Appendix D

Traffic Impact Analysis Report
County of Kauai
Department of Public Works
Lihue Civic Center Master Plan

Lihue, Island of Kauai, Hawaii

OCTOBER 2005

Prepared for:
PBR Hawaii
American Savings Bank Tower, Suite 650
1001 Bishop Street
Honolulu, Hawaii 96813

Prepared by:

M&E Pacific, Inc.

METCALF & EDDY

Davies Pacific Center, 841 Bishop Street
Suite 1900, Honolulu, Hawai'i 96813

Table of Contents

Table of Contents (cont'd)

List of Figures

List of Figures (cont'd)

List of Tables

TRAFFIC IMPACT ANALYSIS
for the
COUNTY OF KAUAI DEPARTMENT OF PUBLIC WORKS
LIHUE CIVIC CENTER MASTER PLAN

I. PURPOSE OF STUDY

The County of Kauai Department of Public Works is developing a master plan for its Lihue Civic Center, a two block area in central Lihue bounded by Rice Street, Kuhio Highway, Hardy Street and Umi Street. This master plan represents a renewed commitment to revitalize the Lihue Civic Center, creating a pedestrian-friendly town center where workers, residents and visitors could enjoy civic activities and walk to nearby shops and businesses, as an example for all of Kauai. The County engaged PBR Hawaii to develop and evaluate various concepts of site improvements for the Lihue Civic Center, based on input from government, business and community representatives, then recommend a final master plan. M&E Pacific, Inc., was subcontracted to evaluate the traffic impacts of the conceptual, preliminary and recommended master plans. A location map of the project site is provided as **Figure I-1**.

This study was initiated in the fall of 2003 and proceeded concurrently with the County Planning Department's Lihue Town Core Urban Design Plan conducted by PBR Hawaii. Its scope and effort involved a wider area of Lihue town, including the Civic Center, and many planning efforts were coordinated to ensure consistency. The traffic forecasts for this latter study were not available at the time of this study and were not incorporated into this study. However, the findings and recommendations from this study will be incorporated into the traffic study prepared for that project.

This report identifies the current and future traffic conditions for the Lihue Civic Center with the recommended master plan. Chapter II describes current traffic conditions. Chapter III reviews and analyzes conceptual and refined alternatives that were

developed with input from the various stakeholders. Chapter IV discusses alternative traffic solutions for the preferred master plan. Chapter V summarizes the traffic-related recommendations for the final recommended master plan.

II. REVIEW OF CURRENT TRAFFIC CONDITIONS

The Lihue Civic Center is a two block area in central Lihue bounded by Rice Street, Kuhio Highway, Hardy Street, and Umi Street. A plan of the current Civic Center is shown on **Figure II-1**. M&E Pacific, Inc., conducted a survey of existing roadway and traffic conditions within the study area in October 2003.

A. Roadways

The roadways encompassing the Lihue Civic Center include Kuhio Highway on the west, Rice Street on the south, Hardy Street on the north and Umi Street on the east. Eiwa Street separates the civic center into an east block that includes the County and State buildings, and a west block with the Lihue Civic Center Building, some commercial offices, and a super market.

Kuhio Highway is a four-lane highway whose name changes to Kaumualii Highway south of its intersection with Rice Street. It provides north-south access through Lihue from the rest of the island and is under the jurisdiction of the State of Hawaii Department of Transportation (State DOT). On-street parking is not permitted on Kuhio Highway within the study area.

Rice Street was recently improved to a four-lane roadway. It provides east-west access on the south boundary of the Civic Center. The eastbound lanes have several off-line parking stalls (that do not block traffic flow) between Haleko Street and Eiwa Street, and several on-street stalls between Eiwa Street and Umi Street. The westbound lanes have several on-street stalls west of Eiwa Street. On-street parking is permitted during off peak periods that effectively limit Rice Street to one travel lane in each direction.

Peak parking bans are in effect from 7:00 to 9:00 A.M. and from 3:00 to 5:00 P.M. that allow two lanes of travel. The County placed traffic delineators in early October 2003 on the center line of Rice Street between Eiwa Street and Haleko Street to prevent left turns into several buildings along Rice Street due to accident experience.

Rice Street provides continuous access from the Kuhio Highway/Kaumualii Highway intersection to east of the study area. The Kuhio Highway/Kaumualii Highway and Umi Street intersections are controlled by traffic signals within the study area. All of the other side street approaches intersecting Rice Street are controlled by stop signs, including Haleko Street, Kele Street, Eiwa Street and Waa Street. There are no stop sign controlled approaches on Rice Street within the study area.

Hardy Street is a two-lane roadway that provides east-west access on the north boundary of the civic center. On street parking is permitted on both sides of the street. There is a sidewalk on the north curb and painted shoulders or an asphalt berm on the south curb. The roadway curb-to-curb width varies from 40' to 50' and can be poorly defined on the south curb. Hardy Street provides limited access to private driveways on the north curb and to the Lihue Civic Center and State Building parking lots on the south curb.

Hardy Street provides continuous access from the Kuhio Highway intersection to its intersection with Rice Street east of the study area. All of the side street approaches intersecting Hardy Street are controlled by stop signs, including Akahi Street, Eiwa Street, Elua Street, Umi Street and Ka'ana Street. There are no stop sign controlled approaches on Hardy Street within the study area.

Umi Street and Eiwa Street are two-lane local roads that provide north-south access between Rice Street and Hardy Street, and access to the Civic Center parking lots. Both streets permit on-street parking and have painted shoulders. Umi Street continues north from Hardy Street to Ahukini Road as a local residential roadway.

Haleko Street is a two-lane roadway providing access between Rice Street and the Kukui Grove Center. The northbound approach at Rice Street is restricted to right turns only. Kele Street is a short two-lane roadway off Rice Street providing access to the post office, Lihue Plantation Building and banks. Akahi Street and Elua Street are two-lane local residential roadways between Hardy Street and Ahukini Road.

B. Traffic Volumes

Traffic turning movement counts were taken at all major and most minor intersections and driveways in the study area to determine the existing traffic patterns around the Civic Center during the morning and afternoon peak periods. The counts were taken during the same time periods as the peak parking restrictions. Traffic turning movement counts require traffic surveyors to station themselves by each study intersection and record each vehicle movement as through or turning movements by 15 minute intervals. Full traffic counts were taken from late September to mid-October 2003, at the following intersections and dates:

- Rice Street at Kuhio Highway/Kaumualii Highway (October 1. 2003)
- Rice Street at Haleko Street (October 14, 2003)*
- Rice Street at driveway entry to Lihue Civic Center (October 2, 2003)
- Rice Street at Eiwa Street (September 30, 2003)
- Rice Street at Umi Street (October 7, 2003)*
- Hardy Street at Kuhio Highway September 25, 2003)
- Hardy Street at Akahi Street (September 23, 2003)
- Hardy Street at Eiwa Street (September 24, 2003)
- Hardy Street at Umi Street (October 8, 2003)*

Those counts identified by an asterisk (*) were taken after plastic delineators were placed on Rice Street. Partial traffic counts of turning movements only were taken at the two Eiwa Street driveway entrances to the Lihue Civic Center on October 9, 2003,

after the traffic delineators were placed. The several entrances to the County and State Building parking lots (east of Eiwa Street) were counted as one driveway.

Additional traffic counts were subsequently taken in December 2004 at the following locations and dates as issues arose and emphasized the need for this information:

- Rice Street at Kele Street (December 16, 2004)
- Hardy Street at Big Save Driveway (December 14, 2004)
- Kuhio Highway at County/Big Save Driveway, AM peak only (December 10, 2004)
- Umi Street at State/County driveway (December 15, 2004)

The worksheets for the traffic counts are included in **Appendix A**. The results of the traffic counts are shown schematically on the attached **Figure II-2A** for the A.M. peak hour and **Figure II-2B** for the P.M. peak hour (hereafter referred collectively as **Figure II-2**). The volumes for several through traffic movements on Eiwa Street and Hardy Street that were not counted were derived from differences in traffic counts at adjacent intersections and are identified by shading. The traffic volumes are rounded to the nearest five vehicles per hour (vph).

The morning peak hour was observed to be between 7:15 and 8:15 A.M. This is within the limits of the current morning parking ban. The afternoon peak hour was between 4:00 and 5:00 P.M., when the counts were terminated. Based on the trends in the 15 minute traffic volumes, there is reason to believe that the peak extends beyond 5:00 P.M. The County should undertake additional studies to determine if the afternoon parking ban should be extended to 5:30 P.M.

A high peaking pattern was noted in these traffic counts. The highest traffic volumes occurred between 7:30-7:45 A.M. and 4:30-4:45 P.M., which are the County's official start and end work times. This peaking is characterized by the traffic Peak Hour Factor (PHF) values that are generally lower than 0.90. A PHF value less than 0.90 indicates

that traffic volumes in one 15-minute interval of the peak hour is significantly higher than the other intervals.

The State DOT takes metered traffic counts at selected locations on Kauai roadways every two years. One of these count stations is at the Kuhio Highway/Kaumualii Highway/Rice Street intersection. Their data shows that two way daily volumes on Kuhio Highway gradually increased from 1991 to 1995, remained steady to 1999, increased in 2001 and leveled off in 2003. This traffic trend is shown in tabular and graph form on **Figure II-3**. The two counts taken in October 2001 after the September 11, 2001, World Trade Center incident show daily volumes of 24,500 and 29,300 (not shown in **Figure II-3**), a difference of almost 5,000 vehicles per day. The 2003 count was taken after the commencement of Operation Iraqi Freedom in March.

The daily traffic volumes on Kaumualii Highway increased steadily to 1999 and have remained at about the same level. The two October 2001 daily count volumes were the same, unlike the Kuhio Highway counts that differed significantly. The volumes on Rice Street steadily decreased up until 2001 and then increased in 2003 but remained below pre-1999 levels. These traffic trends are also shown on **Figure II-3**.

The state data also includes hourly traffic volumes through the course of the day in 2003, as shown on **Figure II-4**. The southbound hourly volumes on Kuhio Highway peaked at 7:00 A.M. with 960 vph, then after a two hour gap, remained at about that level until 5:00 P.M. The northbound volumes show a small peak at 7:00 A.M., then after a two hour gap, gradually increased to a higher peak at 3:00 P.M. The eastbound traffic on Rice Street reached a peak of 470 vph at 7:00 A.M., then remained at about 400 vph until 5:00 P.M. The westbound traffic show morning, midday and afternoon peaks. These two roadways do not exhibit the typical hourly pattern of a commuter roadway with a morning peak in one direction and an afternoon peak in the other direction, indicating that these two roadways serve a business district.

The current afternoon peak hour traffic volumes were compared to the volumes reported in the Kauai County Office Complex Traffic Impact Analysis Report (November 1989) prepared by Pacific Planning and Engineering, Inc. In general, the current traffic volumes on Rice Street, Eiwa Street, and Hardy Street are equal to or lower than the 1989 volumes while traffic volumes on Kuhio Highway have increased. This finding corresponds to the trends noted on the State DOT biennial traffic counts above.

A separate parking survey of Civic Center occupants was conducted by PBR Hawaii to determine the demand for parking. The surveyed occupants included County and State offices in the Civic Center, the Kauai Museum and the super market. The survey methodology and results are not included in this report.

C. Traffic Accident Analysis

A traffic accident analysis was conducted on the five (5) roadways in the study area for the 18 month period from July 2001 to December 2002. This was the latest period for which these records were available when they were requested from the State of Hawaii Department of Transportation at the start of this study. Rice Street was under construction for part of this time. There were only a limited number of accidents that did not indicate any major traffic problems during this period. The accident experience that caused the placement of traffic delineators on Rice Street occurred after the data period.

D. Level of Service

The concept of level of service is used to quantify the quality of traffic flow on roadway facilities. The Transportation Research Board has developed procedures to calculate level of service value(s) by measuring traffic volumes against the capacities of different types of roadway facilities. Their Highway Capacity Manual 2000 (HCM2000) describes the various procedures developed for freeways, highways, signalized and unsignalized intersections, etc. The existing traffic volumes from **Figure II-2** were used to calculate

current levels of service. The worksheets for the level of service analysis are included in **Appendix B.**

The methodology for analyzing signalized intersections calculates the levels of service for individual approaches and the intersection as a whole based on the average stopped delay per vehicle. The results range from level of service A (best with average delays less than five seconds) to F (worst with average delays longer than 80 seconds, described as follows:

LEVEL OF SERVICE	CONTROL DELAY PER VEHICLE (Seconds/Vehicle)
A	<10.0
B	10.1 to 20.0
C	20.1 to 35.0
D	35.1 to 55.0
E	55.1 to 80.0
F	>80.0

Many jurisdictions consider levels of service A to D as acceptable for areas like Lihue, with levels of service E and F indicating the need for mitigating measures. For signalized intersections, the major streets can be designed to have a higher level of service than the side streets or turning lanes.

The results of the level of service analyses on **Table II-1** show that both signalized intersections are operating at an overall level of service B during both peak periods. At the Kuhio Highway/Kaumualii Highway/Rice Street intersection, the westbound left turn movement from Rice Street to Kaumualii Highway is operating at level of service D, a minimally acceptable level, in both periods while the northbound and southbound movements on the highways are at levels A or B. The difference in levels of service is in accordance with general practice to favor the major street traffic flow. All traffic

movements at the Rice Street/Umi Street intersection are at level of service C or better, indicating acceptable traffic conditions.

The procedure used for analyzing unsignalized intersections calculates vehicle delays and levels of service for critical turning movements including outbound movements from the stop-controlled approach and left turns from the main road to the minor road. The procedure does not calculate an overall intersection level of service. The Highway Capacity Manual defines the relationship between level of service and delay (in seconds/vehicle) for unsignalized intersections as shown below:

LEVEL OF SERVICE	DELAY (Seconds/Vehicle)
A	< 10.0
B	10.1 to 15.0
C	15.1 to 25.0
D	25.1 to 35.0
E	35.1 to 50.0
F	> 50.1

Levels of service A to E are considered acceptable for unsignalized intersections. Level of service F (with average delays longer than 50 seconds) is considered undesirable and would indicate the need for mitigation. Level of service F conditions could be tolerated if the delays are not much higher than 50 seconds, traffic queues are short, and there are no reasonable mitigating measures available.

The results on **Table II-1** show that several left turn movements from the side streets are operating at level of service F, indicating very long delays and the possible need for mitigation. These movements include southbound Eiwa Street onto Rice Street, westbound Hardy Street onto Kuhio Highway, and northbound Umi Street onto Hardy Street. The left turn from Hardy Street onto Kuhio Highway is particularly difficult to make and is characterized with delay times over 100 seconds. The left turns from Umi

Street onto Hardy Street are made into congested local traffic. Drivers on Hardy Street let in the left turners from Umi Street so that their wait may not be as long as the calculations indicate.

A level of service F not only means long delays but could also indicate a hazardous traffic situation as drivers become impatient, take their chances and make their turns into smaller than acceptable gaps in the main traffic stream. This is particularly the case with the left turn from Hardy Street onto Kuhio Highway. For the southbound Eiwa Street left turn onto Rice Street and the westbound Hardy Street left turn onto Kuhio Highway, longer alternate routes could be used to get to a signalized intersection where the turn could be more safely made.

The Haleko Street right turn movement onto Rice Street shows level of service E for both peak periods. This would indicate current minimally acceptable conditions that could require mitigation in the future as traffic on Rice Street increases.

Level of service alone is not always sufficient to evaluate the efficiency of left turn movements from major streets, especially when the movement is made from a shared traffic lane. As an example, traffic backups were forming on Rice Street between Haleko and Eiwa Streets due to large volumes of left turns being made into several office buildings, until the plastic delineators were placed in early October 2003. The levels of service for the left turn movement from Rice Street into Haleko Street were B and C, which would normally be considered acceptable but does not indicate the traffic queuing that was taking place. Average delays and queue length can give a better indication of the disruption that may be caused to through traffic movements. These measures will be given further study.

III. REVIEW OF TRAFFIC ISSUES RELATED TO PRELIMINARY ALTERNATIVES

Four conceptual alternatives were initially developed by PBR Hawaii and evaluated with input from government, business and community representatives. This evaluation resulted in two refined alternatives that were further evaluated and led to the final alternative. This section describes the distinguishing features of the preliminary alternatives and the results of the qualitative traffic analysis conducted by M&E Pacific, Inc.

A. Development of Conceptual Alternatives

The highlights of the initial four conceptual alternatives are described below.

Conceptual Alternative 1- Minimal Construction Demolition

This concept is illustrated on **Figure III-1**. Its distinguishing features include:

- Minimal construction and demolition.
- Provides 485 parking stalls in County area and 224 stalls at War Memorial to meet demand for 559 stalls.
- Traffic roundabout at Hardy Street/'Akahi Street/Eiwa Street intersection.
- Pedestrian promenade from Mo'ikeha Building to County Lawn.
- Tree lined streets with sidewalks.
- On street parking with lots of pavement.
- Lowest cost alternative.
- State property unchanged except for elimination of one driveway on Eiwa Street.

Conceptual Alternative 2- Grand Park Along Rice Street and Parking Structure at War Memorial

This concept is illustrated on **Figure III-2**. Its distinguishing features include:

- 400 stall parking structure at War Memorial.
- Provides 227 parking stalls in County area and 400 stalls at War Memorial to meet demand for 559 stalls.

- Traffic roundabout at Hardy Street/'Akahi Street/Eiwa Street intersection.
- Pedestrian promenade from Mo'ikeha Building to County Lawn.
- Expanded County Lawn and new mini-parks.
- Tree lined streets with sidewalks.
- On street parking.
- Regular, frequent shuttle runs between Civic Center, War Memorial, New Police Station, and Kukui Grove Shopping Center.
- Moderate cost alternative.
- State property unchanged except for elimination of one driveway on Eiwa Street.

Conceptual Alternative 3- Campus-Like Setting and Below Grade Parking

This concept is illustrated on **Figure III-3**. Its distinguishing features include:

- Two below grade parking garages with a total of 326 stalls and park above.
- Provides 379 on site parking stalls and 224 stalls at War Memorial to meet demand for 474 stalls.
- Traffic roundabout at Hardy Street/'Akahi Street/Eiwa Street intersection.
- Pedestrian promenade from Mo'ikeha Building to County Lawn.
- Big Save relocated off site.
- Eiwa Street closed to through traffic, only parking access permitted.
- Tree lined streets with sidewalks.
- On street parking.
- Moderate cost alternative.
- State property unchanged except for elimination of one driveway on Eiwa Street.

Conceptual Alternative 4- Urban Mixed Use Civic Center and Two parking Structures

This concept is illustrated on **Figure III-4**. Its distinguishing features include:

- Two 3-level parking structures with a total of 450 stalls, 26,500 gsf retail space and 22 multi-family units fronting public streets.

- Provides 605 on site parking stalls and 224 stalls at War Memorial to meet demand for 694 stalls.
- Expanded County Lawn with new plazas and mini-parks.
- Tree lined streets with sidewalks.
- On street parking.
- Considerable cost, long-term scenario.
- State property unchanged except for elimination of one driveway on Eiwa Street.

B. Traffic Analysis of Conceptual Alternatives

A qualitative traffic analysis of each of the four conceptual alternatives was conducted by M&E Pacific, Inc., to provide input to the evaluation teams. The comments are based on current traffic volumes since a traffic forecast year was not established at the time of this analysis. Specific comments on each alternative are provided below.

Conceptual Alternative 1- Minimal Construction/Demolition

1. There should be very little changes in existing traffic patterns. There probably will not be a slight decrease in traffic volumes with the transfer of some vehicles to the War Memorial parking lot since other vehicles would serve as informal "shuttles." The proposed roundabout would probably not affect traffic patterns.

2. Consider banning left turns from Hardy Street to Kuhio Highway at least in peak periods, preferably 6 a.m. to 6 p.m. weekdays, if traffic signals are not installed. Left turns would be made at Rice Street via Eiwa Street.

3. If left turns from Rice Street remain prohibited between Eiwa Street and Haleko Street, then the entrance to the south parking lot should be right turn in/out only.

Conceptual Alternative 2- Grand Park Along Rice Street and Parking Structure at War Memorial

1. Large changes in traffic patterns can be expected. There would be more eastbound and less westbound traffic in the morning, and vice versa in the afternoon. There would probably be more traffic on Umi Street between Hardy Street and Ahukini Street, a residential street. There would also be a greater impact on the Hardy Street/Umi Street intersection, which may require traffic signals. There would be an impact at the Rice Street/Hardy Street intersection, which was not studied.

2. Assigning "close-in, preferred" parking will be a difficult task. Big Save and Museum will probably take most of stalls. County customers may experience longer walks to County offices.

3. Shuttle service will have to be frequent to be useful to its users. Having the shuttle go to Kukui Grove Shopping Center may reduce lunch time vehicle traffic, if it provides a convenient service.

4. Consider banning left turns from Hardy Street to Kuhio Highway at least in peak periods, preferably 6 a.m. to 6 p.m. weekdays, if traffic signals are not installed. Left turns would be made at Rice Street via Eiwa Street.

Conceptual Alternative 3- Campus-Like Setting and Below Grade Parking

1. There would be a significant shift in traffic from Rice Street to Hardy Street. Hardy Street would need to be improved for the additional traffic. Traffic signals would be required at the Hardy Street/Kuhio Highway intersection, since left turns onto Kuhio Highway would be required.

2. Entries into parking garage would have to be designed so that inbound queues do not back up into through traffic. Entry from Rice Street should be right turn

in/out during peak periods, and preferably 6 a.m. to 6 p.m. weekdays if left turn ban is lifted. Otherwise, it would right turn in/out only.

3. Removal of Big Save would reduce traffic and parking needs during midday and afternoon periods.

Conceptual Alternative 4- Urban Mixed Use Civic Center and Two Parking Structures

1. Traffic from the Civic Center would not be significantly affected. There would be more traffic on Hardy Street between Akahi Street and Eiwa Street due to the removal of the Hardy Street entrance. Some additional traffic would be generated by the proposed retail and multi-family units.

2. Consider banning left turns from Hardy Street to Kuhio Highway at least in peak periods, preferably 6 A.M. to 6 P.M. weekdays, if traffic signals are not installed. Left turns would be made at Rice Street via Eiwa Street.

3. If left turns from Rice Street remain prohibited between Eiwa Street and Haleko Street, then the entrance to parking lot south of the Piikoi Building would be right turn in/out only.

C. Development of Refined Alternatives

Two refined alternatives were developed by PBR Hawaii following the evaluation of the conceptual alternatives. The distinguishing features of each refined alternatives are described below.

Refined Alternative 1

This concept is illustrated on **Figure III-5**. Its distinguishing features include:

- Two level, 250 stall parking structure off Hardy Street.

- Provides 462 parking stalls in County area and 224 stalls at War Memorial to meet demand of 569 stalls. On-site parking would be short by 10-20 vehicles if County cars and voluntary off-site vehicles park at War Memorial.
- Eiwa Street realigned at Hardy Street to intersect with Akahi Street.
- Realign super market entry toward Eiwa Street, and renovate facades.
- Pedestrian promenade from Mo'ikeha Building to historic County Building.
- New park surrounding Kauai Museum.
- Sidewalk improvements on all streets.
- On street parking where safe and feasible.
- Regular, frequent shuttle runs between Civic Center, War Memorial, New Police Station, and Kukui Grove Shopping Center.
- State property unchanged except for elimination of one driveway on Eiwa Street.

Refined Alternative 2

- Grand park along Rice Street with landscaping and beautification features.
- Eiwa Street closed and made into pedestrian promenade.
- Pedestrian promenade from Mo'ikeha Building to historic County Building.
- Develop shared parking facilities with the State. Depending on the feasibility to build joint parking facilities and number of stalls allocated to the County, another parking structure could be developed at the War Memorial. Improve pedestrian paths to the Civic Center.
- Provides up to 415 County parking stalls and 400 stalls at War Memorial to meet demand of 569 stalls.
- Traffic roundabout at Hardy Street/Umi Street intersection.
- Regular, frequent shuttle runs between Civic Center, War Memorial, New Police Station, and Kukui Grove Shopping Center.
- Reduced on street parking, allow public parking in parking structures if feasible.

D. Traffic Analysis of Refined Alternatives

A qualitative analysis of each of the two refined alternatives was conducted to provide input to the evaluation teams. The comments are based on current traffic volumes

since a traffic forecast year was not established at the time of this analysis. Specific comments on each alternative are provided below.

Refined Alternative 1

1. The traffic circulation plan for this alternative would be very similar to the existing plan. Most of the roadways and parking lot access points remain the same. Large changes in traffic volumes should not be expected. The one major difference is the reduction in number of stalls in the south parking lot from about 155 to 52 stalls. This difference was assumed to be assigned to the War Memorial parking lot. This change would have a minor impact on Rice Street in that there would be an increase in eastbound traffic and decrease in westbound traffic in the morning, and vice-versa in the afternoon. The proposed parking structure in the north lot would have the about the same number of stalls as the existing lot it would be built on, so that there should not be major changes in the traffic patterns on Hardy Street.

2. The distance of the parking lot entrance/exit on Hardy Street from the Kuhio Highway intersection is a concern. Currently, afternoon traffic occasionally backs up to the existing driveway and this can be expected with the proposed plan. A traffic signal with a short cycle length would help keep queue lengths short. A long cycle length would create long queues that could back up to the driveway.

3. A traffic signal is probably warranted at the Kuhio Highway/Hardy Street intersection. The State DOT would have to be involved in this study also. If a signal is installed at this location, it should be interconnected with the existing signals on Kuhio Highway, a State roadway.

4. Realigning Eiwa Street to meet Akahi Street would create several problems. The realigned Eiwa Street would have a tight horizontal curve that should be checked for feasibility. Assuming that all intersection approaches are one lane as is the

current design, and with the existing traffic volumes, both side street approaches would be level of service E in the morning peak and level of service F in the afternoon peak. This is because four approach intersections have more conflict potential than the existing three approach (T) intersection. Also, level of service calculation programs are not able to account for the traffic interruptions at closely-spaced T-intersections, such as Akahi and Eiwa Streets with Hardy Street, so they could calculate better levels of service than is actually occurring. The queues on the realigned Eiwa Street are expected to be about 16 vehicles long in the afternoon, or over 300 feet, with the two way stop. This length would block the access to the State office building. It would be difficult to widen the Akahi Street (southbound), although the realigned Eiwa Street approach could be made into two lanes to mitigate the poor levels of service on Eiwa Street.

This problem could be mitigated by installing a four way stop and widening Hardy Street to four lanes. The intersection would operate at level of service B in the both the morning and afternoon peak periods. The intersection would operate at level of service E in the afternoon if Hardy Street is not widened to four lanes. The roadway widening would eliminate any on-street parking on Hardy Street.

Refined Alternative 2

1. Extensive design changes have been proposed to the system of parking lots. However, there would not be much change in the usage of the lot north of Piikoi building/Big Save and the lot between the historic County Building and State Office Building since the number of stalls would be similar to existing inventory. The change in access points to these lots would affect traffic by concentrating traffic at two points: Hardy Street at Akahi Street, and new local roadway and Umi Street. The former intersection would have to be signalized since a stop controlled approach would operate at level of service F and queue lengths would exceed 100 feet. A very short cycle length would be needed to keep queues under 100 feet.

The parking makai of the Piikoi building would be reduced from 157 to 59 stalls, and the 61 stalls north of Big Save would be eliminated. These changes would reduce the volume of traffic entering these areas. A new shared State/County parking structure on the site of the former police station would increase traffic on Umi Street. The parking structure at the War Memorial site would divert traffic from the immediate Civic Center area.

2. The closure of Eiwa Street would divert more traffic to the remaining streets and add more volume to the turning movements at the Kuhio Highway/Hardy Street, Hardy Street/Umi Street and Rice Street/Umi Street intersections.

   The Kuhio Highway/Hardy Street intersection is already at level of service F in both peak hours due to the difficulty in making the left turn from Hardy Street. This intersection would have to be signalized since it would be difficult to ban the left turn movement in the peak periods since the Eiwa Street connection would be lost.

   A roundabout has been proposed at the Hardy Street/Umi Street intersection to accommodate the additional traffic. There should not be any operational problem with this concept. A 120' diameter roundabout design should be adequate for the travel speeds and volumes expected.

   The existing traffic signal at Rice Street/Umi Street should be able to adequately handle traffic, although the inside eastbound approach of Rice Street would serve as a default left turn lane. During the P.M. peak hour, the right turn movement on the southbound approach of Umi Street would operate at level of service D.

3. The new proposed local roadway between Umi Street and the Akahi Street extension would serve as access points into several parking areas. This roadway should be designed as a low speed roadway to discourage through traffic on it. The median in the roadway could serve as a left turn lane so that these vehicles do not block through vehicles.

IV. TRAFFIC ANALYSIS OF RECOMMENDED PLAN

This section recommends traffic improvements required around the Lihue Civic Center to accommodate the recommended master plan. The study forecast future traffic patterns for ambient and the recommended master plan conditions. Future traffic patterns were based on the proposed redesign of the parking lot. Future traffic conditions were analyzed based on levels of service and delay at major intersections and driveways. Recommendations for roadway improvements were based on the analysis.

A. Elements of Recommended Master Plan

The recommended master plan developed by PBR Hawaii is shown on **Figure IV-1**. The highlights of the recommended master plan are described below.

