6041
DEPT. WEB SITE: www.honoluludpp.org • CITY WEB SITE: www.honolulu.gov

KIRK CALDWELL
MAYOR

KATHY K. SOKUGAWA
ACTING DIRECTOR

TIMOTHY F. T. HIU
DEPUTY DIRECTOR

EUGENE H. TAKAHASHI
DEPUTY DIRECTOR

May 8, 2020 2020/ELOG-787(WA)

Mr. Kawika McKeague
G70
111 South King Street, Suite 170
Honolulu, Hawaii 96813

Dear Mr. McKeague:

SUBJECT: Pre-Draft Environmental Assessment (DEA)
McKinley High School Athletic Complex Improvements
1039 South King Street - Kakaako
Tax Map Key 2-3-009: 001 (por.)

We have reviewed the Pre-DEA for the McKinley High School Athletic Complex Improvements (received April 23, 2020) and have no comment related to zoning and land use. The Project is within the Kakaako Community Development District (KCDD) which is outside the zoning and land use jurisdiction of the Department of Planning and Permitting. The KCDD is regulated by the State of Hawaii Community Development Authority, which is responsible for development in the District.

Should you have any questions, please contact William Ammons, of our staff, at 768-8025.

Very truly yours,

for Kathy K. Sokugawa
Acting Director

POLICE DEPARTMENT

**CITY AND COUNTY OF HONOLULU**

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

KIRK CALDWELL
MAYOR

SUSAN BALLARD
CHIEF

JOHN D. McCARTHY
CLYDE K. HO
DEPUTY CHIEFS

OUR REFERENCE **EO-TS**

May 13, 2020

Mr. Mark Kawika McKeague, AICP
Principal
Group 70 International, Inc. (dba G70)
111 South King Street, Suite 170
Honolulu, Hawaii 96813

Dear Mr. McKeague:

The Honolulu Police Department (HPD) anticipates short-term impacts to pedestrian and vehicular traffic during the construction phase of the project, particularly along Kapiolani Boulevard and Pensacola Street as they are both busy roadways. The HPD recommends that all necessary signs, lights, barricades, and other safety equipment be installed and maintained by the contractor to facilitate the flow of traffic during the construction phase of the project.

Furthermore, the HPD recommends that a parking area for first responders be reserved that is easily accessible to the main entrance of the construction area. Lastly, due to the project's proximity to the Neal S. Blaisdell Center, the contractor should maintain communication with the venue to avoid any disruption with scheduled events.

If there are any questions, please call Major Glenn Hayashi of District 1 (Central Honolulu) at 723-3327.

Thank you for the opportunity to review this project.

Sincerely,

ALLAN T. NAGATA
Assistant Chief
Support Services Bureau

Early Consultation Comments

# Organizations, Neighbors, and Individuals

**From:** Ruth Pagell <rpagell@hawaii.edu>
**Sent:** Saturday, April 25, 2020 12:16 PM
**To:** McKinley HS Athletic Complex comments
**Subject:** McKinley Athletic facilities
**Attachments:** mckinlevhscomments.pdf

As a resident of Admiral Thomas, I support the concept using the existing vacant land to improve the athletic facility but with four reservations: Community access, lighting, gender equity and parking.
I realize this is just a preliminary plan so assume a next step will not be taken without more details.

Please see the attached comments.

--

*Ruth A Pagell*

Ruth A,. Pagell

Author & speaker - Ruth's Rankings on Bibliometrics and university rankings
http://librarylearningspace.com/ruths-rankings-1/ -
Emeritus Faculty Librarian,, Emory University, Atlanta, GA
Founding Librarian, Singapore Management University
Former Adjunct Professor University of Hawaii
Linked in: https://www.linkedin.com/in/ruth-pagell-b9869610/
ORCID ID: 0000-0003-3238-9674

As a resident of Admiral Thomas, I support the building of the planned athletic facilities with four major concerns.

**Community access:** We were told with the first upgrade there would be community access and there is virtually NO community access to the track. We were better off with the three-quarter dirt track which was available all year round.. I have never found a time when the track is available based on existing rules. It is ironic that I have more access to the Punahou track then the track that was built in my neighborhood with my tax money.

This is not true:

> Project, the improvements will provide quality athletic facilities for MHS PE program, athletic team practices, and games. MHS campus contains the most significant pubic-owned outdoor recreation facilities in the Mauka Area as part of the school's physical education and athletic programs. These facilities are available during evenings, weekends and summer months for general community use.

**Lights:** The lights from the softball field already are a problem since they shine into all of our bedrooms. Neighbors on all sides need to be considered when planning the placement of the lights and the type of lighting used. The lights from Roosevelt, almost a mile away, also shine into the buildings in Makiki. I happened to have been on a local planning board in one place I lived and while we strongly supported a project being proposed, the lighting became the major stumbling block.

**New PE Building:** Is this facility Title IX compliant and designed to provide the same level of facilities for both male and female students?

**Parking:** The plan talks about adding over 3400 seats and 41 parking stalls. Where will everyone park?

If all of these issues are addressed, I would support the project.

Ruth A. Pagell

rpagell@hawaii.edu

25 April 2020

**From:** Laverne Moore <laverne.moorehi@gmail.com>
**Sent:** Wednesday, April 29, 2020 9:06 PM
**To:** McKinley HS Athletic Complex comments
**Subject:** Where is the funding coming from when schools are being under funded and state workers and going to be put on furloughs or 20% pay cut.

**From:** racoimua@gmail.com
**Sent:** Sunday, May 10, 2020 4:07 AM
**To:** McKinley HS Athletic Complex comments
**Subject:** Athletic Complex

McKinely High School is one of the first high schools built in Hawaii. Lots of addition and renovation over the years. Not much ‘aina to expand, however the opportunity to transformed a much needed and modernized athletic facility/complex, would bring the Tigers to the forefront, in addition to its awesome educational/academic excellence.

MHS No Ka Oi,

Merlyn E. Raco
Alumni Class ‘62

**From:** racoimua@gmail.com
**Sent:** Sunday, May 10, 2020 5:03 AM
**To:** McKinley HS Athletic Complex comments
**Cc:** 'Lester Oda'
**Subject:** MHS Athletic Complex

As an alumni class of ’62, I can remember the days of practicing and playing football/running track on the old field filled with gravel and grass. A member of the swim team (25 yd. pool) and using the make shift locker room under the concrete swim pool. A wooden wall that separated the boys and girls changing area with no showers. The swim pool was demolished years after. The athletic facilities was not discouraging, rather I was proud to be part of McKinley High School. I am retired from a fruitful 41 years career as a Youth Development Professional in the field of Boys & Girls Clubs of America, by way of California and Hawaii. I have worked with young people in poverty stricken communities where facilities were make shift or improvised programs to developed activities that were “fun with a purpose.” In my professional line of duty with youth, I always felt my priorities are: Kids (students) 1st; Staff (educators/coaches) 2nd; Administrators 3rd).

My past experiences did not discourage me, instead it lead me to the challenge, to be creative and overcome the obstacles to enjoy the athletic programs and opportunities. MHS Athletic facilities/equipment is of the past and deserves the best for the present and future students athletic exposure and experiences. A proposal/consideration for the development of MHS Athletic Complex/facility would be a blessing and long overdue. “Change is the law of life. And those who look only to the past or present are certain to miss the future,” John F. Kennedy – “Change will not come if we wait for some other time. We are the ones we’ve been waiting for. We are the change we seek,” Barack Obama.

MHS No Ka Oi,

Merlyn E. Raco
Alumni Class of ‘62