- New Central Park east the Piikoi Building and expanded County lawn along Rice Street.
- Tree-lined pedestrian promenade connecting Piikoi Building and Historic County Building.
- Two 2-level parking structures north and east of the Piikoi Building with approximately 290 stalls. Other parking areas would be redesigned.
- A total of 535 parking stalls in County parking areas and up to 400 stalls at War Memorial if a parking deck is added above the existing parking lot to meet future demand. Onsite State parking areas lose one stall for a total of 144 stalls
- Eiwa Street closed and a new spine access road built from Umi Street to Hardy Street. The new roadway approach would create a four-way intersection with Akahi Street and Hardy Street.
- Driveway to parking area south of Piikoi Building relocated directly across Kele Street.

- Traffic roundabout at Hardy Street/Umi Street intersection.
- Regular, frequent shuttle runs between Civic Center, War Memorial, New Police Station, and Kukui Grove Shopping Center.
- Striped bicycle lanes on Hardy Street and Umi Street, with bicycle routes on Kuhio Highway and Rice Street.

B. Traffic Forecasting Methodology

Ten year traffic forecasts were prepared for the weekday A.M. and P.M. peak hours. In addition to the traffic forecast for the recommended plan, two sets of ambient forecasts were analyzed. Ambient Scenario 1 representing the "no-build" condition assumed the current roadway conditions and the anticipated opening of the Ka'ana Street extension, which would create a new travel path between Hardy Street and Kapule Highway. Ambient Scenario 2 assumed Scenario 1 conditions and the installation of traffic signals at the Kuhio Highway/Hardy Street intersection, since the analysis indicated that it is needed and would create some traffic pattern changes within the Civic Center.

Existing traffic volumes are summarized on **Figure II-2A** for the A.M. peak and **Figure II-2B** for the P.M. peak. The traffic patterns were then divided into two components: the traffic leaving and entering the Civic Center parking lots and the traffic passing through the study area.

The existing traffic patterns of parking lot traffic were derived in two steps. First, travel paths entering and leaving the parking lots were estimated to obtain origins and destinations of these vehicles in the study area. Then these travel paths were adjusted to account for the expected opening of Ka'ana Street. The resultant traffic assignments of parking lot trips are shown on **Figure IV-2**. It was assumed that these traffic volumes would remain constant for the ambient traffic forecasts since the number of users are currently near capacity and the number of parking stalls would not change by much with the master plan design.

The parking-related traffic assignments from **Figure IV-2** were subtracted from the current traffic patterns from **Figure II-2**. The remaining traffic was assumed to be the through traffic in the study area. This existing through traffic pattern was then adjusted for the opening of the Ka'ana Street extension to obtain the traffic assignment shown on **Figure IV-3**. This traffic assignment pattern was used in Ambient Scenario 1. The **Figure IV-3** through traffic forecast was then adjusted to account for the installation of traffic signals at the Kuhio Highway/Hardy Street intersection, to obtain the **Figure IV-4** traffic assignment used in Ambient Scenario 2. The primary impact of installing this traffic signal would be the diversion of trips from Eiwa Street and Rice Street to Hardy Street and Kuhio Highway.

The two ambient through traffic volumes patterns from **Figures IV-3** and **IV-4** were increased by 20% in both study peak hours to obtain the future through traffic volumes for each scenario. The 20% growth rate is based on the analysis of existing and traffic forecast data in the Kauai Long Range Land Transportation Plan (1997) prepared by Austin Tsutsumi and Associates, Inc. The volumes of trips entering and leaving Kele Street were not increased by 20% but were assumed to remain constant. The through traffic forecast for Ambient Scenario 1 is shown on **Figure IV-5** and for Ambient Scenario 2 on **Figure IV-6**. These forecasts do not account for the traffic changes that would take place with the proposed widening of Kaumualii Highway from Lihue to Puhi or the implementation of the Lihue Bypass Road. These issues will be addressed in the Lihue Town Area Urban Design Plan traffic study.

The existing morning and afternoon peak hour traffic patterns for Civic Center parking from **Figure IV-2** was added to the Ambient Scenario 1 through traffic forecasts from **Figure IV-5** to obtain the combined Ambient Scenario 1 traffic forecasts shown on **Figure IV-7**. In the same manner, the existing parking traffic assignments were added to the Ambient Scenario 2 through traffic forecasts from **Figure IV-6** to obtain the combined Ambient Scenario 2 traffic forecasts shown on **Figure IV-8**.

A similar procedure was used to calculate the traffic assignments with the master plan. The existing incoming and outgoing volumes were analyzed to obtain trip generation rates per parking stall for government-related trips in each peak hour. These unit rates were then used to forecast the hourly number of trips that would be generated from the various parking lot areas under the master plan. In addition, trip generation rates from the Institute of Transportation Engineers Trip Generation (7th Edition, 2003) were used to estimate the trips from the Big Save market. The trips generated by both calculations were then assigned to the roadway network around the Civic Center for the master plan as shown on **Figure IV-9**.

The current through traffic volumes from **Figure IV-3** were adjusted to account for the closure of Eiwa Street, and the resultant traffic assignments were used as the through trip pattern for the master plan scenario. The existing through traffic assignments with the master plan are shown on **Figure IV-10**. The existing through volumes were then increased by 20% to obtain the master plan through traffic forecast shown on **Figure IV-11**.

The master plan parking-related traffic assignments from **Figure IV-9** were added to the master plan through traffic forecasts from **Figure IV-11** to obtain the combined master plan traffic forecasts shown on **Figure IV-12**. The traffic circulation with master plan would further increase the volume of vehicles on Hardy Street relative to Ambient Scenario 2.

The traffic forecast volumes at each study intersection were analyzed for level of service and delay for the current (**Figure II-2**), two ambient forecast (**Figures IV-7** and **-8**) and master plan (**Figure IV-12**) scenarios, for both peak hours. The results are shown on **Table IV-1** with the results for the four scenarios as appropriate. Multiple alternatives were developed at several intersections for the master plan as a process of identifying mitigating actions. For signalized intersections, the level of service and average delay for the entire intersection and each approach are listed, with left turn lane

subapproaches (identified by an underline) included as appropriate. For unsignalized intersections with stops on the side streets, the side street and left turn from main street levels of service are listed. For all-way stop unsignalized intersections, the entire intersection and each approach statistics are given. For the intersection with a proposed roundabout, the volume/capacity (v/c) ratio is listed for each approach. To date because of the limited American experience with roundabouts, there is no correspondence of v/c with levels of service for roundabouts.

C. Traffic Analysis and Recommendations

Recommendations for traffic improvements based on the ten year traffic forecasts are listed by each intersection.

Rice Street

Rice Street was recently reconstructed as a four-lane roadway with left turns made from the inside through lanes. Parking is permitted on certain sections of the outside lanes in the off peak periods. Plastic delineators were placed on certain sections of Rice Street soon after completion of construction to prohibit left turns due to accident experience. The four-lane design would be sufficient in the future but permitting on-street parking during the day time off-peak periods would need to be studied closer. Further roadway improvements are being proposed under the Lihue Town Core Urban Design Plan.

The latest version of the Statewide Transportation Improvement Program: FY 2004 Thru FY 2006 (STIP) (Amendment #8, revised August 10, 2005,) lists the transportation improvement projects approved for funding in the listed fiscal years. Two projects are listed on Rice Street. The State DOT is currently designing the Kapule Highway/Rice Street intersection so that the through movement is from Kapule Highway to the Nawiliwili leg of Rice Street. The Lihue leg of Rice Street would become stop sign controlled. The funds for construction of the project are listed for Federal Fiscal Year

2006. This project could divert traffic using Rice Street and Haleko Street to access the Kukui Grove Shopping Center.

The STIP also lists the Rice Street/Nawiliwili Road Bikeway from Kaumualii Highway to Waapa Road. The design is listed for funding in Federal Fiscal Year 2004 and construction in Federal Fiscal Year 2005.

Rice Street/Umi Street

The current design and signalized operation of the Rice Street/Umi Street intersection would be adequate to meet traffic increases under the two Ambient Scenarios. The intersection would continue to operate at level of service D even with a 20% increase in through traffic. However, the volume of left turns from eastbound Rice Street into Umi Street would increase significantly with the recommended master plan due to the proposed closure of Eiwa Street. Although the signal would operate at level of service B in the A.M. peak and at C in the P.M. peak, the above left turn movement is forecast to operate at level of service E in the future P.M. peak hour. Although this level is generally considered undesirable for a signalized intersection, level of service E is sometimes tolerated for minor movements such as left turns when there are no feasible mitigating measures or if it helps maintain the main through movements at acceptable levels of service. The capacity analysis program also indicates that the left lane would operate as a default left turn lane. The eastbound approach would still operate satisfactorily with one through and one left turn lane.

Recommendation: Convert the left eastbound lane of Rice Street into an exclusive left turn lane by restriping. Create a three phase signal with a leading left turn and through phase for eastbound traffic. This may require new traffic signals to provide the mastarms required for leading turn phases. The left turn movement is forecast to operate at level of service D with these improvements.

Rice Street/Eiwa Street

This unsignalized intersection would be eliminated under the master plan's proposal to close Eiwa Street. The volume of right turns from Eiwa Street exceeds the volume of traffic egressing the parking lots. This implies that many drivers are using Eiwa Street as a shortcut to get to Rice Street to access Haleko Road or Kaumualii Highway. It is very difficult to make a left turn from Eiwa Street due to the heavy traffic volumes on Rice Street. This is indicated by the low volumes making this move and the poor levels of service calculated for the current and ambient conditions. There are also relatively heavy volumes of left turns into Eiwa Street from Rice Street during both peak periods. If the master plan were not implemented and Eiwa Street were maintained, the only way to mitigate this condition for the ambient scenarios would be to signalize the intersection, which then would then cause a major change in the traffic patterns.

Rice Street/Kele Street/County-Museum Driveway

Kele Street has high volumes for a side street due to the Post Office and businesses it serves. Its approach is currently operating at levels of service C in the morning peak (due to lower traffic volumes on the approach) and F in the afternoon peak, the latter is considered undesirable. In addition, it is difficult to make outbound left turns from Kele Street as indicated by the high proportion of right turns. Future increases in traffic on Rice Street would make the outbound movement more difficult and increase delay significantly.

The driveway for the County Building and Kauai Museum parking lot is located about 120 feet east and across the street from Kele Street. As with Eiwa and Kele Streets, the high volume of right turns and low volume of left turns from this approach indicates difficulty in making left turns. The master plan proposes to relocate this driveway westward to align directly across Kele Street. With this move, Kele Street and the County driveway approaches are forecast to continue operating at undesirable levels of service as an unsignalized intersection.

Recommendation 1: Restrict the traffic movements to right-turn in, right-turn out at these two approaches. The outbound right turn movements on both approaches are expected to improve to level of service B with this change.

Recommendation 2: As an alternative, signalize the intersection if right turn only restrictions are not acceptable. Traffic signals are barely warranted with the forecast volumes and the intersection is forecast to operate at level of service A in both peak periods. Pedestrian crossings would become safer with traffic signals.

Rice Street/Haleko Road

Left turn movements from Haleko Road onto Rice Street are currently not permitted. The outbound right turn movement is presently level of service E in both the A.M. and P.M. peaks. It is forecast to decline to an undesirable level of service F in both peak periods due to increases in through traffic on Rice Street and right turn traffic from Haleko Road. There is a heavy left turn movement from Rice Street unto Haleko Road during both peak periods. This movement is currently at level of service B in the A.M. peak and C in the P.M. peak. Although level of service C is generally considered acceptable, observations elsewhere indicate that level of service C for left turns from the main roadway can be difficult to make and could require mitigation.

A possible mitigating measure that was analyzed was to create two eastbound lanes on Rice Street, one through and one right turn lane. This would improve right turn operations from Haleko Road in the P.M. peak but would not help the A.M. peak. In addition, the level of service for the left turn movement from Rice Street would not be improved. Since there does not appear to be sufficient right-of-way to implement this alternative, it should not be given further consideration.

The Kauai Long Range Land Transportation Plan (1997) that is in the process of being updated recommends widening Haleko Road to four lanes from Nawiliwili Road to Rice

Street. Haleko Road would need to be widened to four lanes to adequately handle the traffic volumes forecast on it. There is also sentiment to retain the two-lane design of Haleko Road as a historic landmark. The widening of Kaumualii Highway from Lihue to Puhi is currently under design. The STIP lists the Right-of-Way acquisition for the Phase 1 widening of Kaumualii Highway from Lihue to Puhi in Federal Fiscal Year 2005.

When the latter is implemented, the need to widen Haleko Road would be minimized. Therefore, the following recommendations are based on whether or not Haleko Road is widened.

Recommendation 1: If Haleko Road is widened, signalize this intersection when warranted. The intersection is forecast to operate at level of service C in both peak periods if signalized. The left westbound lane of Rice Street is currently marked for through and left turn traffic. It would serve as a default left turn lane and could be restriped as such. This widening and signalization also implies permitting left turns onto Rice Street. A detailed traffic study would need to be done when this widening project is designed.

Under this recommendation, traffic signals would be installed at the Kele Street and Haleko Road intersections to mitigate their individual traffic problems. Implementing both signals would result in four very closely spaced signals with the current signals at Kuhio Highway and Umi Street. This could create a traffic operations problem. Therefore, only one of these two recommended signals should be implemented if possible.

Recommendation 2: If Haleko Road is not widened, the intersection should be left unsignalized and made right turn in, right turn out to minimize the traffic volumes on Haleko Road. Eastbound traffic would be diverted to Kaumualii Highway. The left turn from Rice Street onto Kaumualii Highway would have to be made into two lanes to accommodate the additional traffic. This widening would correspond with the widening

of Kaumualii Highway to four lanes. The resultant levels of service with this recommendation were not analyzed but will be in the traffic study for the Lihue Town Core Urban Design Plan.

Rice Street/Kuhio Highway/Kaumualii Highway

This signalized intersection was recently improved and should be able to accommodate the future traffic growth for the ambient scenarios and recommended plan conditions if Haleko Road is widened. The level of service forecast for the Kuhio Highway southbound left turn lane is forecast to be at E in the morning peak and D in the afternoon peak. Although level of service E is considered to be undesirable, it is considered tolerable for minor movements like left turns if it helps maintain the main through movements at acceptable levels of service. If Haleko Road is not widened, then a second left turn lane from Rice Street should be added as discussed above.

Recommendation: Adjust traffic signal timing as growth occurs. Add a second left turn lane to the Rice Street approach in conjunction with the widening of Kaumualii Highway if Haleko Road is not widened.

Hardy Street

Hardy Street is a two-lane roadway with wide lanes to permit on-street parking. There is a sidewalk on the north curb and painted shoulders or an asphalt berm on the south curb. The roadway curb-to-curb width varies from 40' to 50' and can be poorly defined on the south curb. Hardy Street provides limited access to private driveways on the north curb and to the Lihue Civic Center and State Building parking lots on the south curb.

Hardy Street should be able to operate as a two-lane roadway with the projected traffic growth, although it could operate at level of service D or worse during some time

periods. Further growth would require mitigation as is being proposed in the Lihue Town Core Urban Design Plan.

Recommendation: Signalize the proposed Hardy Street/Akahi Street/County driveway intersection when warranted. Traffic signals are minimally warranted with the forecast traffic volumes. The current two-lane roadway design of Hardy Street would be sufficient, although adding left turn lanes on the Hardy Street approaches would improve traffic operations slightly.

Kuhio Highway/Hardy Street

The left turn movement from Hardy Street westbound onto Kuhio Highway southbound is difficult to make due to the heavy traffic on the highway, and is currently operating at level of service F in both peak periods at this unsignalized intersection. Based on the pattern of traffic volumes, it is believed many drivers are using Eiwa Street as a shortcut to make a right turn onto Rice Street, and make a left turn onto Kamuali'i Highway at the traffic signal. The proposed closure of Eiwa Street would significantly increase the volume of left turns at Hardy Street. Even without the closure of Eiwa Street, traffic signals are warranted at this intersection to meet the latent demand and this is why it was included in Ambient Scenario 2.

The left turn movement from Kuhio Highway southbound onto Hardy Street is at level of service C in the morning peak and B in the afternoon peak. As previously discussed, level of service C condition for the left turn from a through street could identify a need for mitigation.

Recommendation: Signalize the intersection with a leading phase for the Kuhio Highway southbound left turn movement. The intersection is forecast to operate at level of service B in the morning peak and C in the afternoon peak with traffic signalization.

Hardy Street/County-Big Save Driveway

This is one of only two driveways on the south curb of Hardy Street between Kuhio Highway and Umi Street. It is midway between Kuhio Highway and Akahi Street and permits both inbound and outbound left and right turns. This driveway is used by County employees and Big Save market customers since there are large traffic peaks immediately before 7:45 A.M. and after 4:30 P.M. The driveway approach currently operates at level of service C in both peak periods and is forecast to operate at the same level for both ambient scenarios.

The master plan would limit access to right turn in only because the shuttle bus stop would be located immediately east of the driveway. With this restriction, there would be no movements to calculate levels of service, and is shown as a blank space on **Table IV-1**. Two separate analyses indicated that outbound right turns, and outbound and inbound left turns would operate at satisfactory levels of service if permitted, although the outbound left/right movement would be at level of service E in the P.M. peak.

Recommendation: All inbound and outbound movements should be permitted at this driveway under the master plan if feasible to reduce demand at the proposed Akahi Street/County driveway intersection. The feasibility of any outbound movement would depend on the frequency of bus service and whether or not buses would be parking at the bus stop for long periods of time. If the bus stop is expected to be unoccupied for most of the time, then right turn in, right turn out operations should be permitted when the master plan is implemented. Then traffic conditions should be monitored to determine if the outbound movements are interfering with the shuttle bus operations.

The feasibility of permitting inbound and outbound left turns into and from the driveway would depend on whether or not traffic queues from the Kuhio Highway/Hardy Street intersection backed up to this driveway. If the traffic queue does not back up to the driveway, then inbound and outbound left turns should be permitted and monitored.

The driveway could be located further west to get it away from bus stop, however this would bring the driveway closer to Kuhio Avenue, and could obviate implementing left turns at this driveway.

Hardy Street/Akahi Street/Proposed County Driveway

Akahi Street and Eiwa Street intersect Hardy Street from opposite sides about 50' apart. The master plan proposes the closure of Eiwa Street and a new roadway to the County parking lot directly across from Akahi Street. This would eliminate the "zig-zag" movement now required to cross Hardy Street. This intersection is currently unsignalized.

Outbound traffic from the unsignalized Akahi Street approach is currently operating at level of service B in both peak hours due to the relatively low traffic volumes on Hardy Street. The higher through traffic volumes forecast for the ambient scenarios would cause the approach to operate at levels D and F in the A.M. peak and F in the P.M. peak. This would imply the need for some form of mitigation.

The higher traffic volumes forecast for Hardy Street due to general traffic growth are expected to have an adverse impact on the outbound traffic from both side streets. Both the Akahi Street and the County parking lot roadway approaches are forecast to operate at level of service F in both peak periods with the current two-lane design. Several alternatives were analyzed to mitigate this problem. Adding a left turn lane on both approaches of Hardy Street would still incur level of service F. Changing the two-lane and left turn lane designs into a four way stop would also not improve the level of service F. The high volumes of eastbound traffic forecast for Hardy Street are responsible for causing the poor levels of service. For these possible mitigating alternatives, A.M. traffic conditions were analyzed with a 12% traffic increase that was developed as an earlier forecast. The higher 20% growth rate used for this study was not evaluated since the levels of service with the lower growth rate were already very undesirable.

Recommendation: Signalize the proposed intersection when warranted. Traffic signals are minimally warranted with the forecast traffic volumes. The current two-lane roadway design of Hardy Street would be sufficient, although adding left turn lanes on the Hardy Street approaches would allow through traffic to safely pass cars queuing to turn left.

Hardy Street/Eiwa Street

The northbound approach of Eiwa Street is currently operating at level of service B in both peak periods. As with Akahi Street, the higher through traffic volumes forecast for Hardy Street would cause the Eiwa Street approach to operate at level of service F for both ambient scenarios in both peak periods. This intersection would be eliminated with the recommended plan's proposed closure of Eiwa Street.

Hardy Street/Umi Street

The northbound approach of Umi Street is currently operating at level of service F in the A.M. peak and E in the P.M. peak. The master plan proposes a traffic roundabout as one means to mitigate the problem. Traffic roundabouts were thought to be a better solution than traffic signals due to the unique geometry of this intersection. Traffic signals would probably require split phasing that would reduce the green time for Hardy Street traffic. There is sufficient land to install a traffic roundabout. Additionally, a traffic roundabout would be more inexpensive to install and easier to maintain than a traffic signal. A four-way stop would not be feasible due to the much higher traffic volumes on the east approach.

The analysis for traffic roundabouts does not calculate a level of service value due to the limited American experience with roundabouts. The HCS methodology for traffic roundabouts calculates only a volume/capacity (v/c) ratio. The eastbound approach of

Hardy Street is forecast to have the highest v/c ratio of the four approaches, ranging from 0.61 in the morning peak to 0.70 in the afternoon.

Umi Street/State-County Driveway

Umi Street is a two-lane roadway with on-street parking on the eastern boundary of the Lihue Civic Center. The current one-way ingress and egress driveways to the State and County parking lots are set apart about 60'. The master plan proposes a single two-lane access roadway.

Recommendation: Large traffic increases are not forecast for Umi Street; therefore, major traffic improvements are not required. The current two-lane roadway design without left turn lanes would be sufficient. The analysis assumed separate left and right turn lanes on the driveway approach. A left turn lane on the northbound Umi Street approach would be desirable but not necessary.

The driveway to the 26-stall State Courthouse parking lot was not analyzed due to its small size. Based on the above analysis, traffic problems are not expected.

This recommendation assumes no major land use changes for the State properties on Umi Street, including the vacant Police Building. Major land use changes would require a restudy of the Umi Street design.

V. SUMMARY OF TRAFFIC RECOMMENDATIONS TO SUPPORT THE RECOMMENDED MASTER PLAN

This section lists the recommendations made in the previous section.

1. The four-lane design of Rice Street would be sufficient in the future but permitting on-street parking during the day time off-peak periods would need to be studied closer. Further roadway improvements are being proposed under the Lihue Town Core Urban Design Plan.

2. Convert the left eastbound lane of Rice Street at Umi Street into an exclusive left turn lane by restriping. Create a three phase signal with a leading left turn and through phase for eastbound traffic. This may require new traffic signals to provide the mastarms required for leading turn phases.

3. The Rice Street/Eiwa Street unsignalized intersection would be eliminated under the master plan. If the master plan were not implemented and Eiwa Street were maintained, the only way to mitigate traffic problems at both ends of Eiwa Street for the ambient scenarios would be to signalize the intersections, which then would then cause a major change in the traffic patterns.

4. The master plan proposes to relocate the County/Kauai Museum driveway westward to align directly across Kele Street. With this move, restrict the traffic movements to right-turn in, right-turn out at these two approaches. As an alternative if right turn only restrictions are not acceptable, signalize the intersection. Traffic signals are barely warranted with the forecast volumes but pedestrian crossings would become safer with traffic signals.

5. If Haleko Road is widened, signalize the Rice Street intersection when warranted. Restripe the left westbound lane of Rice Street with a left turn lane. This widening and signalization also implies permitting left turns onto Rice Street. A detailed traffic study would need to be done when this widening project is designed. Under this recommendation, traffic signals would be installed at the Kele Street and Haleko Road intersections to mitigate their individual traffic problems. Implementing both signals would result in four very closely spaced signals on Rice Street with the current signals at Kuhio Highway and Umi Street. This could create a traffic operations problem. Therefore, only one of these two recommended signals should be implemented if possible.

If Haleko Road is not widened, the Rice Street intersection should be left unsignalized and made right turn in, right turn out to minimize the traffic volumes on Haleko Road. Eastbound traffic would be diverted to Kaumualii Highway. The left turn from Rice Street onto Kaumualii Highway would have to be made into two lanes to accommodate the additional traffic. This widening would correspond with the widening of Kaumualii Highway to four lanes.

6. Adjust traffic signal timing at the Rice Street/Kuhio Highway/Kaumualii Highway intersection as growth occurs. Add a second left turn lane to the Rice Street approach if Haleko Road is not widened, and coordinate with the widening of Kaumualii Highway west of Rice Street. This would require coordination with the State Department of Transportation who has jurisdiction over the highways.

7. Signalize the Kuhio Highway/Hardy Street intersection with a leading phase for the Kuhio Highway southbound left turn movement. This would require coordination with the State Department of Transportation who has jurisdiction over the highway.

8. Signalize the proposed Hardy Street/Akahi Street/County driveway intersection when warranted. Traffic signals are minimally warranted with the forecast traffic volumes. The current two-lane roadway design of Hardy Street would be sufficient, although adding left turn lanes on the Hardy Street approaches would improve traffic operations slightly. Further traffic growth would require mitigation as is being proposed in the Lihue Town Core Urban Design Plan.

9. The master plan proposes a traffic roundabout at the Hardy Street/Umi Street intersection as one means to mitigate the current problems. This would provide acceptable service levels and avoid delays that may be incurred if a traffic signal were installed.

10. Large traffic increases are not forecast for Umi Street; therefore, major traffic improvements are not required. The current two-lane roadway design without left turn lanes would be sufficient. A left turn lane on the northbound Umi Street approach to the new driveway would be desirable but not necessary. This recommendation assumes no major land use changes for the State properties on Umi Street, including the vacant Police Building. Major land use changes would require a restudy of the Umi Street design.

References

References

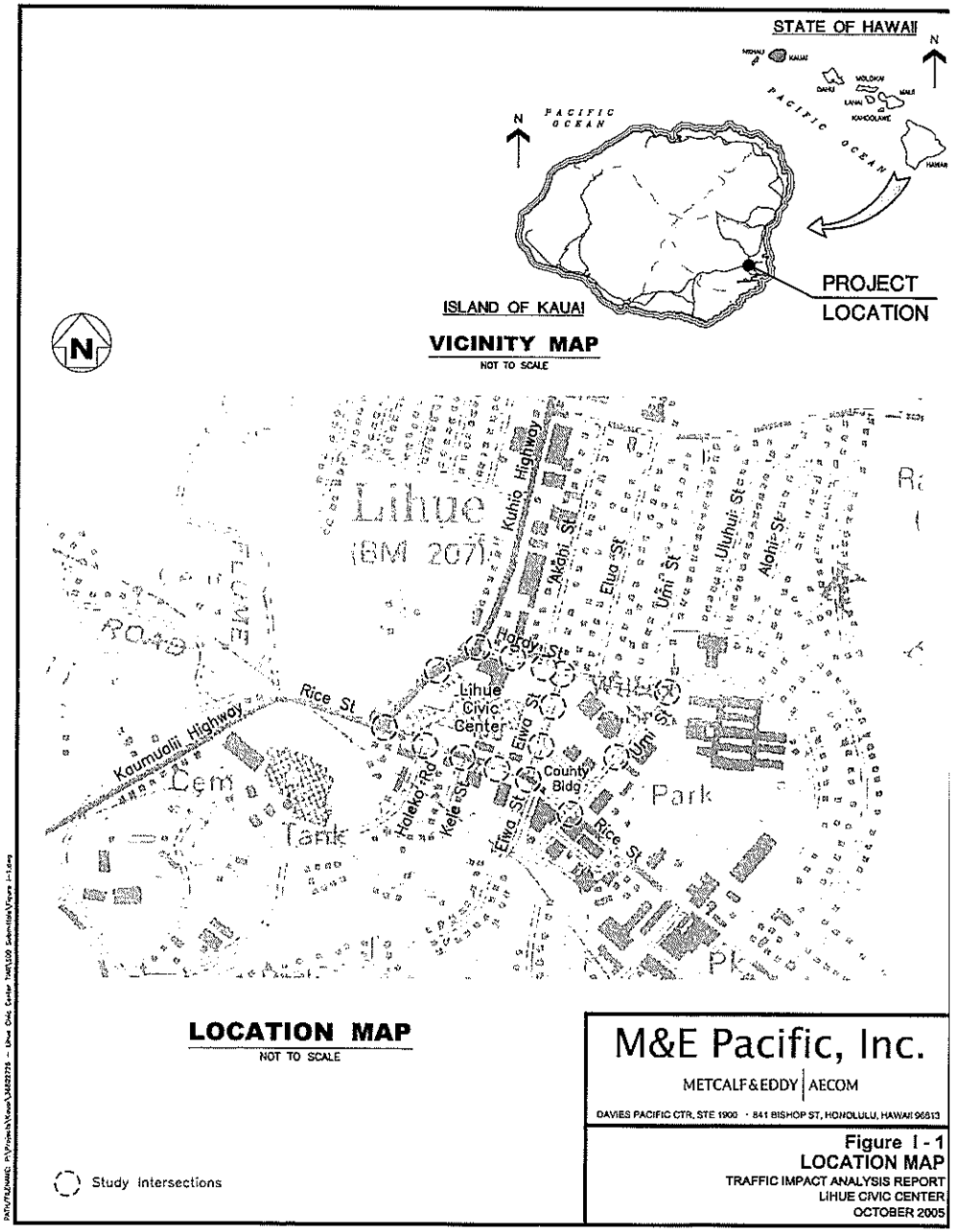
1. *Kauai County Office Complex Traffic Impact Analysis Report*, November 1989, Pacific Planning and Engineering, Inc.

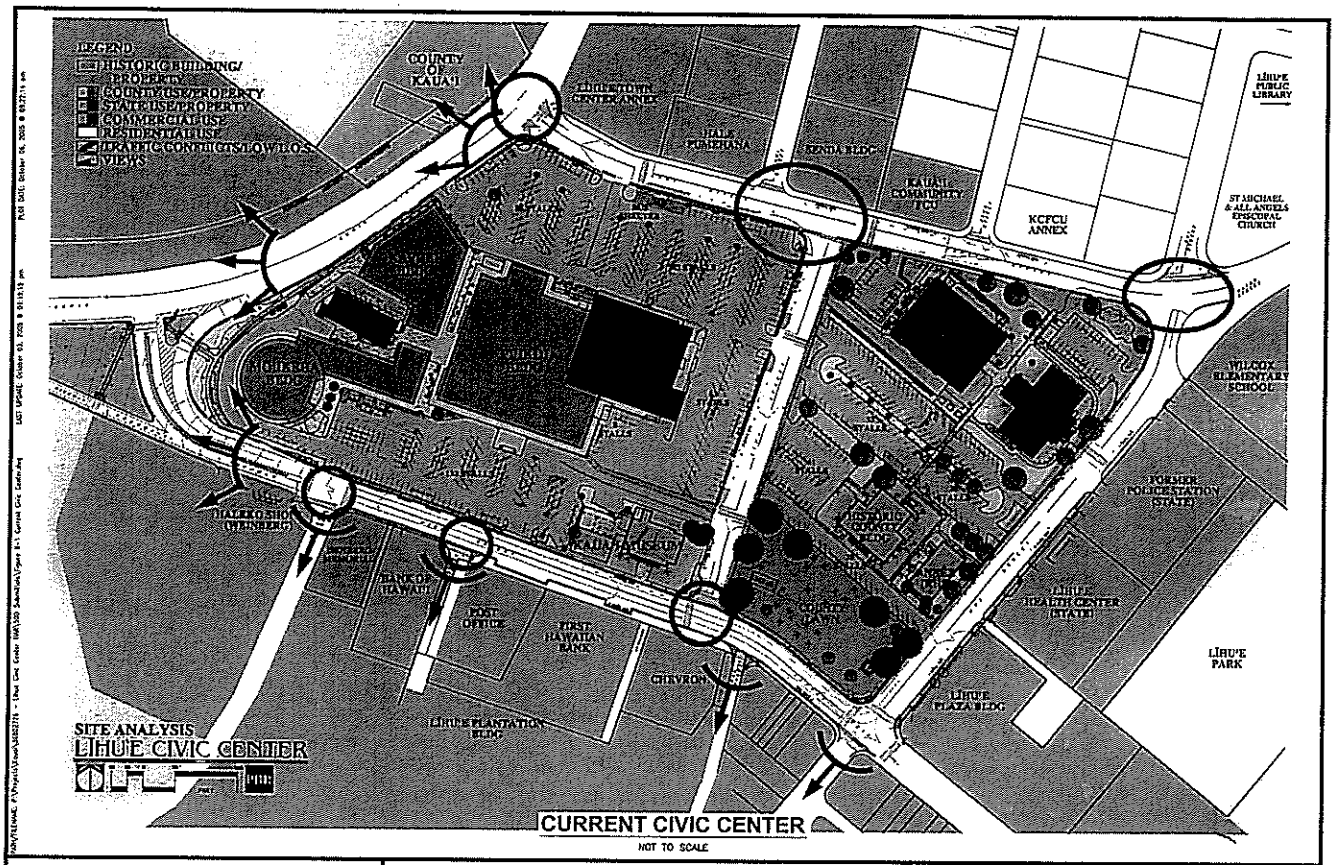
2. *Highway Capacity Manual*, 2000, HCM2000, Transportation Research Board.

3. *Kauai Long Range Land Transportation Plan*, 1997, Austin Tsutsumi and Associates, Inc.

4. *Statewide Transportation Improvement Program: FY 2004 Thru FY2006, Amendment #8*, 2002, revised 2005, Kaku Associates, Inc.

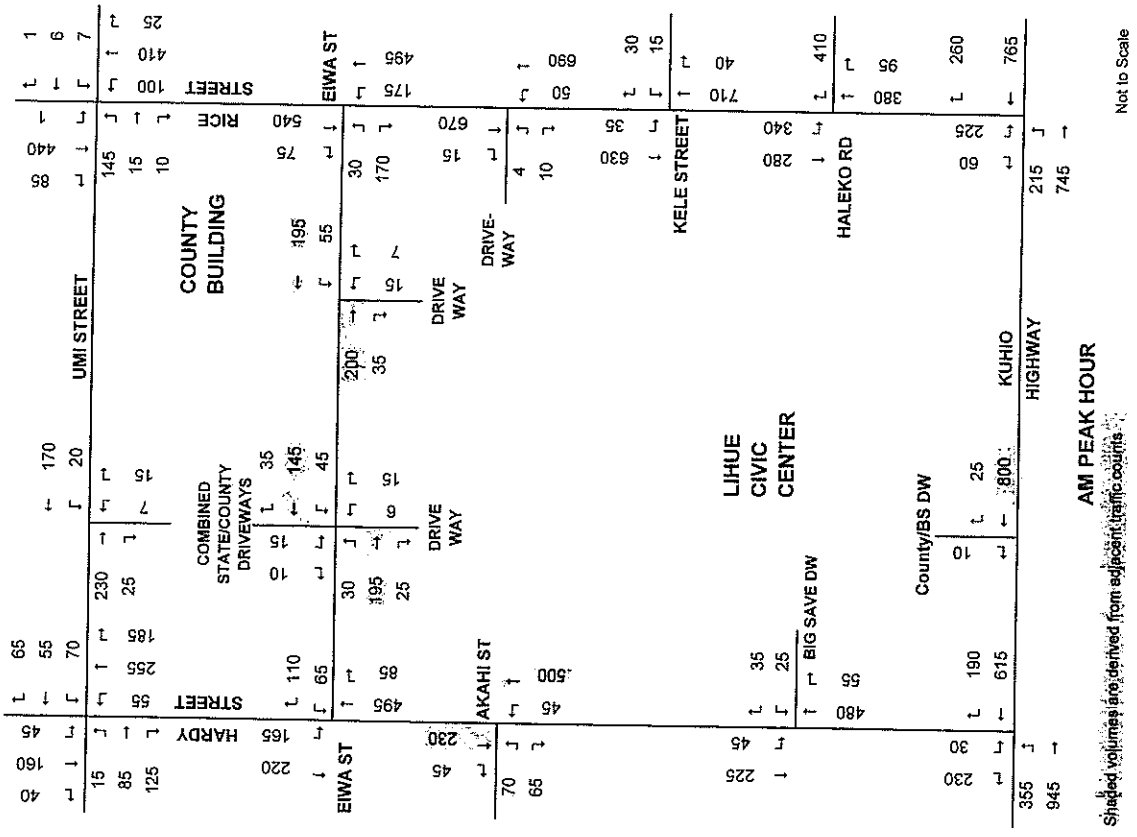
Figures


STATE OF HAWAII
PACIFIC OCEAN
ISLAND OF KAUAI
PROJECT LOCATION
VICINITY MAP
NOT TO SCALE
Lihue
(BM 207)
Kuhio Highway
Akahi St
Ehua St
Hardy St
Rice St
Kaumualii Highway
Lihue Civic Center
County Bldg
Halelea Rd
Keje St
Umi St
Uluhui St
Alohi St
Park
Tank
LOCATION MAP
NOT TO SCALE
Study Intersections
M&E Pacific, Inc.
METCALF & EDDY | AECOM
DAVIES PACIFIC CTR, STE 1900 · 841 BISHOP ST, HONOLULU, HAWAII 96813
Figure 1-1
LOCATION MAP
TRAFFIC IMPACT ANALYSIS REPORT
LIHUE CIVIC CENTER
OCTOBER 2005



M&E Pacific, Inc.
METCALF & EDDY | AECOM
DAVIES PACIFIC CTR, STE 1900 · 841 BISHOP ST, HONOLULU, HAWAII 96813

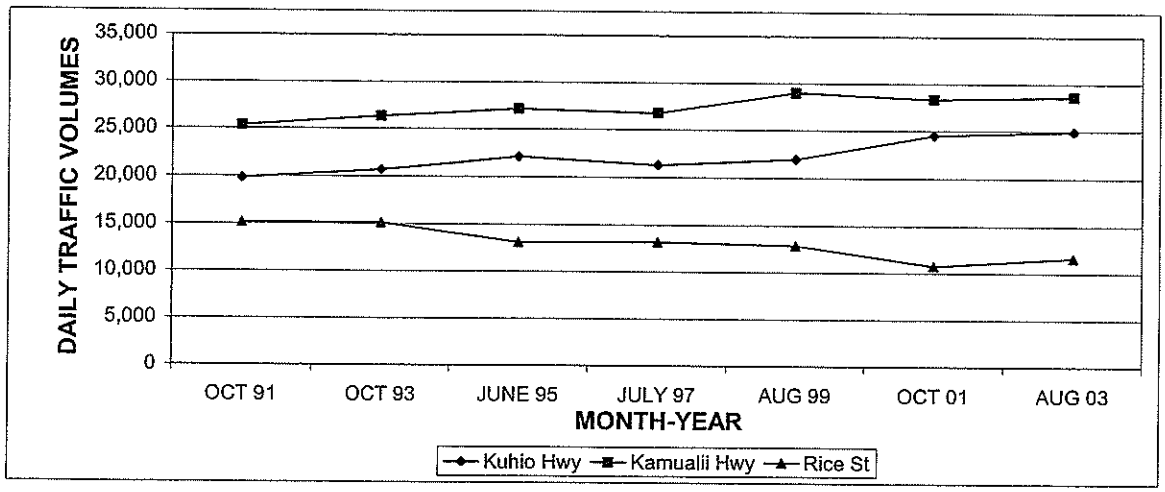
Figure II-1
CURRENT CIVIC CENTER
TRAFFIC IMPACT ANALYSIS REPORT
LIHUE CIVIC CENTER
LIHUE, KAUAI, HAWAII
OCTOBER, 2005



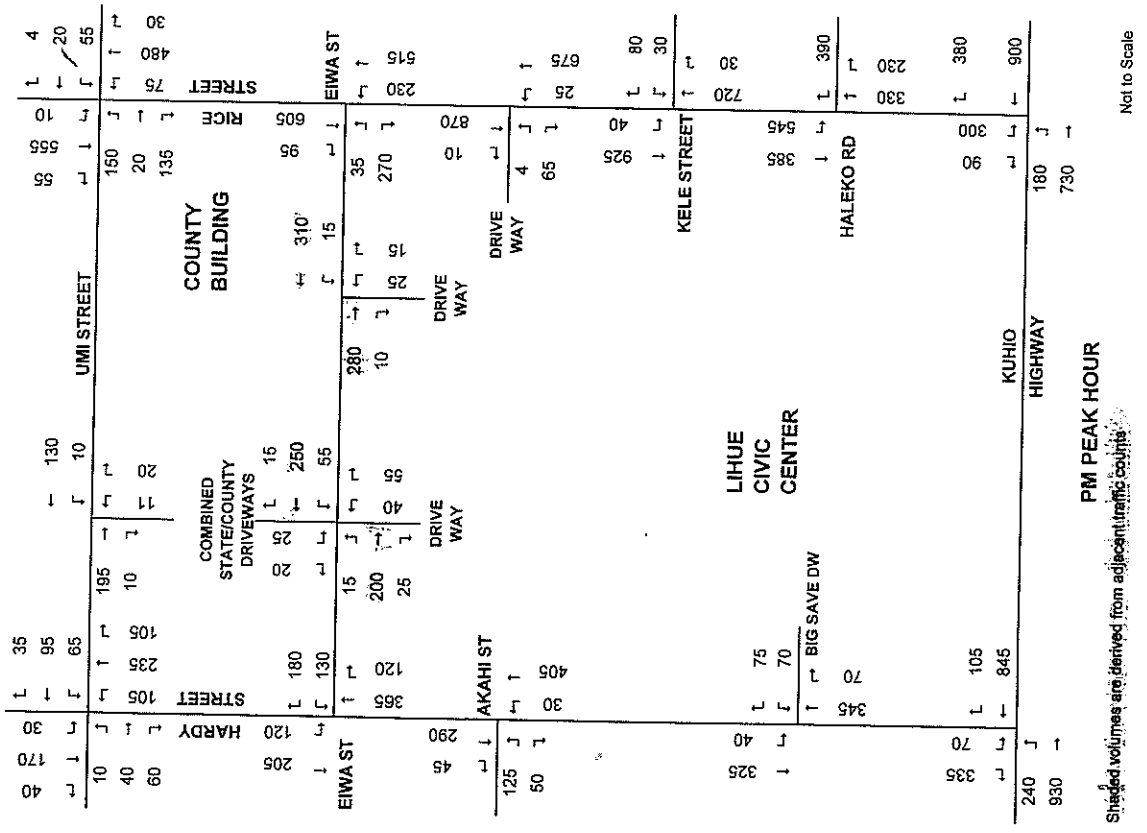
EXISTING TRAFFIC VOLUMES
FIGURE II-2A

DAILY TRAFFIC VOLUMES AT STATION NO. 1-B
Kaumualii Highway/Kuhio Highway/Rice Street

DATE OF COUNT	DAILY TRAFFIC VOLUMES		
	KUHIO HIGHWAY	KAUMUALII HIGHWAY	RICE STREET
OCT 91	19,833	25,333	15,146
OCT 93	20,726	26,321	15,135
JUNE 95	22,084	27,132	13,087
JULY 97	21,324	26,744	13,185
AUG 99	21,956	28,990	12,871
OCT 01	24,512	28,341	10,763
AUG 03	24,919	28,604	11,613



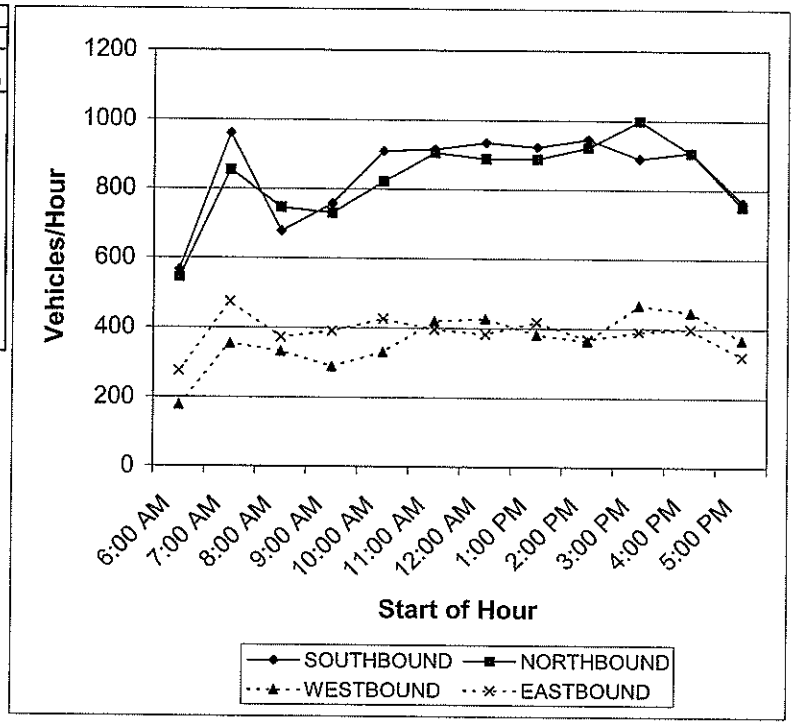
DAILY TRAFFIC VOLUMES ON KUHIO HIGHWAY, KAUMUALII HIGHWAY AND RICE STREET
FIGURE II-3



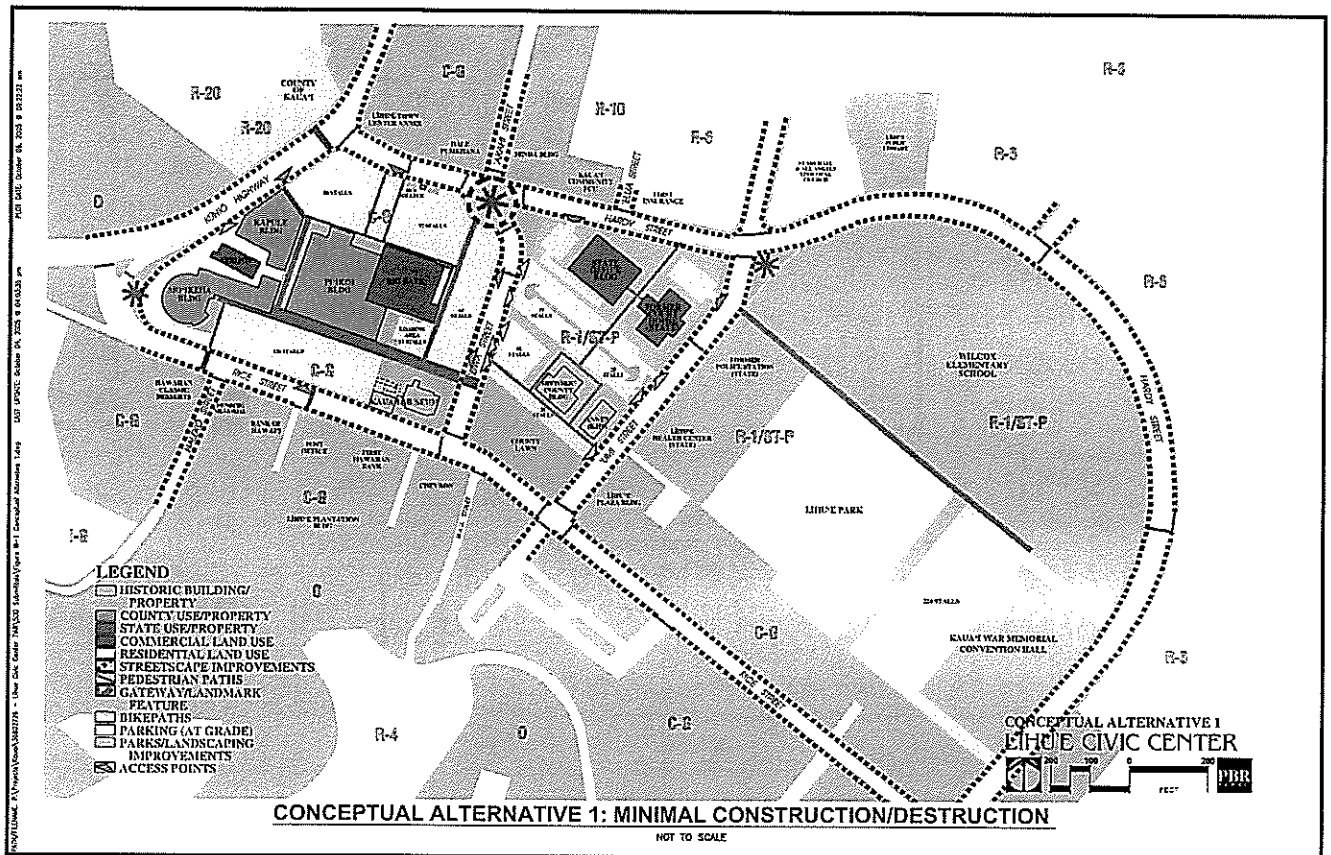
EXISTING TRAFFIC VOLUMES
FIGURE II-2B

HOURLY TRAFFIC VOLUMES AT STATION NO. 1-B, Kuhio Highway/Rice Street (October 11, 2001)

START OF HOUR	VEHICLES/YEAR			
	KUHIO HIGHWAY		RICE STREET	
	SOUTH-BOUND	NORTH-BOUND	WEST-BOUNT	EAST-BOUND
6:00 AM	566	544	178	276
7:00 AM	960	855	355	474
8:00 AM	677	745	332	373
9:00 AM	757	730	289	391
10:00 AM	909	821	331	426
11:00 AM	915	905	420	396
12:00 AM	935	888	428	383
1:00 PM	922	888	382	418
2:00 PM	945	921	364	368
3:00 PM	890	999	467	391
4:00 PM	908	906	447	398
5:00 PM	763	751	368	320



HOURLY TRAFFIC VOLUMES ON KUHIO HIGHWAY AND RICE STREET
FIGURE II-4

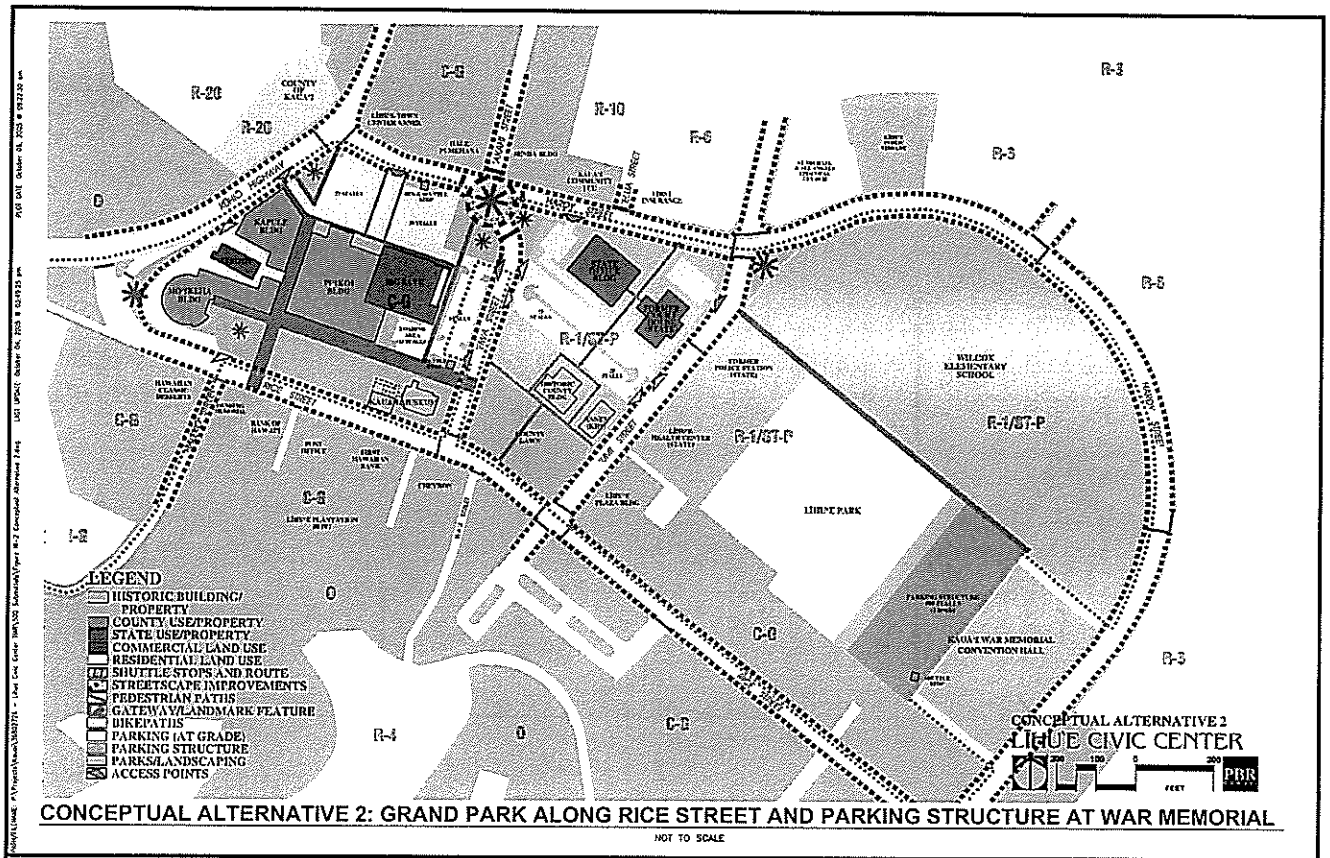


CONCEPTUAL ALTERNATIVE 1: MINIMAL CONSTRUCTION/DESTRUCTION

NOT TO SCALE

M&E Pacific, Inc.
METCALF & EDDY | AECOM
DAVIES PACIFIC CTR, STE 1900 · 841 BISHOP ST, HONOLULU, HAWAII 96813

Figure III - 1
CONCEPTUAL ALTERNATIVE 1
TRAFFIC IMPACT ANALYSIS REPORT
LIHUE CIVIC CENTER
LIHUE, KAUAI, HAWAII
OCTOBER, 2005

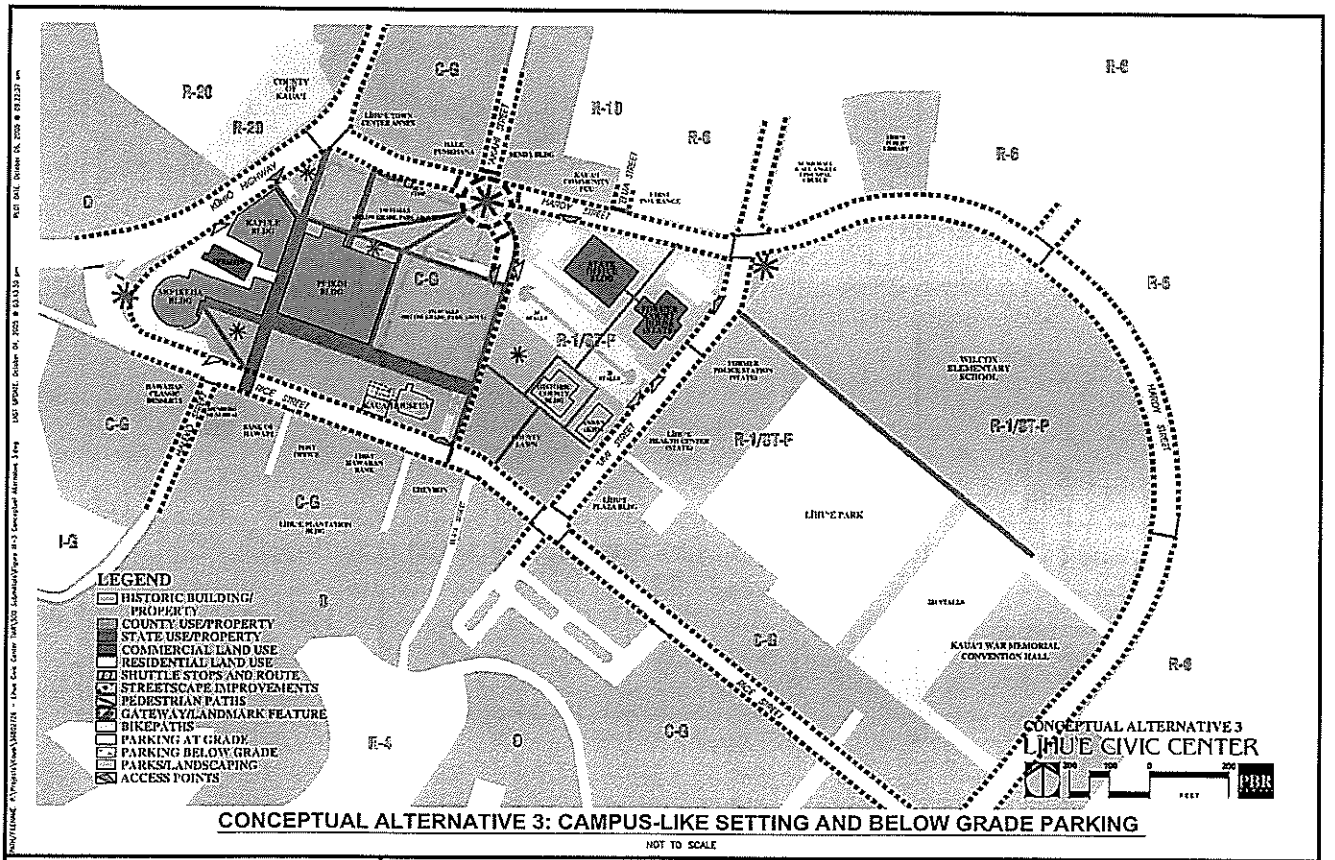


CONCEPTUAL ALTERNATIVE 2: GRAND PARK ALONG RICE STREET AND PARKING STRUCTURE AT WAR MEMORIAL

NOT TO SCALE

M&E Pacific, Inc.
METCALF & EDDY | AECOM
DAVIES PACIFIC CTR, STE 1900 · 841 BISHOP ST, HONOLULU, HAWAII 96813

Figure III - 2
CONCEPTUAL ALTERNATIVE 2
TRAFFIC IMPACT ANALYSIS REPORT
LIHUE CIVIC CENTER
LIHUE, KAUAI, HAWAII
OCTOBER, 2005

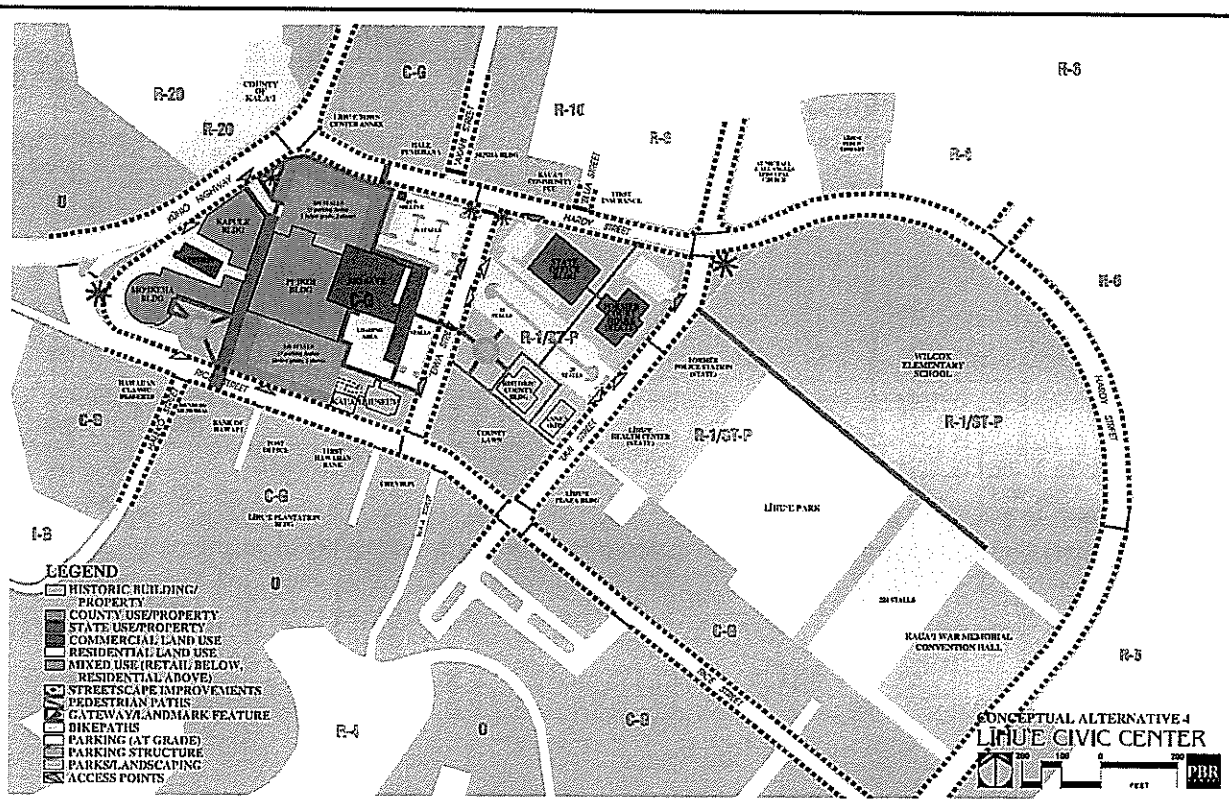


CONCEPTUAL ALTERNATIVE 3: CAMPUS-LIKE SETTING AND BELOW GRADE PARKING

NOT TO SCALE

M&E Pacific, Inc.
METCALF & EDDY | AECOM
DAVIES PACIFIC CTR, STE 1900 · 841 BISHOP ST, HONOLULU, HAWAII 96813

Figure III - 3
CONCEPTUAL ALTERNATIVE 3
TRAFFIC IMPACT ANALYSIS REPORT
LIHUE CIVIC CENTER
LIHUE, KAUAI, HAWAII
OCTOBER, 2005

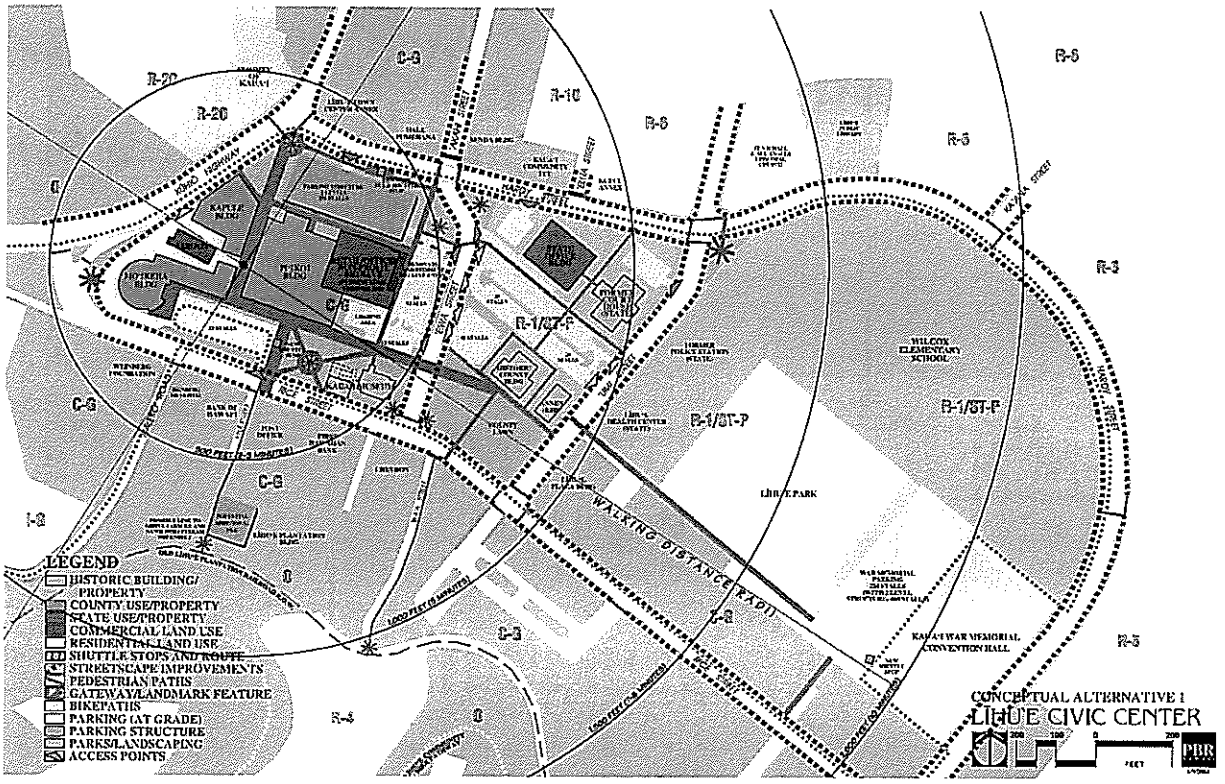


CONCEPTUAL ALTERNATIVE 4: URBAN MIXED USE CIVIC CENTER AND TWO PARKING GARAGES

NOT TO SCALE

M&E Pacific, Inc.
METCALF & EDDY | AECOM
DAVIES PACIFIC CTR, STE 1900 · 841 BISHOP ST, HONOLULU, HAWAII 96813

Figure III - 4
CONCEPTUAL ALTERNATIVE 4
TRAFFIC IMPACT ANALYSIS REPORT
LIHUE CIVIC CENTER
LIHUE, KAUAI, HAWAII
OCTOBER, 2005

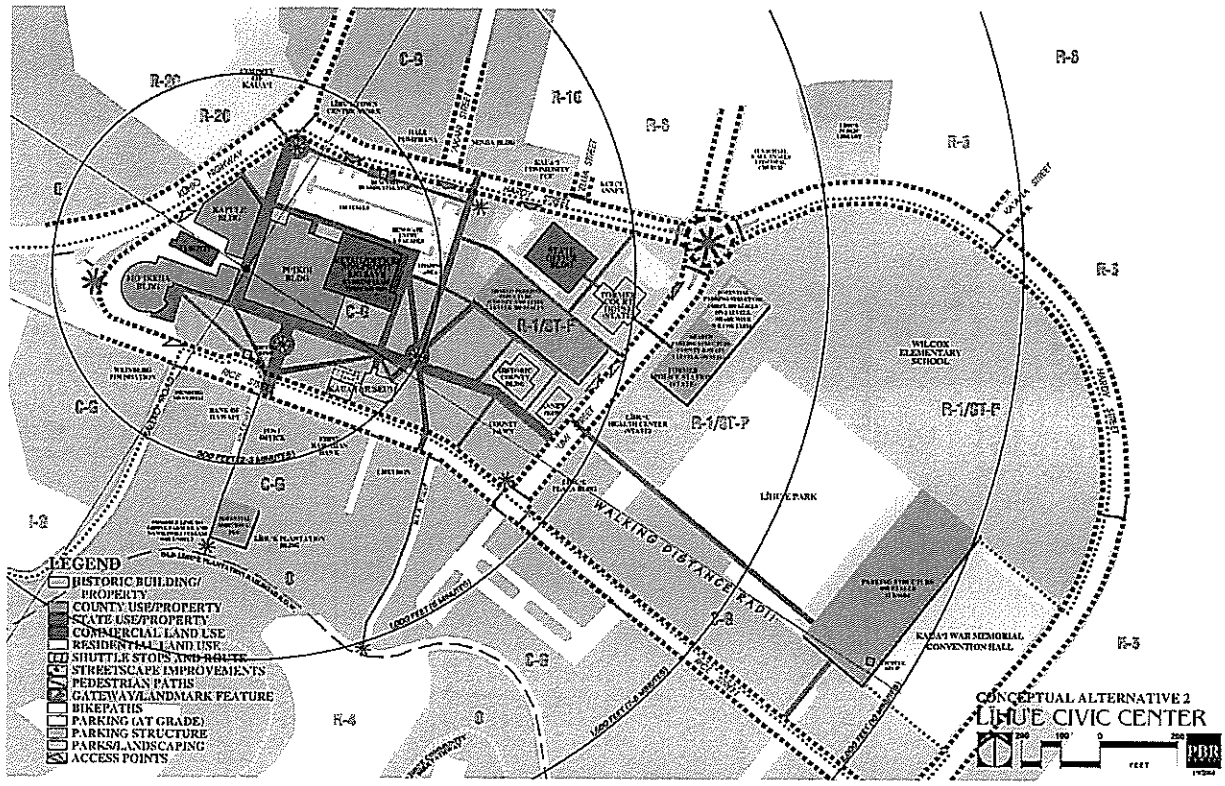


REFINED ALTERNATIVE 1

NOT TO SCALE

M&E Pacific, Inc.
METCALF & EDDY | AECOM
DAVIES PACIFIC CTR, STE 1900 · 841 BISHOP ST, HONOLULU, HAWAII 96813

Figure III - 5
REFINED ALTERNATIVE 1
TRAFFIC IMPACT ANALYSIS REPORT
LIHUE CIVIC CENTER
LIHUE, KAUAI, HAWAII
OCTOBER, 2005



REFINED ALTERNATIVE 2

NOT TO SCALE

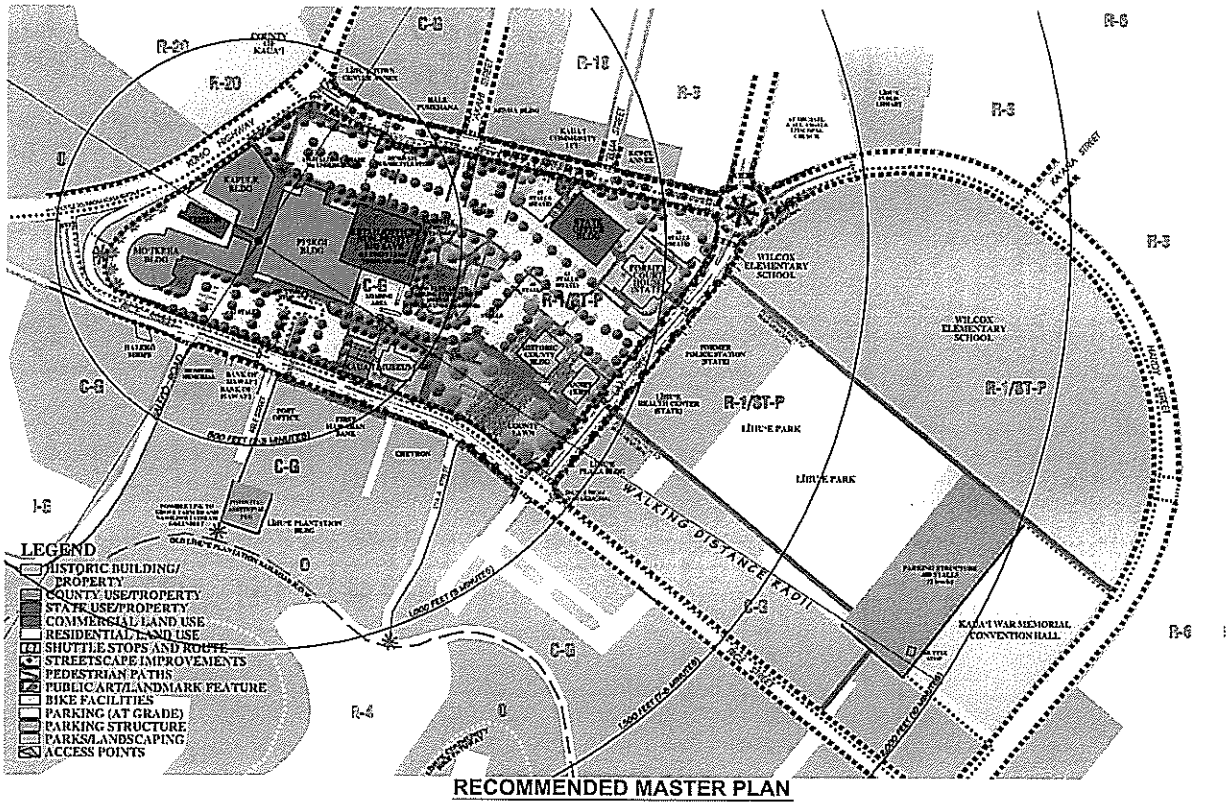
M&E Pacific, Inc.

METCALF & EDDY | AECOM

DAVIES PACIFIC CTR, STE 1900 · 841 BISHOP ST, HONOLULU, HAWAII 96813

Figure III - 6
REFINED ALTERNATIVE 2
TRAFFIC IMPACT ANALYSIS REPORT
LIHUE CIVIC CENTER
LIHUE, KAUAI, HAWAII

OCTOBER, 2005



RECOMMENDED MASTER PLAN

NOT TO SCALE

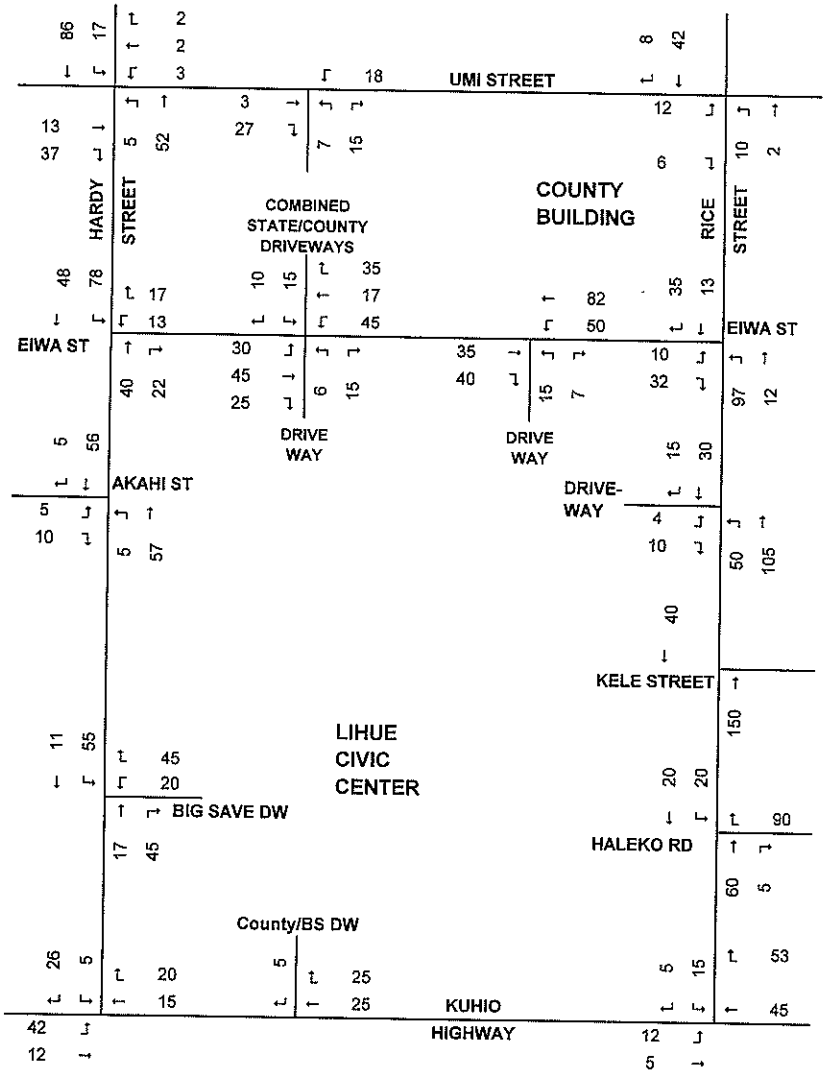
M&E Pacific, Inc.

METCALF & EDDY | AECOM

DAVIES PACIFIC CTR, STE 1900 · 841 BISHOP ST, HONOLULU, HAWAII 96813

Figure IV- 1
RECOMMENDED MASTER PLAN
TRAFFIC IMPACT ANALYSIS REPORT
LIHUE CIVIC CENTER
LIHUE, KAUAI, HAWAII

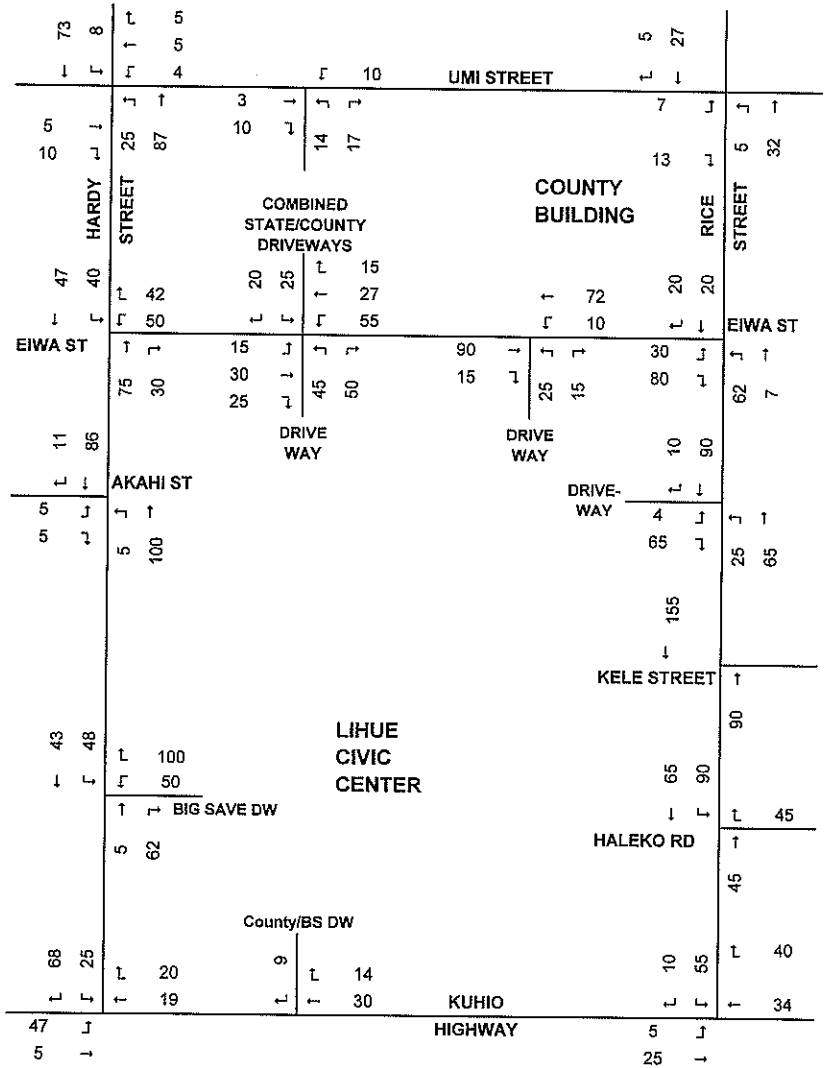
OCTOBER, 2005



AM PEAK HOUR

Not to Scale

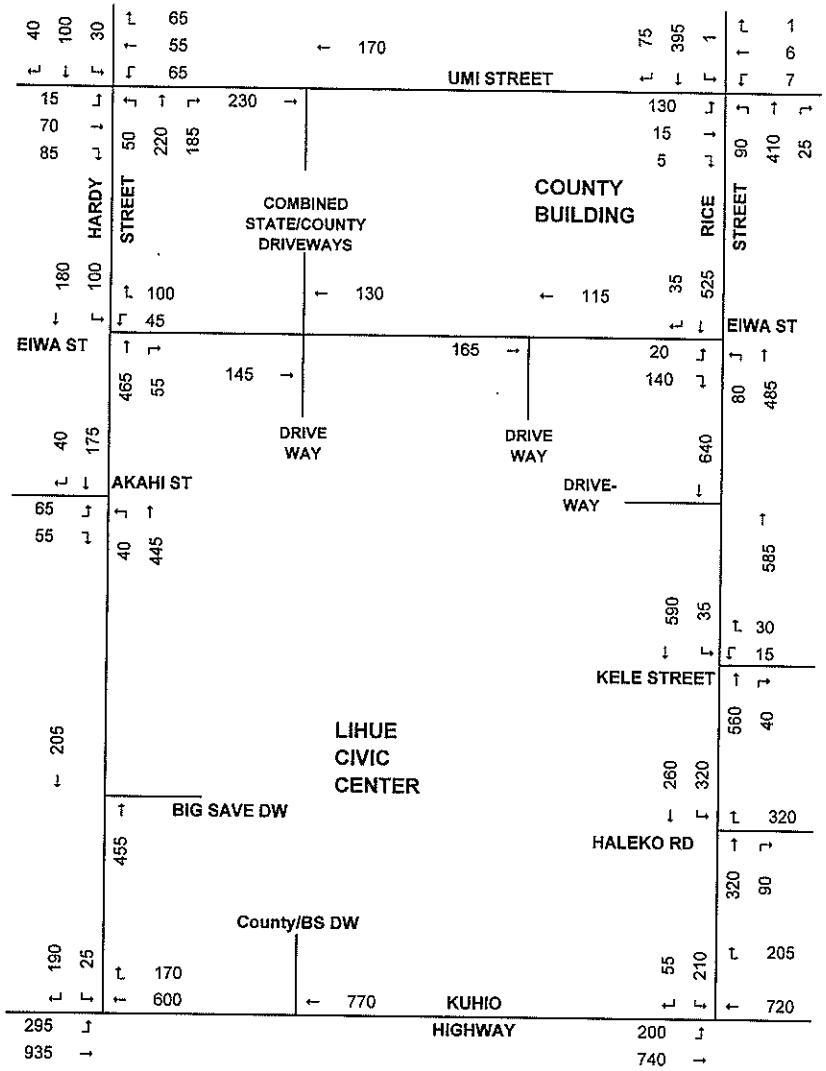
EXISTING TURNS INTO CIVIC CENTER PARKING AREAS ADJUSTED FOR OPENING OF KA'ANA STREET EXTENSION
FIGURE IV-2A



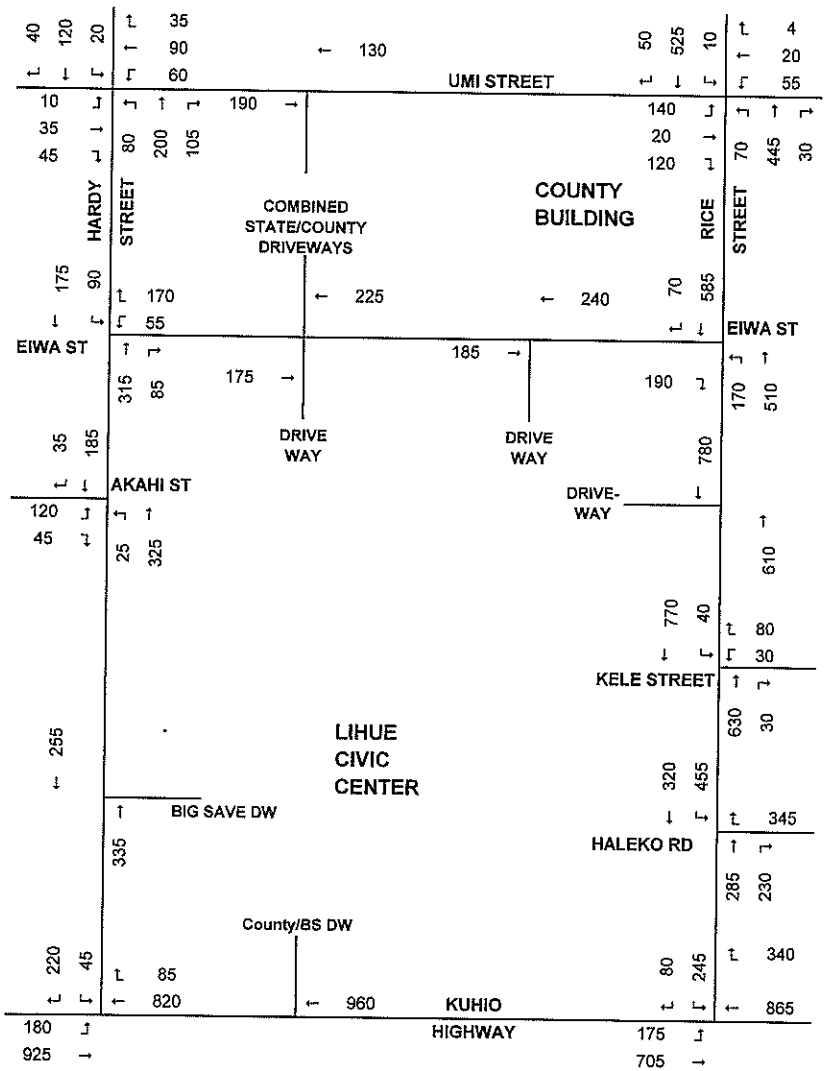
PM PEAK HOUR

Not to Scale

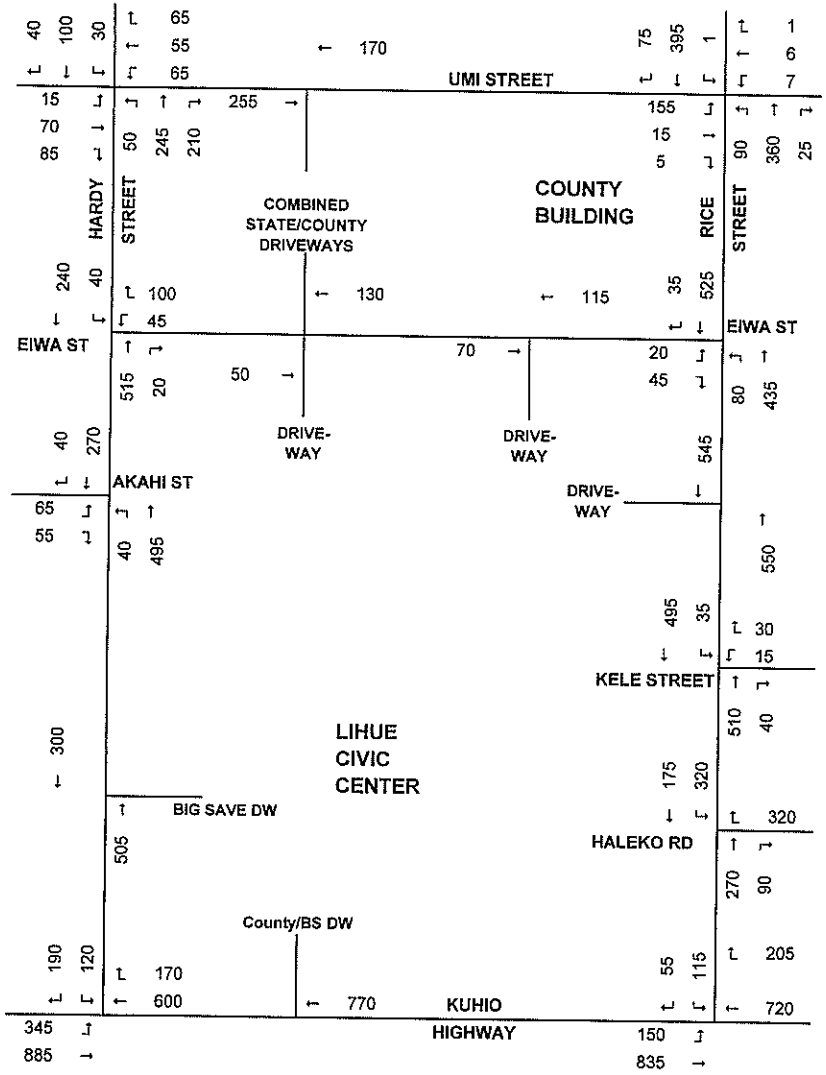
EXISTING TURNS INTO CIVIC CENTER PARKING AREAS ADJUSTED FOR OPENING OF KA'ANA STREET EXTENSION
FIGURE IV-2B



EXISTING THROUGH TRAFFIC VOLUMES
FIGURE IV-3A

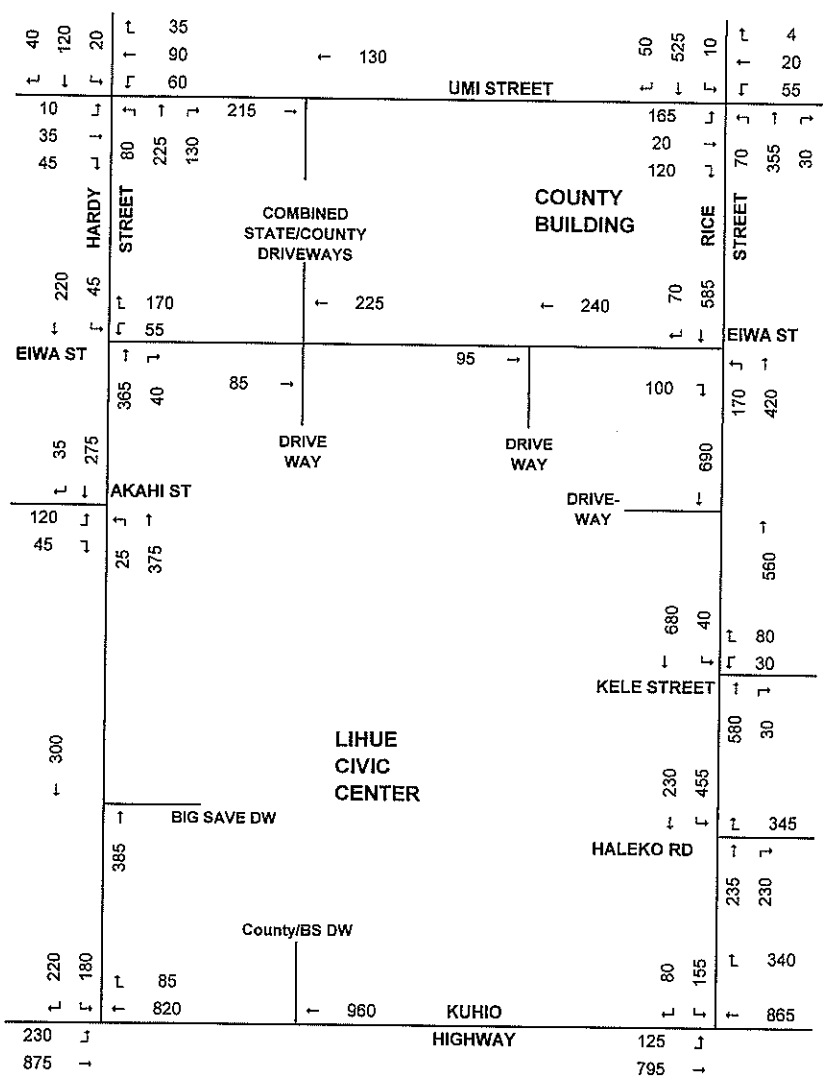


EXISTING THROUGH TRAFFIC VOLUMES
FIGURE IV-3B



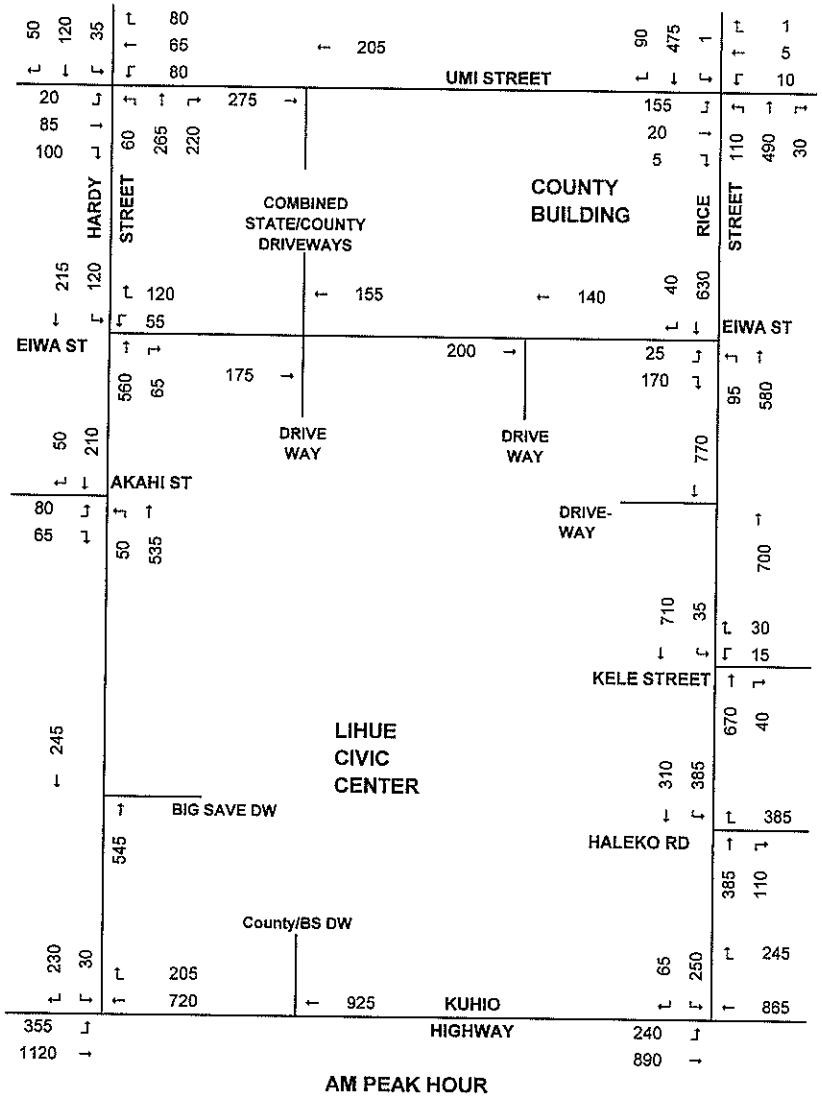
Not to Scale

EXISTING THROUGH TRAFFIC VOLUMES
ADJUSTED FOR KUHIO/HARDY SIGNAL (AMBIENT SCENARIO 2)
FIGURE IV-4A

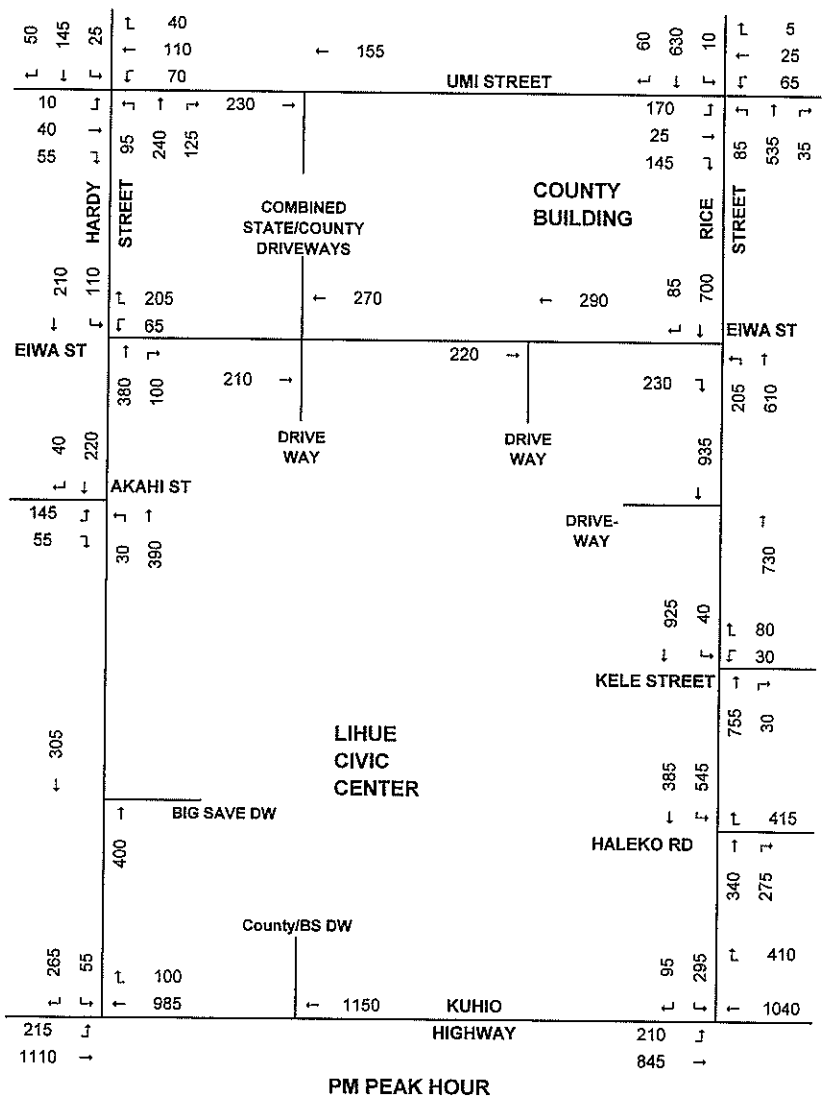


Not to Scale

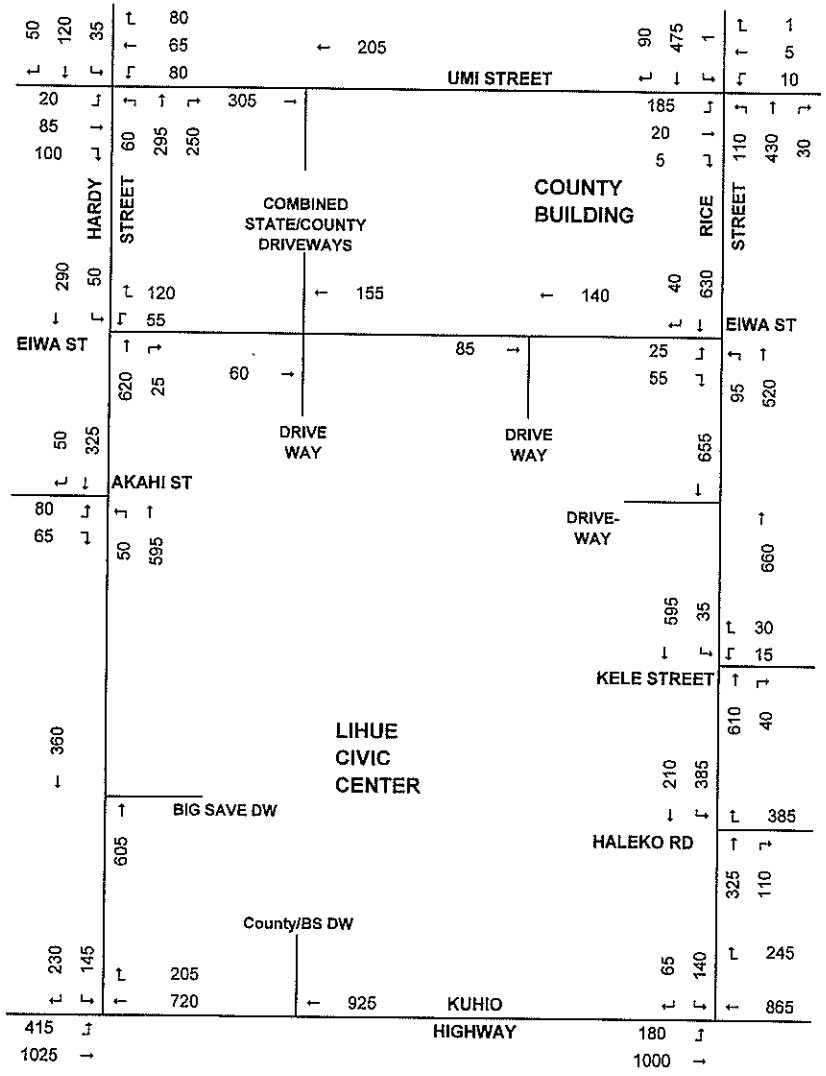
EXISTING THROUGH TRAFFIC VOLUMES
ADJUSTED FOR KUHIO/HARDY SIGNAL (AMBIENT SCENARIO 2)
FIGURE IV-4B



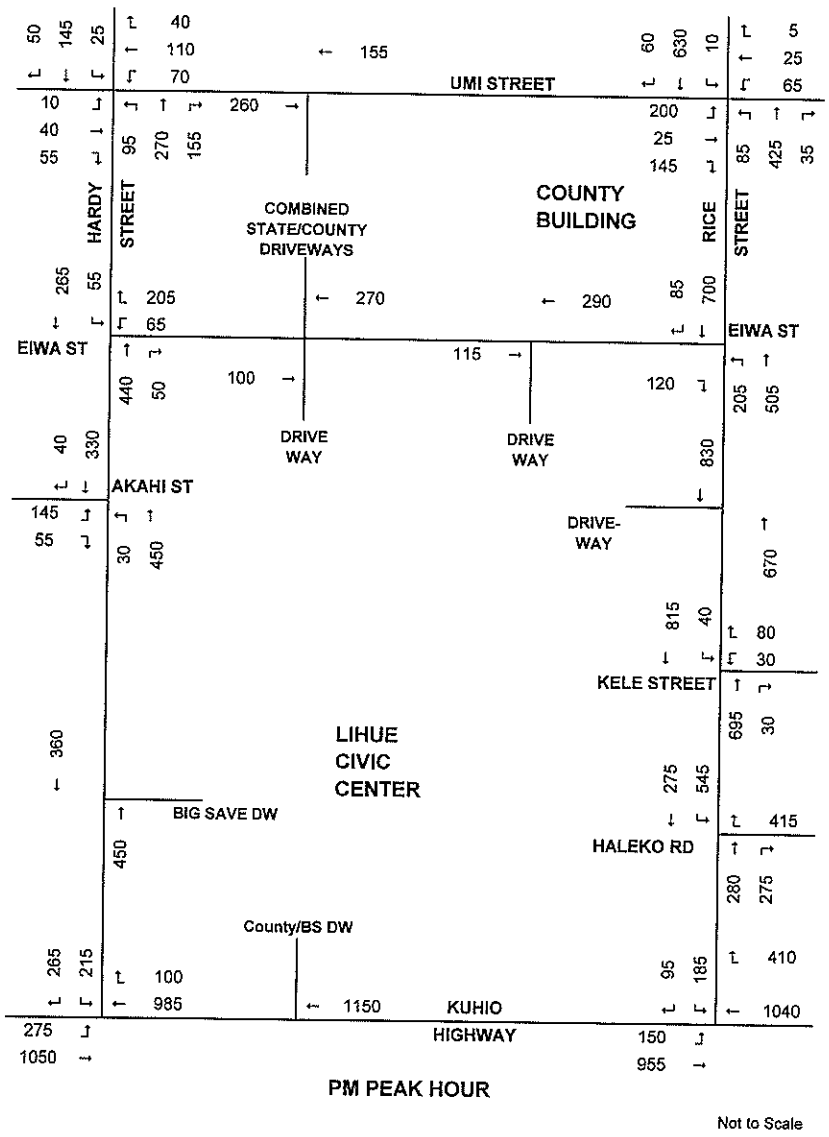
AMBIENT SCENARIO 1 THROUGH TRAFFIC FORECAST
FIGURE IV-5A



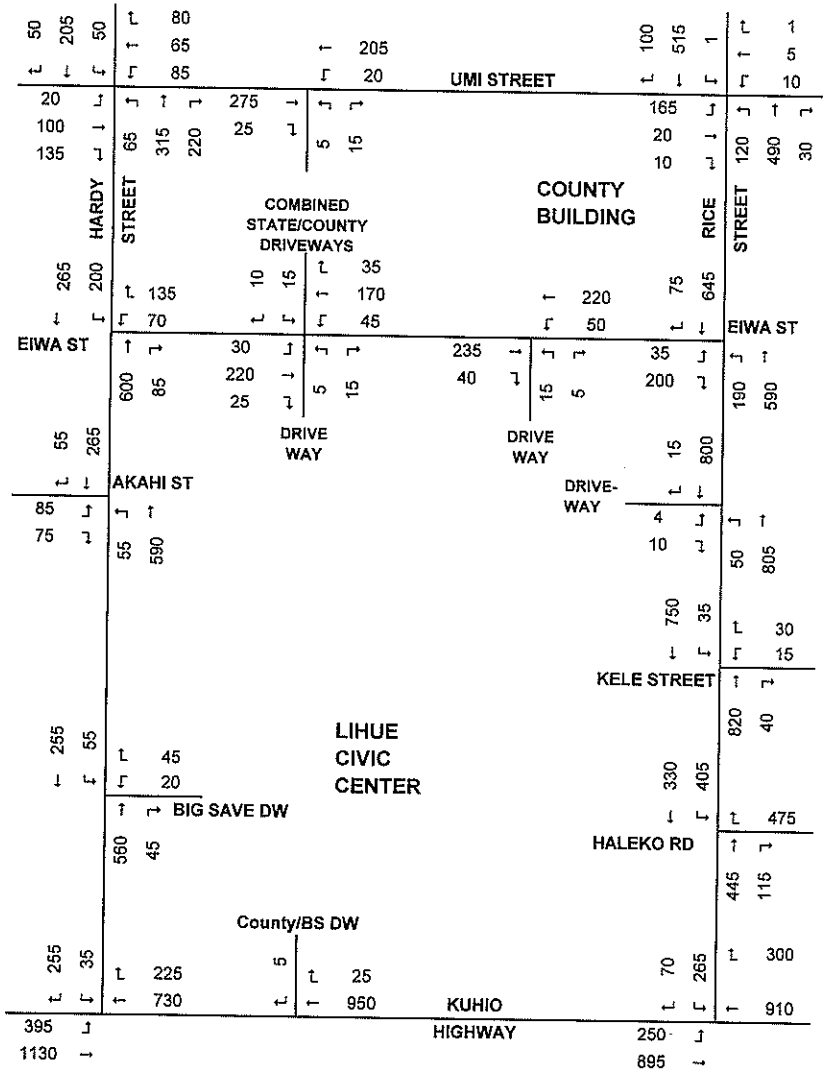
AMBIENT SCENARIO 1 THROUGH TRAFFIC FORECAST
FIGURE IV-5B



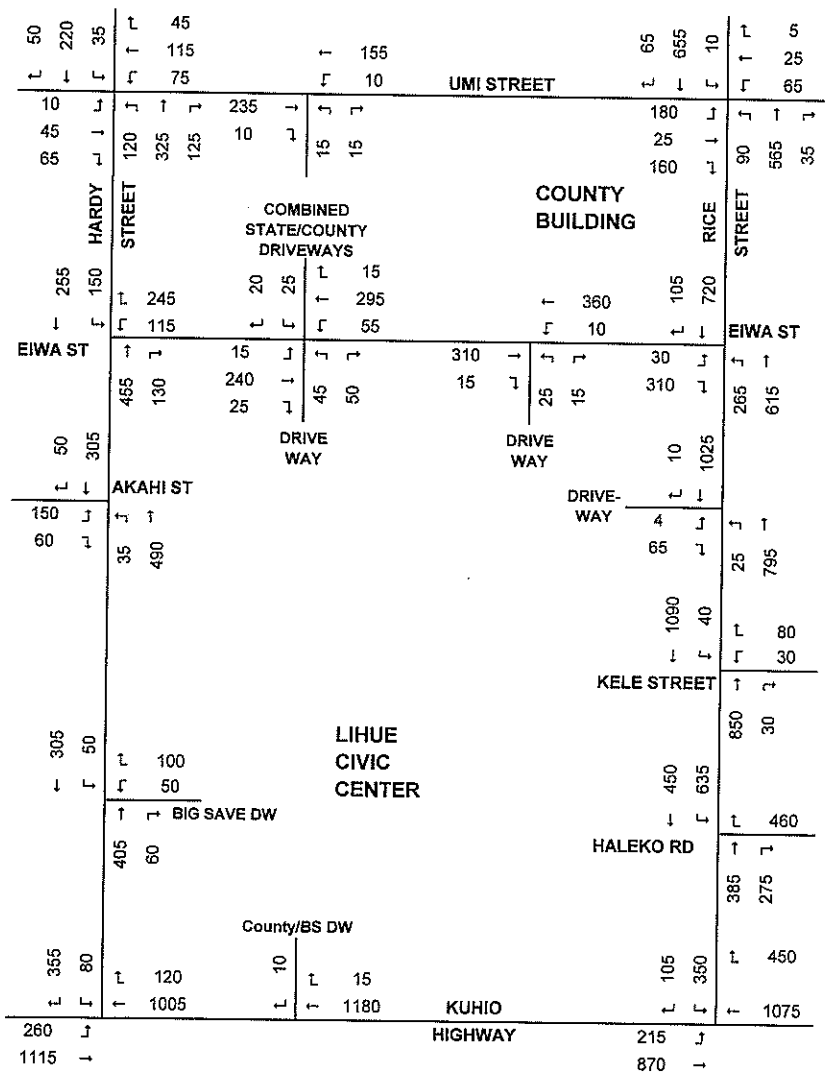
AMBIENT SCENARIO 2 THROUGH TRAFFIC FORECAST
FIGURE IV-6A



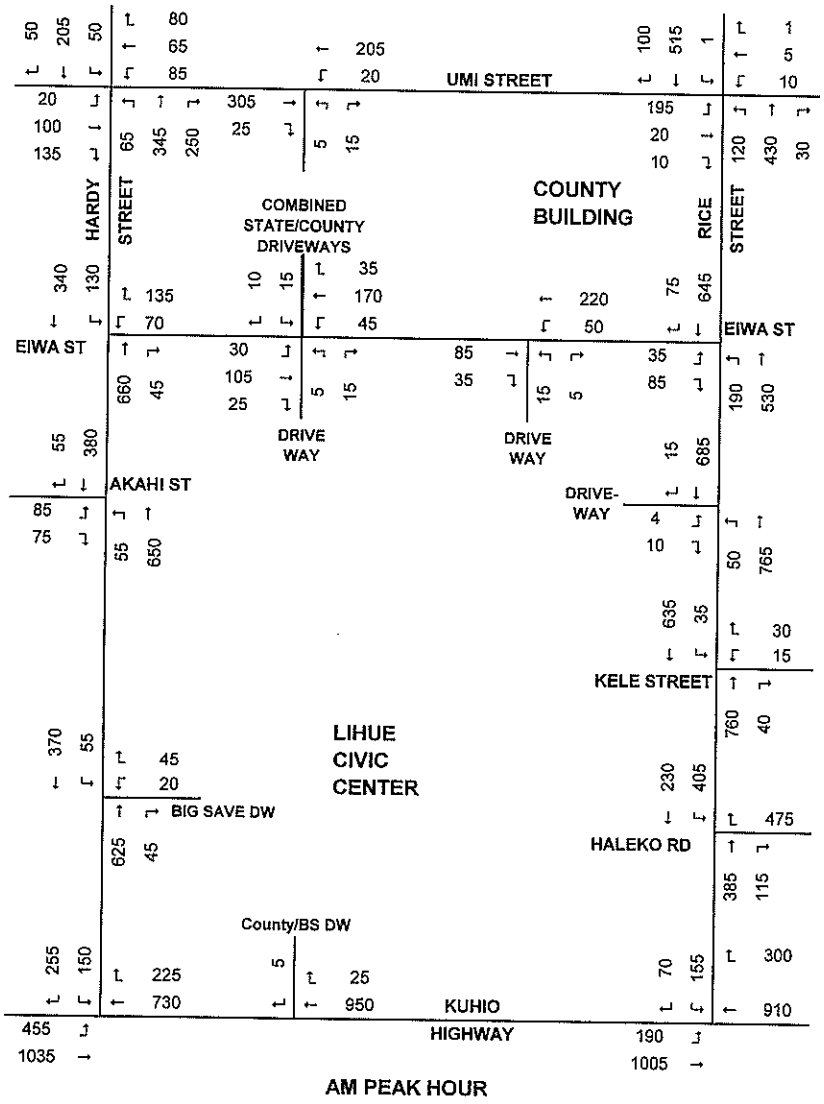
AMBIENT SCENARIO 2 THROUGH TRAFFIC FORECAST
FIGURE IV-6B



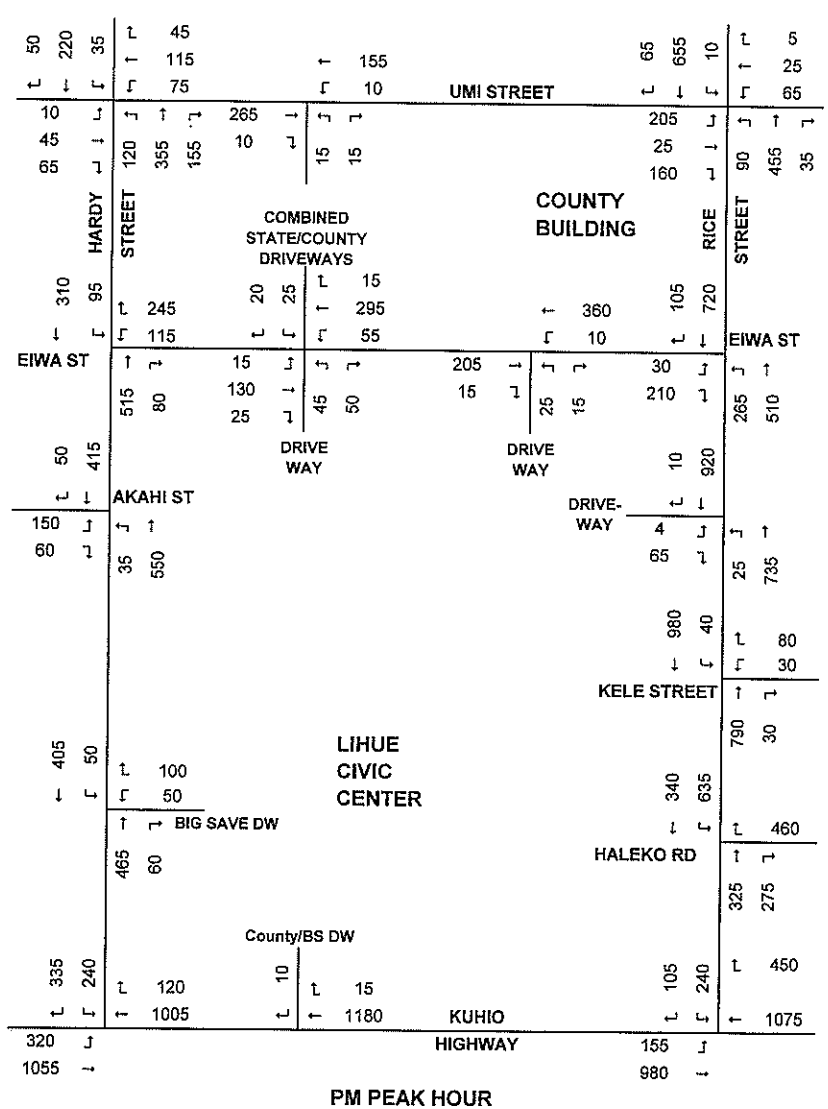
AMBIENT SCENARIO 1 COMBINED TRAFFIC FORECAST
FIGURE IV-7A



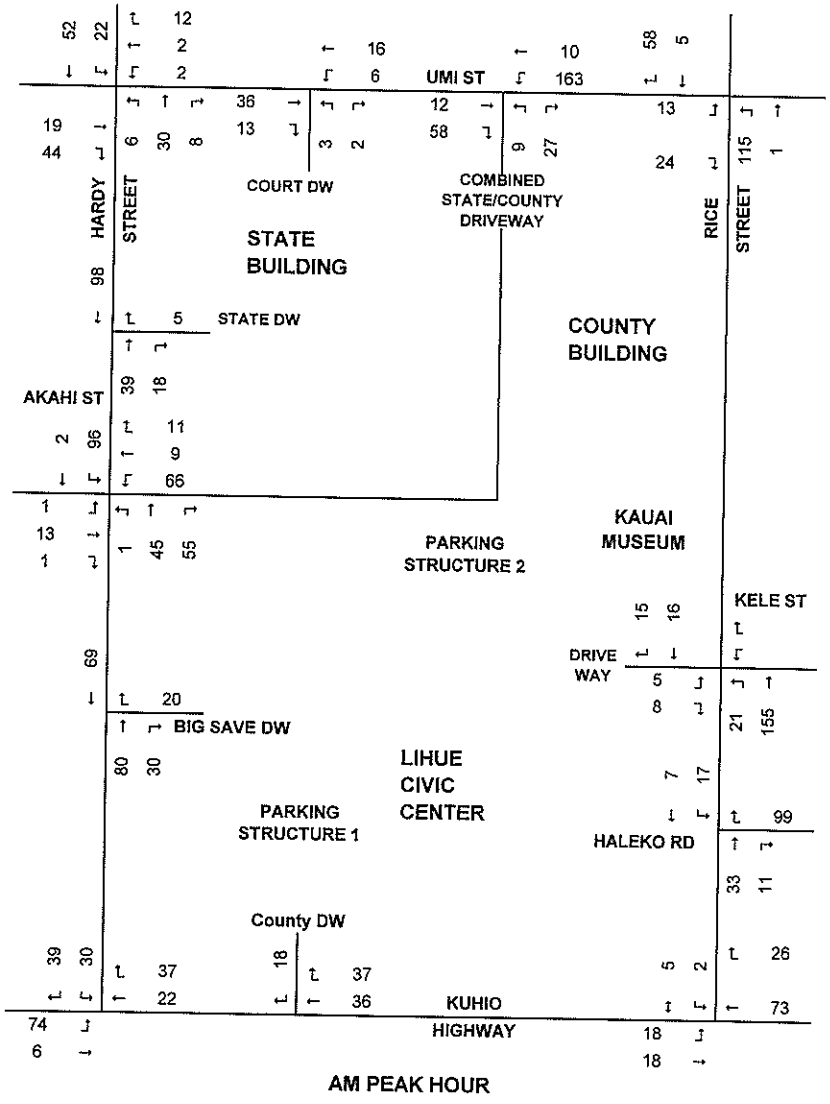
AMBIENT SCENARIO 1 COMBINED TRAFFIC FORECAST
FIGURE IV-7B



AMBIENT SCENARIO 2 COMBINED TRAFFIC FORECAST
FIGURE IV-8A



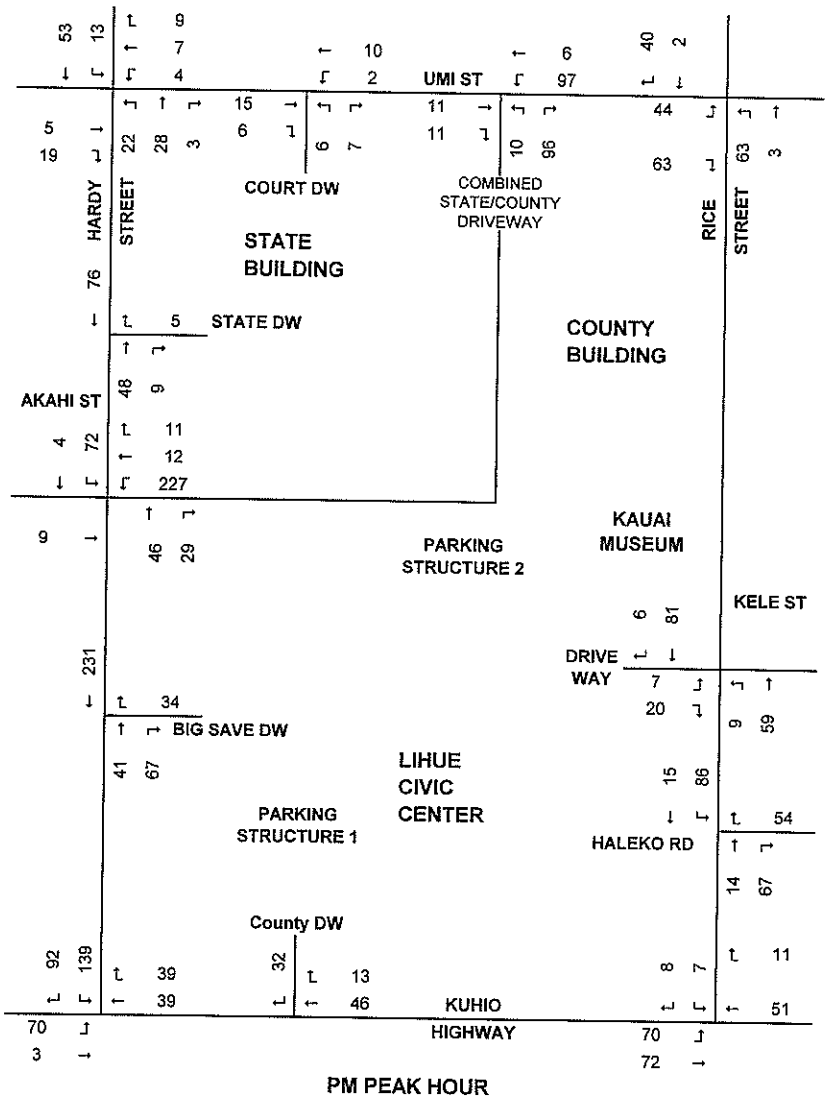
AMBIENT SCENARIO 2 COMBINED TRAFFIC FORECAST
FIGURE IV-8B



AM PEAK HOUR

Not to Scale

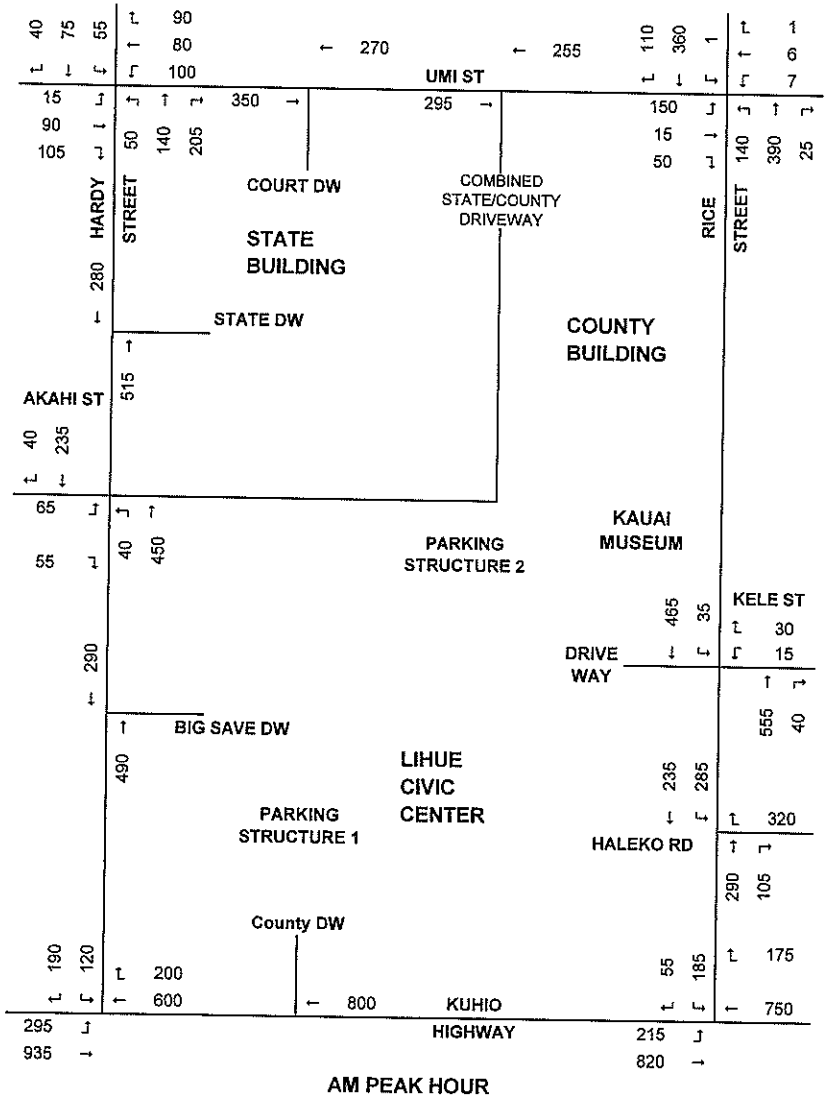
MASTER PLAN PARKING TRAFFIC ASSIGNMENT
FIGURE IV-9A



PM PEAK HOUR

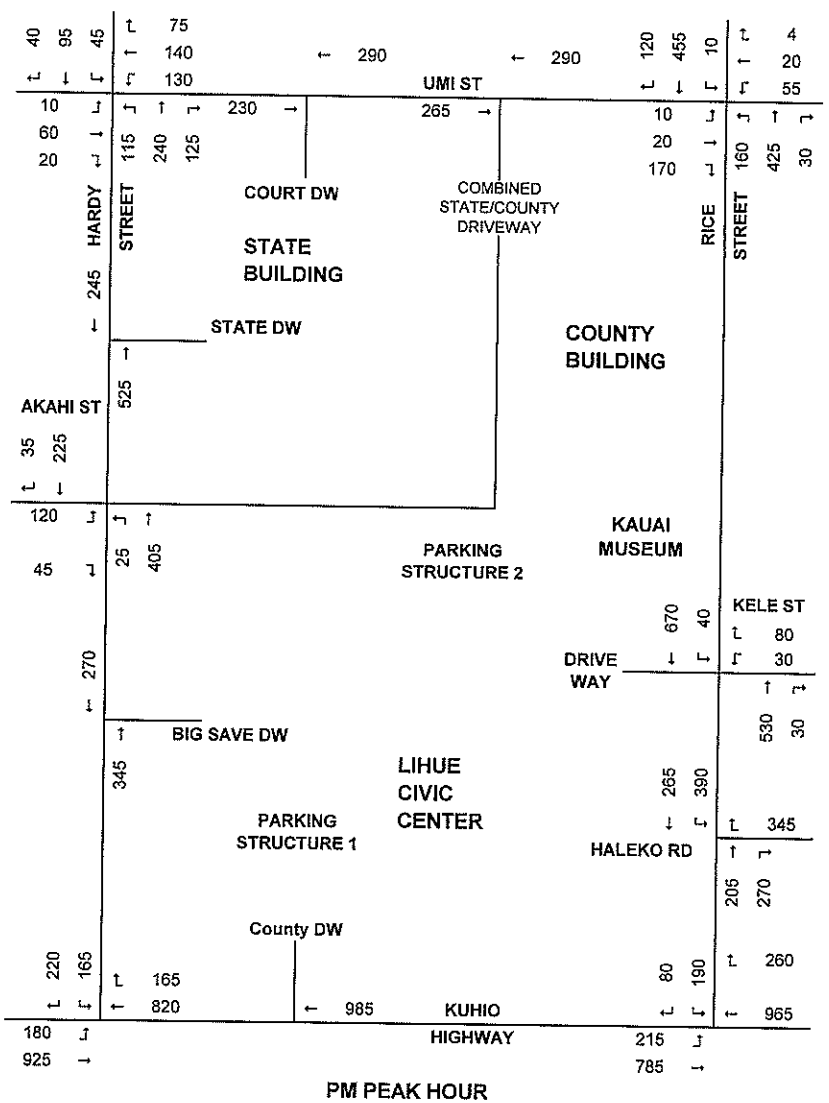
Not to Scale

MASTER PLAN PARKING TRAFFIC ASSIGNMENT
FIGURE IV-9B



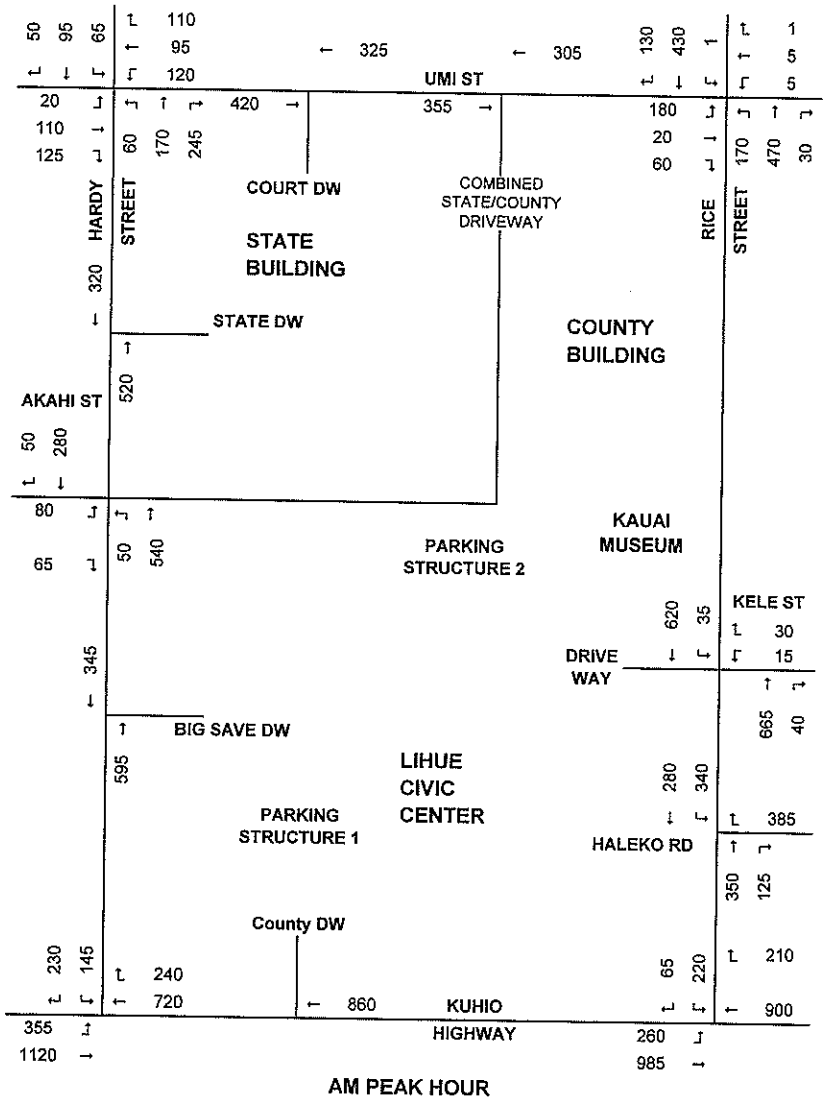
Not to Scale

MASTER PLAN EXISTING THROUGH TRAFFIC ASSIGMENT
FIGURE IV-10A

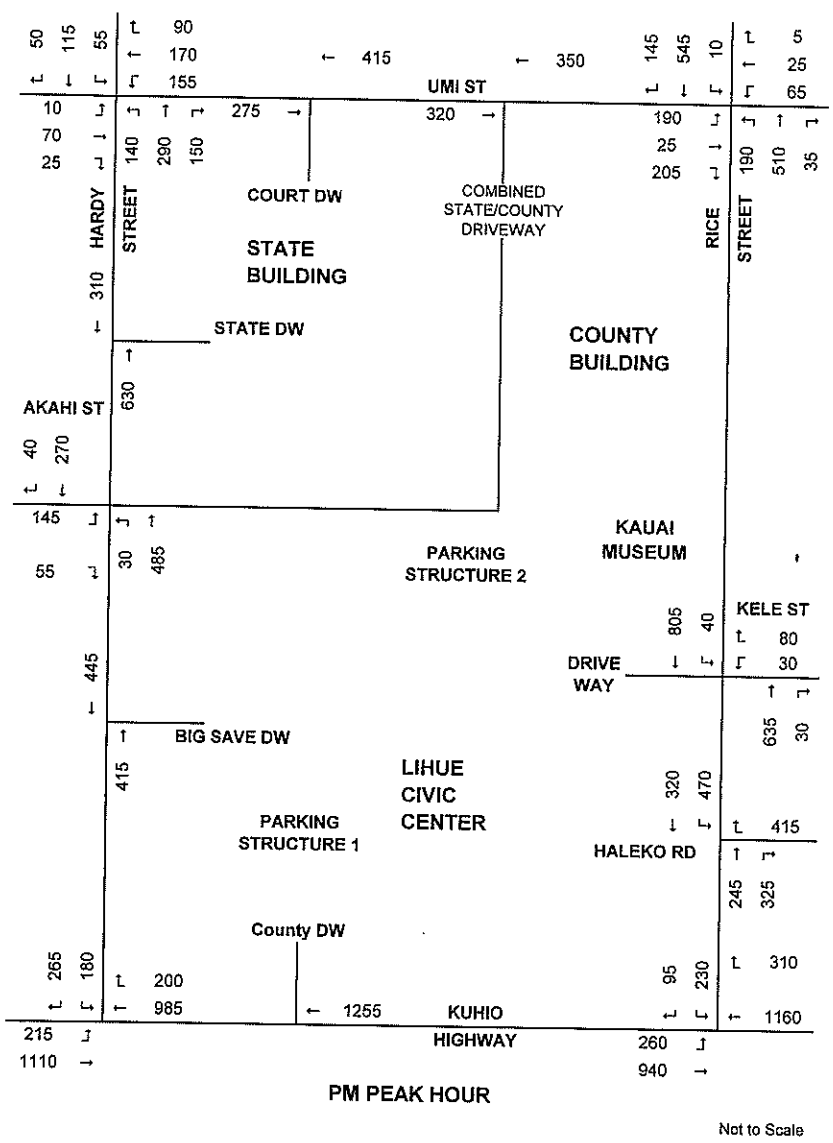


Not to Scale

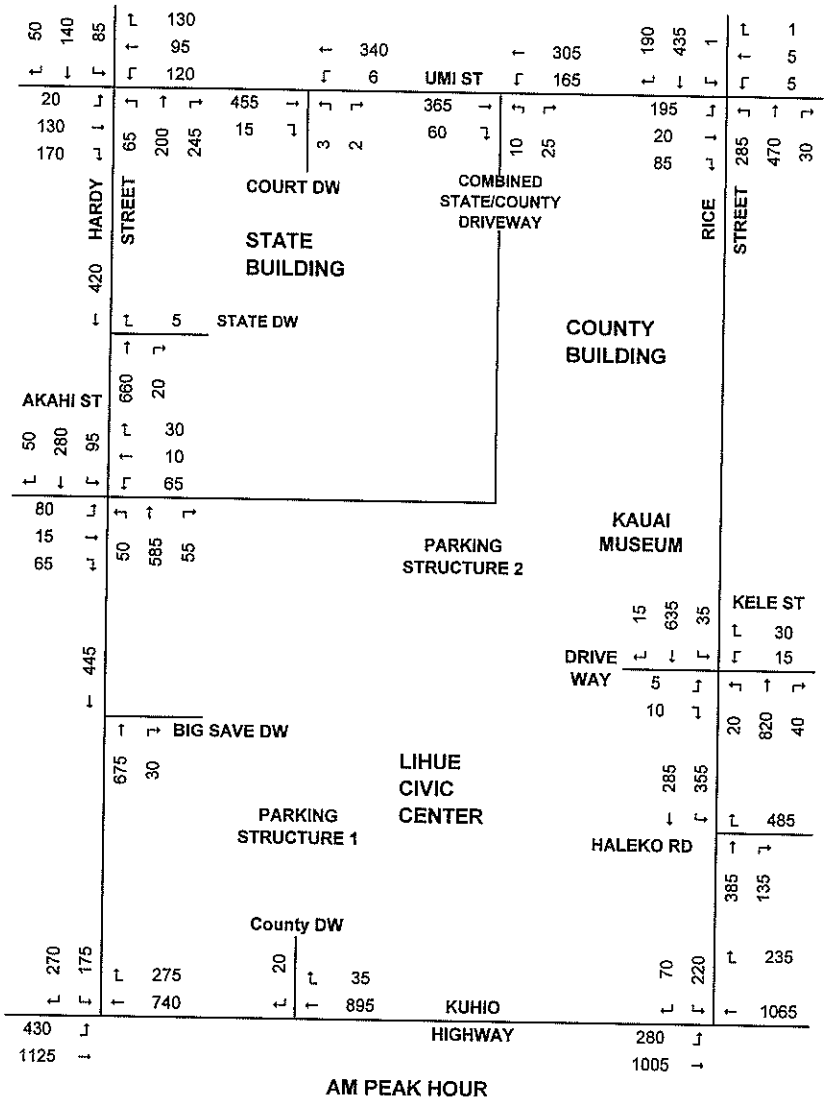
MASTER PLAN EXISTING THROUGH TRAFFIC ASSIGMENT
FIGURE IV-10B



MASTER PLAN FORECAST THROUGH TRAFFIC ASSIGMENT
FIGURE IV-11A



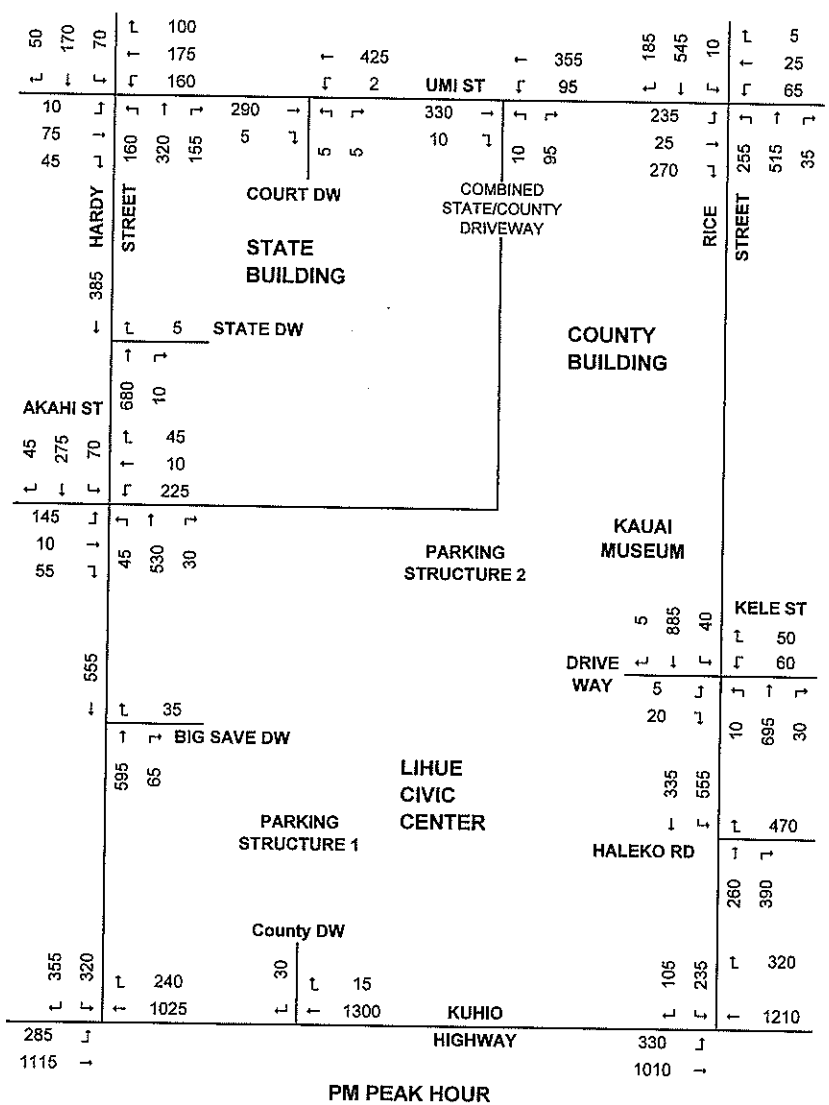
MASTER PLAN FORECAST THROUGH TRAFFIC ASSIGMENT
FIGURE IV-11B



AM PEAK HOUR

Not to Scale

MASTER PLAN COMBINED TRAFFIC FORECAST
FIGURE IV-12A



PM PEAK HOUR

Not to Scale

MASTER PLAN COMBINED TRAFFIC FORECAST
FIGURE IV-12B

Tables

TABLE II-1
EXISTING LEVEL OF SERVICE ANALYSES SUMMARY

INTERSECTION APPROACH	AM PEAK HOUR LOS	AM PEAK HOUR Delay	PM PEAK HOUR LOS	PM PEAK HOUR Delay
RICE STREET/UMI STREET				
SIGNALIZED INTERSECTION ANALYSIS				
Rice Street/Umi Street	B	11.2	B	12.8
Rice St EB	A	9.4	A	9.5
Rice St WB	A	8.4	A	8.8
Umi St NB	B	18.1	C	21.4
Umi St SB	C	24.6	C	24.7
RICE STREET/EIWA STREET				
UNSIGNALIZED INTERSECTION ANALYSIS				
Eiwa St SB	C	17.3	C	24.3
Eiwa St SB right	B	12.8	C	16.6
Eiwa St SB left	E	45.7	F	90.1
Rice St EB left	B	10.1	B	11.8
RICE STREET/KELE STREET				
UNSIGNALIZED INTERSECTION ANALYSIS				
Rice Street/Kele St/Driveway				
Kele St NB	C	22.2	F	78.3
Rice St WB LT	A	9.8	A	9.8
RICE STREET/COUNTY DRIVEWAY				
UNSIGNALIZED INTERSECTION ANALYSES				
County Driveway SB	B	11.0	B	13.0
Rice St EB LT	A	9.6	B	10.4
RICE STREET/HALEKO ROAD				
UNSIGNALIZED INTERSECTION ANALYSES				
Haleko Rd NB RT	E	39.6	E	38.1
Rice St WB LT	B	10.5	C	15.3
RICE STREET/KUHIO HIGHWAY				
SIGNALIZED INTERSECTION ANALYSIS				
Rice Street/Kuhio Highway	B	13.9	B	17.3
Rice St WB	D	36.9	D	45.7
Rice St WB LT	D	37.4	D	47.1
Kamualii Highway NB	B	13.4	B	15.3
Kuhio Hwy SB	A	8.6	A	9.4
Kuhio Hwy SB LT	B	15.0	B	18.4

TABLE II-1
EXISTING LEVEL OF SERVICE ANALYSES SUMMARY

INTERSECTION APPROACH	AM PEAK HOUR LOS	AM PEAK HOUR Delay	PM PEAK HOUR LOS	PM PEAK HOUR Delay
HARDY STREET/KUHIO HIGHWAY				
UNSIGNALIZED INTERSECTION ANALYSES				
Hardy St WB	F	100+	F	100+
Hardy St WB right	C	16.9	D	31.7
Hardy St WB left	F	100+	F	100+
Kuhio Hwy SB left	C	15.1	B	14.4
HARDY STREET/BIG SAVE DRIVEWAY				
UNSIGNALIZED INTERSECTION ANALYSES				
Big Save Driveway NB	C	16.2	C	19.0
Hardy St WB LT	A	8.9	A	8.4
HARDY STREET/AKAHI STREET				
UNSIGNALIZED INTERSECTION ANALYSES				
Akahi Street SB	B	10.0	B	10.8
Hardy St EB LT	A	8.1	A	8.2
HARDY STREET/EIWA STREET				
UNSIGNALIZED INTERSECTION ANALYSES				
Eiwa St NB	B	14.5	B	13.9
Hardy St WB left	A	9.8	A	8.9
HARDY STREET/UMI STREET				
UNSIGNALIZED INTERSECTION ANALYSES				
Umi St NB	F	54.7	E	45.4
Umi St NB R	B	11.1	B	10.3
Umi St NB TL	F	78.2	F	54.4
Umi St SB	C	25.0	D	25.6
Hardy St EB left	A	7.8	A	8.0
Hardy St WB left	A	8.5	A	8.2
UMI STREET/COUNTY-STATE DRIVEWAY				
UNSIGNALIZED INTERSECTION ANALYSES				
Driveway EB	B	10.5	B	10.1
Umi St NB LT				

NOTES: 1. Subapproach lanes of an approach are underlined
2. Movements with undesirable levels of service are higlighted.

TABLE IV-1
LEVEL OF SERVICE ANALYSES SUMMARY

INTERSECTION APPROACH	Existing LOS	Existing Delay	Ambient Scenario 1 LOS	Ambient Scenario 1 Delay	Ambient Scenario 2 LOS	Ambient Scenario 2 Delay	Recom. Plan LOS	Recom. Plan Delay	Existing LOS	Existing Delay	Ambient Scenario 1 LOS	Ambient Scenario 1 Delay	Ambient Scenario 2 LOS	Ambient Scenario 2 Delay	Recom. Plan LOS	Recom. Plan Delay
	AM PEAK HOUR								PM PEAK HOUR							
RICE STREET/UMI STREET																
SIGNALIZED INTERSECTION ANALYSIS																
Rice Street/Umi Street				*(w/ 2 phase signal)*												
Rice St EB	B	11.2	B	12.2	B	12.8	B	18.9	B	12.8	B	14.2	B	15.1	C	24.6
Rice St EB LT	A	9.4	B	10.9	B	10.3	C	23.6	A	9.5	B	10.9	B	12.4	C	28.4
Rice St EB left							D	44.7							E	65.6
Rice St WB	A	8.4	A	8.8	A	8.8	A	8.9	A	8.8	A	9.5	B	11.5	A	9.7
Umi St NB	B	18.1	B	18.3	B	18.3	B	18.1	C	21.4	C	24.1	B	19.9	C	27.2
Umi St SB	C	24.6	C	26.6	C	29.8	C	27.6	C	24.7	C	27.5	C	24.5	D	37.7
SIGNALIZED INTERSECTION ANALYSIS				*(w/ 3 phase signal and EB LT lane)*												
Rice Street/Umi Street							B	19.9							C	26.4
Rice St EB							B	19.1							C	25.2
Rice St EB LT							C	33.9							D	51.9
Rice St WB							B	14.9							B	17.5
Umi St NB							C	20.6							C	30.1
Umi St SB							C	32.2							D	39.9
RICE STREET/EIWA STREET																
UNSIGNALIZED INTERSECTION ANALYSIS																
Eiwa St SB	C	17.3	C	21.5	D	26.8			C	24.3	E	41.1	E	39.7		
Eiwa St SB right	B	12.8	B	14.6	B	12.0			C	16.6	C	22.1	C	16.4		
Eiwa St SB left	E	45.7	F	72.8	F	87.9			F	90.1	F	100+	F	100+		
Rice St EB left	B	10.1	B	11.0	B	11.0			B	11.8	B	13.2	B	13.2		

TABLE IV-1
LEVEL OF SERVICE ANALYSES SUMMARY

INTERSECTION APPROACH	AM PEAK HOUR Existing LOS	Delay	Ambient Scenario 1 LOS	Delay	Ambient Scenario 2 LOS	Delay	Recom. Plan LOS	Delay	PM PEAK HOUR Existing LOS	Delay	Ambient Scenario 1 LOS	Delay	Ambient Scenario 2 LOS	Delay	Recom. Plan LOS	Delay
RICE STREET/KELE STREET/COUNTY DRIVEWAY																
UNSIGNALIZED INTERSECTION ANALYSIS																
Rice Street/Kele St/Driveway (w/ left turns permitted)																
Kele St NB	C	22.2	D	29.2	C	24.1	E	41.9	F	78.3	F	100+	F	100+	F	78.6
County Driveway SB (for recommended plan)							C	20.5							C	22.2
Rice St EB LT							A	9.3							B	10.3
Rice St WB LT	A	9.8	B	10.4	B	10.1	B	10.4	A	9.8	B	10.5	B	10.2	A	9.7
Rice Street/Kele St/Driveway (w/ right turns only permitted)																
Kele St NB							B	12.5							B	12.6
County Driveway SB							B	10.8							B	12.4
Rice St EB LT							A	9.3							B	10.3
Rice St WB LT							B	10.4							A	9.7
SIGNALIZED INTERSECTION ANALYSIS																
Rice Street/Kele Street/Driveway (w/ left turns permitted)							A	8.4							A	9.3
Rice St EB							A	8.1							A	7.4
Rice St WB							A	7.4							A	8.5
Kele St NB							C	23.3							C	24.7
County Driveway SB							C	22.7							C	22.9
RICE STREET/COUNTY DRIVEWAY																
UNSIGNALIZED INTERSECTION ANALYSES																
County Driveway SB	B	11.0	B	11.7	B	11.0			B	13.0	B	14.3	B	13.4		
Rice St EB LT	A	9.6	B	10.3	A	9.7			B	10.4	B	11.3	B	10.7		

TABLE IV-1
LEVEL OF SERVICE ANALYSES SUMMARY

INTERSECTION APPROACH	AM PEAK HOUR Existing LOS	Delay	Ambient Scenario 1 LOS	Delay	Ambient Scenario 2 LOS	Delay	Recom. Plan LOS	Delay	PM PEAK HOUR Existing LOS	Delay	Ambient Scenario 1 LOS	Delay	Ambient Scenario 2 LOS	Delay	Recom. Plan LOS	Delay
RICE STREET/HALEKO ROAD																
UNSIGNALIZED INTERSECTION ANALYSES																
Rice Street/Haleko Road (current design)																
Haleko Rd NB RT	E	39.6	F	100+	F	71.7	F	83.2	E	38.1	F	100+	F	73.1	F	75.1
Rice St WB LT	B	10.5	B	12.2	B	11.5	B	11.1	C	15.3	D	25.1	C	21.0	C	18.6
Rice Street/Haleko Road (w/ separate through and right turn EB lanes)																
Haleko Rd NB RT							F	51.4							C	23.2
Rice St WB LT							B	11.1							C	18.6
SIGNALIZED INTERSECTION ANALYSIS																
Rice Street/Haleko Road (widened)							C	27.9							C	31.8
Rice St EB							C	32.7							D	38.2
Rice St WB							B	13.8							B	17.9
Rice ST WB LT							B	16.7							C	22.9
Haleko Rd NB R							D	44.2							D	54.4
RICE STREET/KUHIO HIGHWAY																
SIGNALIZED INTERSECTION ANALYSIS																
Rice Street/Kuhio Highway	B	13.9	B	17.7	B	13.2	C	21.4	B	17.3	C	24.0	B	16.2	B	18.0
Rice St WB	D	36.9	D	42.7	C	30.7	D	40.6	D	45.7	D	41.4	D	35.2	C	33.5
Rice St WB LT	D	37.4	D	44	C	31.4	D	41.7	D	47.1	D	43.3	D	36.6	C	33.2
Kamualii Highway NB	B	13.4	B	14.7	B	14.7	B	17.7	B	15.3	C	24.6	B	17.4	B	15.5
Kuhio Hwy SB	A	8.6	B	13.8	A	9.6	C	20.8	A	9.4	B	17.2	B	10.6	B	17.4
Kuhio Hwy SB LT	B	15.0	D	36.8	B	18.9	E	69.4	B	18.4	D	48.6	C	25.3	D	51.1

TABLE IV-1
LEVEL OF SERVICE ANALYSES SUMMARY

INTERSECTION APPROACH	AM PEAK HOUR Existing LOS	Delay	Ambient Scenario 1 LOS	Delay	Ambient Scenario 2 LOS	Delay	Recom. Plan LOS	Delay	PM PEAK HOUR Existing LOS	Delay	Ambient Scenario 1 LOS	Delay	Ambient Scenario 2 LOS	Delay	Recom. Plan LOS	Delay
HARDY STREET/KUHIO HIGHWAY																
UNSIGNALIZED INTERSECTION ANALYSES																
Hardy St WB	F	100+	F	100+					F	100+	F	100+				
Hardy St WB right	C	16.9	C	21.9					D	31.7	E	49.5				
Hardy St WB left	F	100+	F	100+					F	100+	F	100+				
Kuhio Hwy SB left	C	15.1	C	21.5					B	14.4	C	18.7				
SIGNALIZED INTERSECTION ANALYSIS																
Kuhio Highway/Hardy Street					B	18.6	B	15.2					C	20.8	C	22.3
Hardy St WB					C	27.2	C	31.9					C	29.1	C	26.5
Hardy St WB LT					C	24.8	C	28.3					C	25.1	C	25.1
Kuhio Hwy NB					B	16.7	B	14.1					C	24.0	C	25.0
Kuhio Hwy SB					B	17.7	B	11.6					B	15.3	B	18.2
Kuhio Hwy SB LT					D	48.0	C	32.2					D	46.1	E	57.5
HARDY STREET/BIG SAVE-COUNTY DRIVEWAY																
UNSIGNALIZED INTERSECTION ANALYSES																
Big Save Driveway NB	C	16.2	C	17.7	C	21.0			C	19.0	C	19.6	C	23.5		
Hardy St WB LT	A	8.9	A	9.2	A	9.5			A	8.4	A	8.6	A	8.9		
Big Save Driveway NB RT (if outbound right turns permitted)							C	15.3							B	14.0
Big Save Driveway NB (if outbound left and right turns permitted)							C	23.9							E	40.4
Hardy St WB LT (if inbound left turns permitted)							A	9.7							A	9.4

TABLE IV-1
LEVEL OF SERVICE ANALYSES SUMMARY

INTERSECTION APPROACH	AM PEAK HOUR Existing LOS	Delay	Ambient Scenario 1 LOS	Delay	Ambient Scenario 2 LOS	Delay	Recom. Plan LOS	Delay	PM PEAK HOUR Existing LOS	Delay	Ambient Scenario 1 LOS	Delay	Ambient Scenario 2 LOS	Delay	Recom. Plan LOS	Delay
HARDY STREET/AKAHI STREET/COUNTY DRIVEWAY																
UNSIGNALIZED INTERSECTION ANALYSES																
Hardy Street/Akahi Street/County Driveway	(w/ current two-lane design on Hardy St.)															
County DW NB							F	69.8							F	100+
County DW NB TR							C	19.9							C	17.4
County DW NB L							F	100+							F	100+
Akahi Street SB	B	10.0	D	29.5	F	50.5	F	89.6	B	10.8	F	57.0	F	74.0	F	100+
Hardy St EB LT	A	8.1	A	8.2	A	8.7	A	8.1	A	8.2	A	8.3	A	8.3	A	8.1
Hardy St WB LT							A	9.5							A	9.1
Hardy Street/Akahi Street/County Driveway	(w/ left turn lane on Hardy St. and 12% growth factor)															
County DW NB							F	64.8							F	100+
County DW NB TR							C	19.5							C	17.2
County DW NB L							F	95.4							F	100+
Akahi Street SB							F	81.3							F	100+
Hardy St EB LT							A	8.1							A	8.2
Hardy St WB LT							A	9.5							A	9.1
Hardy Street/Akahi Street/County Driveway	(w/ current two-lane design on Hardy St., four way stop and 12% growth factor)															
Overall intersection							F	68.0							F	100+
Hardy St EB							F	100+							F	100+
Hardy St WB							D	25.6							F	57.3
County Driveway NB							B	12.8							D	31.3
Akahi St SB							B	13.6							C	22.8

TABLE IV-1
LEVEL OF SERVICE ANALYSES SUMMARY

INTERSECTION APPROACH	AM PEAK HOUR Existing LOS	Delay	Ambient Scenario 1 LOS	Delay	Ambient Scenario 2 LOS	Delay	Recom. Plan LOS	Delay	PM PEAK HOUR Existing LOS	Delay	Ambient Scenario 1 LOS	Delay	Ambient Scenario 2 LOS	Delay	Recom. Plan LOS	Delay
Hardy Street/Akahi Street/County Driveway	(w/ left turn lane on Hardy St., four way stop and 12% growth factor)															
Overall intersection							F	56.6							F	76.7
Hardy St EB							F	99.4							F	100+
Hardy St WB							C	16.4							D	26.4
County Driveway NB							B	11.8							C	20.9
Akahi St SB							B	11.2							B	14.1
SIGNALIZED INTERSECTION ANALYSIS																
Hardy Street/Akahi Street/County Driveway	(w/ current two-lane design on Hardy St.)															
Overall intersection							B	14.7							B	16.5
Hardy St EB							B	15.1							B	12.1
Hardy St WB							B	10.9							A	9.5
County Driveway NB							B	18.8							C	29.3
Akahi St SB							C	20.6							C	25.5
Hardy Street/Akahi Street/County Driveway	(w/ left turn lane on Hardy St.)															
Overall intersection							B	12.1							B	15.3
Hardy St EB							B	11.7							B	10.2
Hardy St WB							A	8.1							A	7.9
County Driveway NB							B	18.8							C	29.3
Akahi St SB							C	20.6							C	25.5
HARDY STREET/EIWA STREET																
UNSIGNALIZED INTERSECTION ANALYSES																
Eiwa St NB	B	14.5	F	100+	F	100+			B	13.9	F	100+	F	100+		
Hardy St WB left	A	9.8	B	10.8	B	10.2			A	8.9	A	9.7	A	9.4		

TABLE IV-1
LEVEL OF SERVICE ANALYSES SUMMARY

INTERSECTION APPROACH	AM PEAK HOUR Existing LOS	Delay	Ambient Scenario 1 LOS	Delay	Ambient Scenario 2 LOS	Delay	Recom. Plan LOS	Delay	PM PEAK HOUR Existing LOS	Delay	Ambient Scenario 1 LOS	Delay	Ambient Scenario 2 LOS	Delay	Recom. Plan LOS	Delay
HARDY STREET/UMI STREET																
UNSIGNALIZED INTERSECTION ANALYSES																
Umi St NB	F	54.7	F	100+	F	100+	F	100+	E	45.4	F	100+	F	100+	F	100+
Umi St NB R	B	11.1	B	12.2	B	12.8	B	10.9	B	10.3	B	11.3	B	11.6	B	11.3
Umi St NB TL	F	78.2	F	100+	F	100+	F	100+	F	54.4	F	100+	F	100+	F	100+
Umi St SB	C	25.0	F	98.6	F	100+	D	34.2	D	25.6	E	39.3	E	45.2	F	86.3
Hardy St EB left	A	7.8	A	8.0	A	8.0	A	7.8	A	8.0	A	8.2	A	8.2	A	8.2
Hardy St WB left	A	8.5	A	8.9	A	9.2	A	8.7	A	8.2	A	8.5	A	8.6	A	8.8
ROUNDABOUT INTERSECTION ANALYSIS - utilization is measured by lowerbound volume/capacity ratio. Level of service is not calcuated.																
Hardy Street/Umi Street							v/c ratio								v/c ratio	
Hardy St EB							0.61								0.70	
Hardy St WB							0.34								0.45	
Umi St NB							0.43								0.67	
Umi St SB							0.43								0.18	
UMI STREET/COUNTY-STATE DRIVEWAY																
UNSIGNALIZED INTERSECTION ANALYSES																
Driveway EB	B	10.5	B	10.9	B	11.4	C	15.3	B	10.1	B	10.8	B	11.1	B	12.2
Driveway EB RT							B	11.1							B	11.4
Driveway EB LT							C	26.0							C	19.9
Umi St NB LT							A	9.0							A	8.4

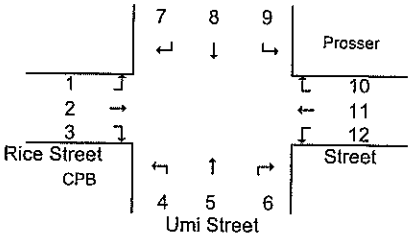
NOTES: 1. Subapproach lanes of an approach are underlined.
2. Movements with undesirable levels of service are higlighted.
3. Alternative mitigation measures are analyzed for intersections with poor levels of service.
4. Ambient scenario 1 is current roadway conditions with opening of Ka'ana Street extension.
5. Ambient scenario 2 is ambient scenario 1 with traffic signal installed at Kuhio Highway/Harding Street intersection.

Appendix A

Traffic Turning Movement Counts

TRAFFIC TURNING MOVEMENT COUNT
Lihue Civic Center Master Plan

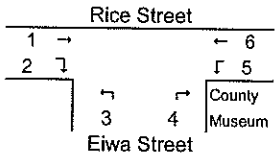
LOCATION: Rice Street/Umi Street
DATE: October 7, 2003; Tuesday
TIME: 7:00a-9:00a/3:00p-5:00p
WEATHER: partly cloudy
RECORDER: H. Funamura, M. Paea



TIME	MOVEMENT NUMBER												
PERIOD	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
7:00-7:15	0	71	13	16	0	16	0	0	3	1	82	12	214
7:15-7:30	1	93	20	25	4	25	0	1	1	1	83	31	285
7:30-7:45	0	135	31	50	5	35	0	1	4	10	110	43	424
7:45-8:00	0	132	18	39	4	38	0	1	1	5	110	14	362
8:00-8:15	0	82	14	30	1	13	1	3	1	9	106	14	274
8:15-8:30	3	100	17	27	3	14	1	2	3	4	100	10	284
8:30-8:45	1	103	8	26	8	17	1	3	2	11	93	5	278
8:45-9:00	2	90	13	18	7	20	2	5	4	10	116	10	297
7:00-9:00	7	806	134	231	32	178	5	16	19	51	800	139	2418
7:15-8:15	1	442	83	144	14	111	1	6	7	25	409	102	1345
PHF	0.79			0.75						0.82			
3:00-3:15	1	139	16	27	2	21	1	3	7	13	127	11	368
3:15-3:30	3	147	18	29	11	18	3	0	16	12	121	18	396
3:30-3:45	1	146	19	25	3	18	2	4	6	10	124	9	367
3:45-4:00	1	125	15	22	4	22	0	8	13	13	134	13	370
4:00-4:15	2	140	18	31	6	31	1	5	14	7	97	21	373
4:15-4:30	2	126	9	37	4	21	1	2	13	4	123	16	358
4:30-4:45	2	154	19	36	7	47	2	9	23	7	133	17	456
4:45-5:00	2	133	10	45	5	34	0	5	7	12	129	20	402
3:00-5:00	14	1110	124	252	42	212	10	36	99	78	988	125	3090
3:30-4:30	6	557	68	103	20	79	6	15	42	48	506	51	1501
4:00-5:00	8	553	56	149	22	133	4	21	57	30	482	74	1589
PHF	0.88			0.90						0.91			

TRAFFIC TURNING MOVEMENT COUNT
Lihue Civic Center Master Plan

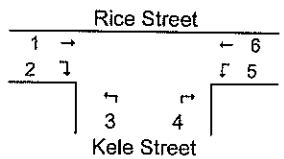
LOCATION: Rice Street/Eiwa Street
DATE: September 30, 2003; Tuesday
TIME: 7:00a-9:00a/3:00p-5:00p
WEATHER: sunny
RECORDER: H. Funamura



TIME PERIOD	MOVEMENT NUMBER 1	2	3	4	5	6	TOTAL
7:00-7:15	76	15	7	15	28	112	253
7:15-7:30	126	11	6	32	27	131	333
7:30-7:45	164	23	5	49	56	149	446
7:45-8:00	140	23	7	54	53	107	384
8:00-8:15	108	16	10	36	38	109	317
8:15-8:30	88	24	8	45	27	98	290
8:30-8:45	106	20	11	43	35	115	330
8:45-9:00	99	35	12	37	37	127	347
7:00-9:00	907	167	66	311	301	948	2700
7:15-8:15	538	73	28	171	174	496	1480
PHF	0.82		0.82		0.82		
3:00-3:15	136	20	8	66	64	132	426
3:15-3:30	120	16	14	60	61	133	404
3:30-3:45	151	22	8	69	63	127	440
3:45-4:00	154	25	7	65	56	146	453
4:00-4:15	138	29	9	57	53	109	395
4:15-4:30	152	19	9	68	49	147	444
4:30-4:45	177	27	7	78	69	141	499
4:45-5:00	140	19	9	68	61	117	414
3:00-5:00	1168	177	71	531	476	1052	3475
4:00-5:00	607	94	34	271	232	514	1752
PHF	0.86		0.90		0.89		

TRAFFIC TURNING MOVEMENT COUNT
Lihue Civic Center Master Plan

LOCATION: Rice Street/Kele Street
DATE: December 16, 2004
TIME: 7:00a-9:00a/3:00p-5:00p
WEATHER: partly cloudy
RECORDER: H. Funamura

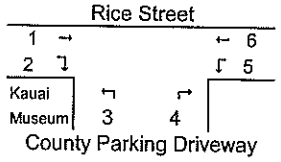


TIME PERIOD	MOVEMENT NUMBER 1	2	3	4	5	6	TOTAL
7:00-7:15	109	5	2	6	2	70	194
7:15-7:30	156	4	1	6	5	135	307
7:30-7:45	234	7	5	5	6	187	444
7:45-8:00	175	8	4	13	12	175	387
8:00-8:15	144	19	7	8	12	135	325
8:15-8:30	135	17	6	13	17	113	301
8:30-8:45	119	13	6	22	14	126	300
8:45-9:00	111	8	5	23	11	120	278
7:00-9:00	1183	81	36	96	79	1061	2536
7:15-8:15	709	38	17	32	35	632	1463
PHF	0.77		0.82		0.86		
8:00-9:00	509	57	24	66	54	494	1204
3:00-3:15	180	24	4	27	22	178	435
3:15-3:30	154	21	9	44	20	206	454
3:30-3:45	194	15	6	38	28	239	520
3:45-4:00	185	12	8	28	22	223	478
4:00-4:15	204	5	9	32	16	231	497
4:15-4:30	169	8	5	18	6	229	435
4:30-4:45	184	10	9	20	6	257	486
4:45-5:00	163	5	7	11	10	207	403
3:00-5:00	1433	100	57	218	130	1770	3708
4:00-5:00	720	28	30	81	38	924	1821
PHF	0.96		0.96		0.91		
3:00-4:00	713	72	27	137	92	846	1887

Post office hours- 8:00 am to 4:00 pm
First Hawaiian Bank hours- 8:30 am to 4:00 pm

TRAFFIC TURNING MOVEMENT COUNT
Lihue Civic Center Master Plan

LOCATION: Rice Street/County Parking Drwy
DATE: October 2, 2003; Thursday
TIME: 7:00a-9:00a/3:00p-5:00p
WEATHER: rain in AM; cloudy in PM
RECORDER: H. Funamura

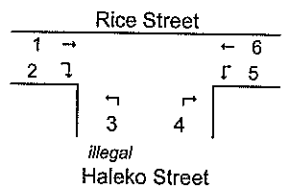


TIME PERIOD	MOVEMENT NUMBER 1	2	3	4	5	6	TOTAL
7:00-7:15	112	1	0	2	7	121	243
7:15-7:30	140	2	0	4	19	163	328
7:30-7:45	197	5	0	3	13	228	446
7:45-8:00	194	4	2	4	19	165	388
8:00-8:15	139	4	2	0	0	134	279
8:15-8:30	95	1	1	10	14	139	260
8:30-8:45	144	6	1	8	4	138	301
8:45-9:00	141	2	0	3	5	138	289
7:00-9:00	1162	25	6	34	81	1226	2534
7:15-8:15	670	15	4	11	51	690	1441
PHF	0.85				0.77		
3:00-3:15	185	8	1	7	8	194	403
3:15-3:30	186	4	3	9	9	195	406
3:30-3:45	195	6	1	11	6	155	374
3:45-4:00	191	7	2	20	5	185	410
4:00-4:15	225	4	0	12	14	168	423
4:15-4:30	183	4	1	19	4	162	373
4:30-4:45	272	1	2	25	6	175	481
4:45-5:00	189	1	1	10	2	172	375
3:00-5:00	1626	35	11	113	54	1406	3245
4:00-5:00	869	10	4	66	26	677	1652
PHF	0.80				0.97		

NOTE: This count was take just prior to the County's placing plastic delineators to prevent left turns across Rice Street.

TRAFFIC TURNING MOVEMENT COUNT
Lihue Civic Center Master Plan

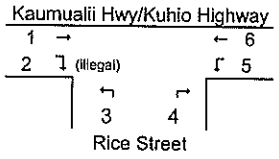
LOCATION: Rice Street/Haleko Street
DATE: October 14, 2003; Tuesday
TIME: 7:00a-9:00a/3:00p-5:00p
WEATHER: cloudy and rain
RECORDER: H. Funamura



TIME PERIOD	MOVEMENT NUMBER 1	2	3	4	5	6	TOTAL
7:00-7:15	85	17		49	46	50	247
7:15-7:30	87	25		91	58	65	326
7:30-7:45	103	29		138	119	78	467
7:45-8:00	103	21		85	103	83	395
8:00-8:15	89	20		97	60	56	322
8:15-8:30	88	24		60	56	59	287
8:30-8:45	128	19		64	73	60	344
8:45-9:00	97	16		61	98	87	359
7:00-9:00	780	171	0	645	613	538	2747
7:15-8:15	382	95	0	411	340	282	1510
PHF	0.90			0.74	0.79		
3:00-3:15	106	24		87	87	84	388
3:15-3:30	104	25		99	114	87	429
3:30-3:45	84	31	2	87	101	117	422
3:45-4:00	82	22	1	103	114	94	416
4:00-4:15	83	47		117	129	96	472
4:15-4:30	82	37		93	116	93	421
4:30-4:45	85	61		94	163	113	516
4:45-5:00	79	85		88	138	83	473
3:00-5:00	705	332	3	768	962	767	3537
4:00-5:00	329	230	0	392	546	385	1882
PHF	0.85			0.84	0.84		

TRAFFIC TURNING MOVEMENT COUNT
Lihue Civic Center Master Plan

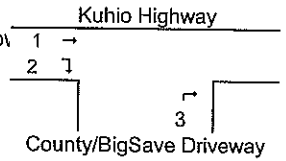
LOCATION: Kuhio Hwy/Kaumualii Hwy/Rice St
DATE: October 1, 2003; Wednesday
TIME: 7:00a-9:00a/3:00p-5:00p
WEATHER: partly cloudy
RECORDER: H. Funamura



TIME PERIOD	MOVEMENT NUMBER 1	2	3	4	5	6	TOTAL
7:00-7:15	162		41	8	33	178	422
7:15-7:30	187		56	11	43	214	511
7:30-7:45	205		51	23	63	199	541
7:45-8:00	205		72	12	63	184	536
8:00-8:15	168		44	13	48	148	421
8:15-8:30	168		25	16	48	126	383
8:30-8:45	178		81	23	56	143	481
8:45-9:00	156		57	17	63	157	452
7:00-9:00	1431	0	427	123	417	1349	3747
7:15-8:15	765	0	223	59	217	745	2009
PHF	0.93		0.84		0.92		
3:00-3:15	225		59	31	43	133	491
3:15-3:30	209		72	20	62	168	531
3:30-3:45	207		78	28	51	164	528
3:45-4:00	214		71	18	43	185	531
4:00-4:15	219		86	25	39	192	561
4:15-4:30	241		63	17	39	196	556
4:30-4:45	223		88	29	53	173	566
4:45-5:00	218		64	20	47	168	517
3:00-5:00	1756	0	581	188	377	1379	4281
4:00-5:00	901	0	301	91	178	729	2200
PHF	0.93		0.84		0.96		

TRAFFIC TURNING MOVEMENT COUNT
Lihue Civic Center Master Plan

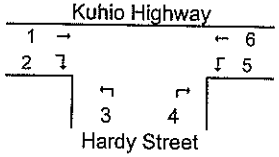
LOCATION: Kuhio Highway-County/BigSave Dr
DATE: December 10, 2004; Friday
TIME: 7:00a-9:00a/3:00p-5:00p
WEATHER: cloudy
RECORDER: H. Funamura



TIME PERIOD	MOVEMENT NUMBER 1	2	3	4	5	6	TOTAL
7:00-7:15	197	7	0				204
7:15-7:30	217	8	2				227
7:30-7:45	226	6	3				235
7:45-8:00	247	6	5				258
8:00-8:15	202	4	1				207
8:15-8:30	174	4	3				181
8:30-8:45	193	3	4				200
8:45-9:00	162	5	1				168
7:00-9:00	1618	43	19	0	0	0	1680
7:15-8:15	892	24	11	0	0	0	927

TRAFFIC TURNING MOVEMENT COUNT
Lihue Civic Center Master Plan

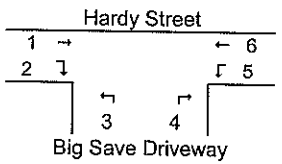
LOCATION: Kuhio Hwy/Hardy St
DATE: September 25, 2003; Thursday
TIME: 7:00a-9:00a/3:00p-5:00p
WEATHER: light rain
RECORDER: H. Funamura



TIME PERIOD	MOVEMENT NUMBER 1	2	3	4	5	6	TOTAL
7:00-7:15	148	32	10	28	58	235	511
7:15-7:30	135	54	10	55	85	249	588
7:30-7:45	161	81	7	51	125	253	678
7:45-8:00	150	30	8	77	70	238	573
8:00-8:15	169	27	7	46	76	206	531
8:15-8:30	145	17	8	59	61	202	492
8:30-8:45	149	22	9	58	67	181	486
8:45-9:00	137	26	5	43	57	186	454
7:00-9:00	1194	289	64	417	599	1750	4313
7:15-8:15	615	192	32	229	356	946	2370
PHF	0.83		0.77		0.86		
3:00-3:15	180	29	17	99	63	205	593
3:15-3:30	226	35	12	91	69	207	640
3:30-3:45	227	28	15	79	67	258	674
3:45-4:00	215	24	17	72	63	206	597
4:00-4:15	200	22	14	83	51	236	606
4:15-4:30	228	23	14	77	55	259	656
4:30-4:45	222	32	30	97	67	213	661
4:45-5:00	195	30	11	76	69	222	603
3:00-5:00	1693	223	130	674	504	1806	5030
4:00-5:00	845	107	69	333	242	930	2526
PHF	0.95		0.79		0.93		

TRAFFIC TURNING MOVEMENT COUNT
Lihue Civic Center Master Plan

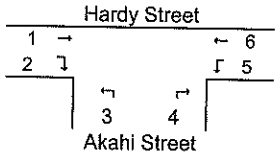
LOCATION: Hardy Street/Big Save Driveway
DATE: December 14, 2004
TIME: 7:00a-9:00a/3:00p-5:00p
WEATHER: clear
RECORDER: H. Funamura



TIME PERIOD	MOVEMENT NUMBER 1	2	3	4	5	6	TOTAL
7:00-7:15	65	6	1	5	3	28	108
7:15-7:30	99	15	2	8	9	40	173
7:30-7:45	177	18	8	10	15	67	295
7:45-8:00	117	8	7	8	9	72	221
8:00-8:15	86	15	7	7	11	44	170
8:15-8:30	62	10	12	9	6	46	145
8:30-8:45	71	19	8	5	7	47	157
8:45-9:00	69	14	8	13	10	42	156
7:00-9:00	746	105	53	65	70	386	1425
7:15-8:15	479	56	24	33	44	223	859
PHF	0.69		0.79		0.81		
3:00-3:15	87	10	14	19	16	71	217
3:15-3:30	90	17	13	25	10	78	233
3:30-3:45	82	12	21	9	7	68	199
3:45-4:00	67	18	16	17	10	58	186
4:00-4:15	83	12	16	20	8	81	220
4:15-4:30	77	13	12	11	8	81	202
4:30-4:45	118	25	23	29	11	82	288
4:45-5:00	69	18	18	16	13	83	217
3:00-5:00	673	125	133	146	83	602	1762
4:00-5:00	347	68	69	76	40	327	927
PHF	0.73		0.70		0.99		

TRAFFIC TURNING MOVEMENT COUNT
Lihue Civic Center Master Plan

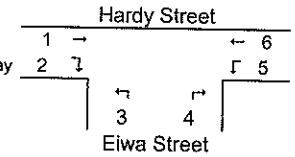
LOCATION: Hardy Street/Akahi Street
DATE: September 23, 2003; Tuesday
TIME: 7:00a-9:00a/3:00p-5:00p
WEATHER: sunny
RECORDER: H. Funamura



TIME PERIOD	MOVEMENT NUMBER 1	2	3	4	5	6	TOTAL
7:00-7:15	28	1	16	10	7	45	107
7:15-7:30	29	8	19	16	10	83	165
7:30-7:45	43	11	15	21	12	86	188
7:45-8:00	48	11	17	16	13	80	185
8:00-8:15	44	16	19	11	9	71	170
8:15-8:30	36	19	23	11	14	81	184
8:30-8:45	52	19	29	9	8	54	171
8:45-9:00	41	13	32	12	15	70	183
7:00-9:00	321	98	170	106	88	570	1353
7:15-8:15	164	46	70	64	44	320	708
PHF	0.89		0.93		0.93		
3:00-3:15	57	9	24	11	11	68	180
3:15-3:30	58	12	32	12	5	84	203
3:30-3:45	60	13	29	16	12	96	226
3:45-4:00	66	18	27	12	12	84	219
4:00-4:15	67	6	21	12	6	94	206
4:15-4:30	72	12	38	10	4	109	245
4:30-4:45	72	12	29	14	10	121	258
4:45-5:00	77	13	36	12	9	79	226
3:00-5:00	529	95	236	99	69	735	1763
4:00-5:00	288	43	124	48	29	403	935
PHF	0.92		0.90		0.82		

TRAFFIC TURNING MOVEMENT COUNT
Lihue Civic Center Master Plan

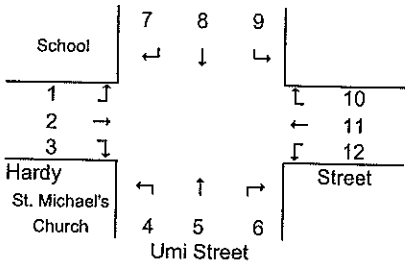
LOCATION: Hardy Street/Eiwa Street
DATE: September 24, 2003; Wednesday
TIME: 7:00a-9:00a/3:00p-5:00p
WEATHER: sunny in morn, cloudy in pm
RECORDER: H. Funamura



TIME PERIOD	MOVEMENT NUMBER 1	2	3	4	5	6	TOTAL
7:00-7:15	74	21	11	13	22	34	175
7:15-7:30	146	11	9	24	29	56	275
7:30-7:45	177	29	11	34	55	74	380
7:45-8:00	95	24	27	32	63	57	298
8:00-8:15	78	20	17	21	20	35	191
8:15-8:30	65	23	24	29	25	45	211
8:30-8:45	58	19	27	34	10	41	189
8:45-9:00	65	30	31	25	24	42	217
7:00-9:00	758	177	157	212	248	384	1936
7:15-8:15	496	84	64	111	167	222	1144
PHF	0.70		0.74		0.75		
3:00-3:15	47	15	35	39	30	33	199
3:15-3:30	87	19	22	48	25	53	254
3:30-3:45	92	29	28	49	21	48	267
3:45-4:00	86	30	30	48	24	47	265
4:00-4:15	90	26	25	48	31	53	273
4:15-4:30	103	25	37	37	38	54	294
4:30-4:45	103	33	35	53	22	54	300
4:45-5:00	69	36	34	43	30	45	257
3:00-5:00	677	213	246	365	221	387	2109
4:00-5:00	365	120	131	181	121	206	1124
PHF	0.89		0.89		0.89		

TRAFFIC TURNING MOVEMENT COUNT
Lihue Civic Center Master Plan

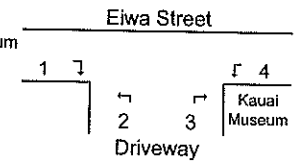
LOCATION: Hardy Street/Umi Street
DATE: October 8, 2003; Wednesday
TIME: 7:00a-9:00a/3:00p-5:00p
WEATHER: partly cloudy
RECORDER: H. Funamura, M. Paea



TIME PERIOD	MOVEMENT NUMBER 1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
7:00-7:15	8	23	4	3	22	12	6	12	9	45	30	12	186
7:15-7:30	15	41	6	5	20	11	23	12	17	51	79	9	289
7:30-7:45	15	54	15	4	29	44	22	22	23	69	99	11	407
7:45-8:00	9	36	13	4	20	39	15	15	25	34	38	22	270
8:00-8:15	4	31	7	1	15	33	4	7	4	32	38	11	187
8:15-8:30	6	31	4	0	16	20	1	7	9	27	36	18	175
8:30-8:45	8	29	8	1	13	18	4	9	11	25	32	13	171
8:45-9:00	4	20	1	3	9	23	2	14	8	33	27	17	161
7:00-9:00	69	265	58	21	144	200	77	98	106	316	379	113	1846
7:15-8:15	43	162	41	14	84	127	64	56	69	186	254	53	1153
PHF	0.73			0.73			0.71			0.69			
3:00-3:15	1	31	5	4	0	19	5	22	12	22	37	25	183
3:15-3:30	9	30	6	0	17	18	7	13	9	26	45	26	206
3:30-3:45	15	18	10	2	7	9	11	19	9	30	61	25	216
3:45-4:00	2	41	13	1	12	10	14	26	8	30	54	23	234
4:00-4:15	3	40	3	2	10	17	8	16	17	23	47	25	211
4:15-4:30	13	36	8	2	10	17	10	19	12	38	57	20	242
4:30-4:45	10	50	14	2	5	15	10	37	20	26	74	32	295
4:45-5:00	5	46	16	2	13	12	9	24	16	18	55	26	242
3:00-5:00	58	292	75	15	74	117	74	176	103	213	430	202	1829
4:00-5:00	31	172	41	8	38	61	37	96	65	105	233	103	990
PHF	0.82						0.74			0.84			

TRAFFIC TURNING MOVEMENT COUNT
Lihue Civic Center Master Plan

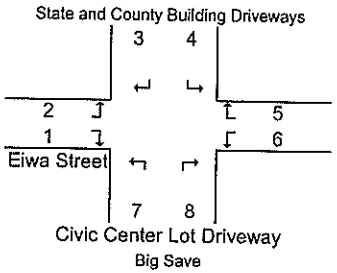
LOCATION: Eiwa Street- Driveway by Museum
DATE: October 9, 2003; Thursday
TIME: 7:00a-9:00a/3:00p-5:00p
WEATHER: overcast in AM; sunny in PM
RECORDER: H. Funamura



TIME PERIOD	MOVEMENT NUMBER 1	2	3	4	5	6	TOTAL
7:00-7:15	9	1	0	7			17
7:15-7:30	7	1	1	10			19
7:30-7:45	16	1	2	21			40
7:45-8:00	9	3	2	13			27
8:00-8:15	4	9	2	9			24
8:15-8:30	7	4	6	10			27
8:30-8:45	2	8	2	11			23
8:45-9:00	7	4	2	4			17
7:00-9:00	61	31	17	85	0	0	194
7:15-8:15	36	14	7	53	0	0	110
3:00-3:15	2	6	4	7			19
3:15-3:30	1	5	4	11			21
3:30-3:45	1	1	2	7			11
3:45-4:00	7	13	5	7			32
4:00-4:15	1	2	7	5			15
4:15-4:30	2	7	2	3			14
4:30-4:45	5	11	3	4			23
4:45-5:00	3	5	1	3			12
3:00-5:00	22	50	28	47	0	0	147
4:00-5:00	11	25	13	15	0	0	64

TRAFFIC TURNING MOVEMENT COUNT
Lihue Civic Center Master Plan

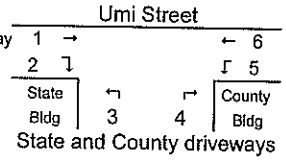
LOCATION: Eiwa Street- County and State Bldg driveways
DATE: October 9, 2003; Thursday
TIME: 7:00a-9:00a/3:00p-5:00p
WEATHER: overcast in AM; sunny in PM
RECORDER: H. Funamura



TIME PERIOD	MOVEMENT NUMBER 1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
7:00-7:15	2	7	2	0	4	8	5	3					31
7:15-7:30	4	7	0	2	4	10	3	2					32
7:30-7:45	12	20	4	8	14	11	4	6					79
7:45-8:00	9	19	3	8	8	12	5	3					67
8:00-8:15	3	4	2	2	13	11	0	5					40
8:15-8:30	6	4	0	3	5	9	0	3					30
8:30-8:45	7	5	4	2	7	13	1	5					44
8:45-9:00	5	2	2	5	5	13	3	5					40
7:00-9:00	48	68	17	30	60	87	21	32	0	0	0	0	363
7:15-8:15	25	32	9	15	33	45	6	16	0	0	0	0	181
3:00-3:15	9	2	4	8	5	21	11	10					70
3:15-3:30	9	8	3	4	10	17	6	12					69
3:30-3:45	4	6	2	13	8	18	15	17					83
3:45-4:00	7	2	4	1	7	21	11	12					65
4:00-4:15	8	3	5	7	0	20	8	10					61
4:15-4:30	3	4	3	3	5	14	5	10					47
4:30-4:45	7	9	9	12	7	9	15	23					91
4:45-5:00	6	1	1	4	4	11	11	14					52
3:00-5:00	53	35	31	52	46	131	82	108	0	0	0	0	538
4:00-5:00	24	17	18	26	16	54	39	57	0	0	0	0	251

TRAFFIC TURNING MOVEMENT COUNT
Lihue Civic Center Master Plan

LOCATION: Umi Street- State/County Driveway
DATE: December15, 2004; Wednesday
TIME: 7:00a-9:00a/3:00p-5:00p
WEATHER: overcast in AM; sunny in PM
RECORDER: H. Funamura



TIME PERIOD	MOVEMENT NUMBER 1	2	3	4	5	6	TOTAL
7:00-7:15	29	3	3	1	1	17	54
7:15-7:30	49	6	2	4	2	45	108
7:30-7:45	75	7	3	6	6	71	168
7:45-8:00	66	6	1	5	4	31	113
8:00-8:15	41	4	1	1	7	21	75
8:15-8:30	34	3	1	2	4	18	62
8:30-8:45	43	6	1	5	1	20	76
8:45-9:00	33	1	2	10	6	24	76
7:00-9:00	370	36	14	34	31	247	732
7:15-8:15	231	23	7	16	19	168	464
3:00-3:15	45	2	1	5	5	34	92
3:15-3:30	52	1	1	6	2	34	96
3:30-3:45	46	2	0	2	4	33	87
3:45-4:00	51	3	0	5	3	35	97
4:00-4:15	50	3	0	3	4	30	90
4:15-4:30	42	1	3	3	2	31	82
4:30-4:45	57	5	7	10	3	38	120
4:45-5:00	44	0	1	3	1	32	81
3:00-5:00	387	17	13	37	24	267	745
4:00-5:00	193	9	11	19	10	131	373

Appendix B

Signalized and Unsignalized Intersection
Level of Service (LOS) Calculations

RICE STREET/UMI STREET

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: 2003 AMEX
Comment: 2003 EXISTING AM PEAK HOUR

Site Information

Jurisdiction/Date: 10/28/03
EB/WB Street: RICE ST
NB/SB Street: UMI ST

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Pretimed | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	100	410	25	1	440	85	7	6	1	145	15	10
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85
Heavy vehicles (%)	2	2	2	2	2	2	0	0	0	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)	10			10			10			0		
Approach bicycle volume (bic/h)	0			0			0			0		
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		LTRP						
SB		LTRP						
Green (s)	40	20						
Yellow + All red (s)	5	5						

Cycle (s): 70 | Lost time per cycle (s): 10 | Critical v/c Ratio: .445

Intersection Performance

	EB	WB	NB	SB	
Lane group configuration	LTR	LTR	LTR	LT	R
No. of lanes	2	2	1	1	1
Flow rate (veh/h)	629	619	16	188	12
Capacity (veh/h)	1481	1885	471	387	452
Adjusted saturation flow (veh/h)	2592	3298	1648	1355	1583
v/c ratio	.425	.328	.035	.486	.026
g/C ratio	.571	.571	.286	.486	.026
Average back of queue (veh)	4.2	3.8	.3	3.5	.2
Uniform delay (s)	8.5	7.9	18	20.7	18
Incremental delay (s)	.9	.5	.1	4.3	.1
Initial queue delay (s)	0	0	0	0	0
Delay (s)	9.4	8.4	18.1	25	18.1
LOS	A	A	B	C	B
Approach delay (s)/LOS	9.4 / A	8.4 / A	18.1 / B	24.6 / C	
Intersection delay (s)/ LOS	11.2 / B				

HICAP 2000 ™

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company: M&E
Analysis Period/Year: 2015 AMAMB1
Comment: 2015 AMBIENT AM FORECAST

Site Information

Jurisdiction/Date: 1/21/05
EB/WB Street: RICE ST
NB/SB Street: UMI ST

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Pretimed | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	120	490	30	1	515	100	10	5	1	165	20	10
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85
Heavy vehicles (%)	2	2	2	2	2	2	0	0	0	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)	10			10			10			0		
Approach bicycle volume (bic/h)	0			0			0			0		
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		LTRP						
SB		LTRP						
Green (s)	40	20						
Yellow + All red (s)	5	5						

Cycle (s): 70 | Lost time per cycle (s): 10 | Critical v/c Ratio: .551

Intersection Performance

	EB	WB	NB	SB	
Lane group configuration	LTR	LTR	LTR	LT	R
No. of lanes	2	2	1	1	1
Flow rate (veh/h)	753	725	19	218	12
Capacity (veh/h)	1378	1884	447	388	452
Adjusted saturation flow (veh/h)	2411	3298	1565	1358	1583
v/c ratio	.546	.385	.042	.561	.026
g/C ratio	.571	.571	.286	.286	.286
Average back of queue (veh)	5.7	4.7	.3	4.2	.2
Uniform delay (s)	9.3	8.2	18.1	21.3	18
Incremental delay (s)	1.6	.6	.2	5.8	.1
Initial queue delay (s)	0	0	0	0	0
Delay (s)	10.9	8.8	18.3	27.1	18.1
LOS	B	A	B	C	B
Approach delay (s)/LOS	10.9 / B	8.8 / A	18.3 / B	26.6 / C	
Intersection delay (s)/ LOS	12.2 / B				

HICAP 2000 ™

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company: M&E
Analysis Period/Year: 2015 AMAMB2
Comment: 2015 AMBAMFC W/KUHIO/HARDY SIGNAL

Site Information

Jurisdiction/Date: 1/21/05
EB/WB Street: RICE ST
NB/SB Street: UMI ST

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Pretimed | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	120	430	30	1	515	100	10	5	1	195	20	10
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85
Heavy vehicles (%)	2	2	2	2	2	2	0	0	0	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)	10			10			10			0		
Approach bicycle volume (bic/h)	0			0			0			0		
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		LTRP						
SB		LTRP						
Green (s)	40	20						
Yellow + All red (s)	5	5						

Cycle (s): 70 | Lost time per cycle (s): 10 | Critical v/c Ratio: .554

Intersection Performance

	EB		WB		NB		SB	
Lane group configuration	LTR		LTR		LTR		LT	R
No. of lanes	2		2		1		1	1
Flow rate (veh/h)	682		725		19		253	12
Capacity (veh/h)	1354		1885		442		386	452
Adjusted saturation flow (veh/h)	2370		3298		1547		1351	1583
v/c ratio	.504		.385		.043		.655	.026
g/C ratio	.571		.571		.286		.286	.286
Average back of queue (veh)	4.9		4.7		.3		5.2	.2
Uniform delay (s)	9		8.2		18.1		22	18
Incremental delay (s)	1.3		.6		.2		8.4	.1
Initial queue delay (s)	0		0		0		0	0
Delay (s)	10.3		8.8		18.3		30.4	18.1
LOS	B		A		B		C	B
Approach delay (s)/LOS	10.3 / B		8.8 / A		18.3 / B		29.8 / C	
Intersection delay (s)/ LOS	12.8 / B							

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company: M&E
Analysis Period/Year: AM 20%RE 2PH 2015
Comment: 2015 REC 20% AMPKHR W/ 2 PHASE

Site Information

Jurisdiction/Date: 1/15/05
EB/WB Street: RICE ST
NB/SB Street: UMI ST

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Pretimed | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	285	470	30	1	435	190	7	6	1	195	20	85
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85
Heavy vehicles (%)	2	2	2	2	2	2	0	0	0	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)	10			10			10			0		
Approach bicycle volume (bic/h)	0			0			0			0		
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		LTRP						
SB		LTRP						
Green (s)	40	20						
Yellow + All red (s)	5	5						

Cycle (s): 70 | Lost time per cycle (s): 10 | Critical v/c Ratio: .834

Intersection Performance

	EB		WB		NB		SB	
Lane group configuration	Def	TR	LTR		LTR		LT	R
No. of lanes	1	1	2		1		1	1
Flow rate (veh/h)	335	588	736		16		253	100
Capacity (veh/h)	364	1054	1842		463		385	452
Adjusted saturation flow (veh/h)	636	1845	3223		1619		1346	1583
v/c ratio	.922	.558	.4		.036		.658	.221
g/C ratio	.571	.571	.571		.286		.286	.286
Average back of queue (veh)	8.9	8.4	4.8		.3		5.2	1.6
Uniform delay (s)	13.6	9.4	8.3		18		22	19.1
Incremental delay (s)	31.1	2.1	.6		.1		8.5	1.1
Initial queue delay (s)	0	0	0		0		0	0
Delay (s)	44.7	11.5	8.9		18.1		30.5	20.2
LOS	D	B	A		B		C	C
Approach delay (s)/LOS	23.6 / C		8.9 / A		18.1 / B		27.6 / C	
Intersection delay (s)/ LOS	18.9 / B							

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company: M&E
Analysis Period/Year: AMRE203PHLT 2015
Comment: 2015 RE 20% AMPKHRW/ 3 PHASE & LT

Site Information

Jurisdiction/Date: 1/16/05
EB/WB Street: RICE ST
NB/SB Street: UMI ST

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Pretimed | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	285	470	30	1	435	190	7	6	1	195	20	85
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85
Heavy vehicles (%)	2	2	2	2	2	2	0	0	0	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)	10			10			10			0		
Approach bicycle volume (bic/h)	0			0			0			0		
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP	LTRP						
WB		LTRP						
NB			LTRP					
SB			LTRP					
Green (s)	5	35	20					
Yellow + All red (s)	5	5	5					

Cycle (s): 75 | Lost time per cycle (s): 10 | Critical v/c Ratio: .792

Intersection Performance

	EB			WB			NB			SB	
Lane group configuration	L	TR		LTR			LTR			LT	R
No. of lanes	1	1		2			1			1	1
Flow rate (veh/h)	335	588		736			16			253	100
Capacity (veh/h)	387	1107		1503			430			359	422
Adjusted saturation flow (veh/h)	1770	1845		3221			1614			1344	1583
v/c ratio	.867	.531		.49			.038			.705	.237
g/C ratio	.6	.6		.467			.267			.267	.267
Average back of queue (veh)	7.1	8.4		6.4			.3			5.8	1.8
Uniform delay (s)	11.7	8.8		13.8			20.4			24.8	21.5
Incremental delay (s)	22.2	1.8		1.1			.2			11.1	1.3
Initial queue delay (s)	0	0		0			0			0	0
Delay (s)	33.9	10.6		14.9			20.6			35.9	22.8
LOS	C	B		B			C			D	C
Approach delay (s)/LOS	19.1	/	B	14.9	/	B	20.6	/	C	32.2	/ C
Intersection delay (s)/ LOS	19.9		/			B					

HICAP 2000 ™

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: 2003 PMEX
Comment: 2003 EXISTING PM PEAK HOUR

Site Information

Jurisdiction/Date: 10/28/03
EB/WB Street: RICE ST
NB/SB Street: UMI ST

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Pretimed | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	75	480	30	8	555	55	55	20	4	150	20	135
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85
Heavy vehicles (%)	2	2	2	2	2	2	0	0	0	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)	10			10			10			0		
Approach bicycle volume (bic/h)	0			0			0			0		
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		LTRP						
SB		LTRP						
Green (s)	40	20						
Yellow + All red (s)	5	5						

Cycle (s): 70 | Lost time per cycle (s): 10 | Critical v/c Ratio: .476

Intersection Performance

	EB			WB			NB			SB	
Lane group configuration		LTR			LTR			LTR		LT	R
No. of lanes		2			2			1		1	1
Flow rate (veh/h)		688			727			93		200	159
Capacity (veh/h)		1560			1891			342		366	452
Adjusted saturation flow (veh/h)		2730			3309			1195		1280	1583
v/c ratio		.441			.385			.272		.547	.351
g/C ratio		.571			.571			.286		.286	.286
Average back of queue (veh)		4.7			4.7			1.6		3.8	2.7
Uniform delay (s)		8.6			8.2			19.4		21.2	19.8
Incremental delay (s)		.9			.6			2		5.8	2.1
Initial queue delay (s)		0			0			0		0	0
Delay (s)		9.5			8.8			21.4		27	21.9
LOS		A			A			C		C	C
Approach delay (s)/LOS	9.5	/	A	8.8	/	A	21.4	/	C	24.7	/ C
Intersection delay (s)/ LOS	12.8		/			B					

HICAP 2000 ™

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	EB/WB Street	RICE ST
Analysis Period/Year	2015 PMAMB1	NB/SB Street	UMI ST
Comment	2015 AMBIENT PM FORECAST		

Site Information

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Pretimed | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	90	565	35	10	655	65	65	25	5	180	25	160
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85
Heavy vehicles (%)	2	2	2	2	2	2	0	0	0	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)	10			10			10			0		
Approach bicycle volume (bic/h)	0			0			0			0		
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		LTRP						
SB		LTRP						
Green (s)	40	20						
Yellow + All red (s)	5	5						

Cycle (s): 70 | Lost time per cycle (s): 10 | Critical v/c Ratio: .59

Intersection Performance

	EB		WB		NB		SB	
Lane group configuration	LTR		LTR		LTR		LT	R
No. of lanes	2		2		1		1	1
Flow rate (veh/h)	812		859		112		241	188
Capacity (veh/h)	1460		1884		287		367	452
Adjusted saturation flow (veh/h)	2555		3296		1003		1285	1583
v/c ratio	.556		.456		.39		.657	.416
g/C ratio	.571		.571		.286		.286	.286
Average back of queue (veh)	6.2		5.9		2		5	3.4
Uniform delay (s)	9.4		8.7		20.1		22	20.3
Incremental delay (s)	1.5		.8		4		8.9	2.8
Initial queue delay (s)	0		0		0		0	0
Delay (s)	10.9		9.5		24.1		30.9	23.1
LOS	B		A		C		C	C
Approach delay (s)/LOS	10.9 / B		9.5 / A		24.1 / C		27.5 / C	
Intersection delay (s)/ LOS	14.2 / B							

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	EB/WB Street	RICE ST
Analysis Period/Year	2015 PMAMB2	NB/SB Street	UMI ST
Comment	2015 AMBPMFC W/KUHIO-HARDY SIGNAL		

Site Information

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Pretimed | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	90	455	35	10	655	65	65	25	5	205	25	160
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85
Heavy vehicles (%)	2	2	2	2	2	2	0	0	0	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)	10			10			10			0		
Approach bicycle volume (bic/h)	0			0			0			0		
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		LTRP						
SB		LTRP						
Green (s)	37	23						
Yellow + All red (s)	5	5						

Cycle (s): 70 | Lost time per cycle (s): 10 | Critical v/c Ratio: .577

Intersection Performance

	EB		WB		NB		SB	
Lane group configuration	LTR		LTR		LTR		LT	R
No. of lanes	2		2		1		1	1
Flow rate (veh/h)	682		859		112		271	188
Capacity (veh/h)	1284		1746		355		416	520
Adjusted saturation flow (veh/h)	2430		3303		1081		1265	1583
v/c ratio	.531		.492		.315		.651	.362
g/C ratio	.529		.529		.329		.329	.329
Average back of queue (veh)	5.4		6.4		1.8		5.4	3.1
Uniform delay (s)	10.8		10.5		17.6		20.1	17.9
Incremental delay (s)	1.6		1		2.3		7.7	1.9
Initial queue delay (s)	0		0		0		0	0
Delay (s)	12.4		11.5		19.9		27.8	19.8
LOS	B		B		B		C	B
Approach delay (s)/LOS	12.4 / B		11.5 / B		19.9 / B		24.5 / C	
Intersection delay (s)/ LOS	15.1 / B							

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company: M&E
Analysis Period/Year: 2015 PMRB
Comment: 2015 REC PM PK HR W/ 2 PHASE

Site Information

Jurisdiction/Date: 1/16/05
EB/WB Street: RICE ST
NB/SB Street: UMI ST

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Pretimed | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	255	515	35	10	545	185	65	25	5	235	25	270
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85
Heavy vehicles (%)	2	2	2	2	2	2	0	0	0	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)	10			10			10			0		
Approach bicycle volume (bic/h)	0			0			0			0		
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		LTRP						
SB		LTRP						
Green (s)	40	20						
Yellow + All red (s)	5	5						

Cycle (s): 70 | Lost time per cycle (s): 10 | Critical v/c Ratio: .945

Intersection Performance

	EB			WB			NB			SB	
Lane group configuration	Def	TR		LTR			LTR			LT	R
No. of lanes	1	1		2			1			1	1
Flow rate (veh/h)	300	647		871			112			306	318
Capacity (veh/h)	301	1054		1841			237			362	452
Adjusted saturation flow (veh/h)	527	1844		3222			829			1267	1583
v/c ratio	.995	.614		.473			.472			.845	.702
g/C ratio	.571	.571		.571			.286			.286	.286
Average back of queue (veh)	9.6	9.8		6			2.1			7.6	6.7
Uniform delay (s)	14.9	9.9		8.8			20.6			23.5	22.3
Incremental delay (s)	50.7	2.7		.9			6.6			20.9	8.8
Initial queue delay (s)	0	0		0			0			0	0
Delay (s)	65.6	12.6		9.7			27.2			44.4	31.1
LOS	E	B		A			C			D	C
Approach delay (s)/LOS	29.4	/	C	9.7	/	A	27.2	/	C	37.7	/ D
Intersection delay (s)/ LOS	24.6			/			C				

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company: M&E
Analysis Period/Year: PMRE 3PHLT 2015
Comment: 2015 REC PMPKHR W/ 3 PH & EBLT LANE

Site Information

Jurisdiction/Date: 1/16/05
EB/WB Street: RICE ST
NB/SB Street: UMI ST

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Pretimed | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	255	515	35	10	545	185	65	25	5	235	25	270
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85
Heavy vehicles (%)	2	2	2	2	2	2	0	0	0	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)	10			10			10			0		
Approach bicycle volume (bic/h)	0			0			0			0		
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP	LTRP						
WB		LTRP						
NB			LTRP					
SB			LTRP					
Green (s)	5	37	23					
Yellow + All red (s)	5	5	5					

Cycle (s): 80 | Lost time per cycle (s): 10 | Critical v/c Ratio: .891

Intersection Performance

	EB			WB			NB			SB	
Lane group configuration	L	TR		LTR			LTR			LT	R
No. of lanes	1	1		2			1			1	1
Flow rate (veh/h)	300	647		871			112			306	318
Capacity (veh/h)	318	1083		1488			237			368	455
Adjusted saturation flow (veh/h)	1770	1844		3218			826			1279	1583
v/c ratio	.942	.597		.585			.471			.832	.698
g/C ratio	.588	.588		.463			.288			.288	.288
Average back of queue (veh)	8.1	10.7		8.7			2.4			8.4	7.6
Uniform delay (s)	14.3	10.5		15.8			23.5			26.7	25.4
Incremental delay (s)	37.6	2.4		1.7			6.6			19.3	8.6
Initial queue delay (s)	0	0		0			0			0	0
Delay (s)	51.9	12.9		17.5			30.1			46	34
LOS	D	B		B			C			D	C
Approach delay (s)/LOS	25.2	/	C	17.5	/	B	30.1	/	C	39.9	/ D
Intersection delay (s)/ LOS	26.4			/			C				

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

RICE STREET/EIWA STREET

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	10/28/03
Agency or Company		Major Street	RICE ST
Analysis Period/Year	2003 AMEX	Minor Street	BIWA ST
Comment	2003 EXISTING AM PEAK HR		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)	T			TR						R		
Lane 2	LT			T						L		
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	175	495			540	75				30		170
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	194	550			600	83				33		189
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1								
	2								
	3								
SB	1	R	189	651	.29	1	12.8	B	17.3
	2	L	30	118	.255	1	45.7	E	
	3								C
		①	194	899	.216	1	10.1	B	
		④							

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company		Major Street	RICE ST
Analysis Period/Year	AMAMB1 2015	Minor Street	BIWA ST
Comment	2015 AMBIENT AM PK HR		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)	T			TR						R		
Lane 2	LT			T						L		
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	190	590			645	75				35		200
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	211	656			717	83				39		222
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1								
	2								
	3								
SB	1	R	222	597	.372	2	14.6	B	21.5
	2	L	30	82	.368	1	72.8	F	
	3								C
		①	211	812	.26	1	11	B	
		④							

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company		Major Street	RICE ST
Analysis Period/Year	AMAMB2 2015	Minor Street	EIWA ST
Comment	2015 AMB AMPKHRW/KUHIO-HARDY SIGNAL		

Site Information

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)		T			TR						R	
Lane 2		LT			T						L	
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	190	530			645	75				35		75
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	211	589			717	83				39		83
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1								
	2								
	3								
SB	1	R	83	597	.139	<1	12	B	26.8
	2	L	30	86	.349	1	67.9	F	
	3								D
		①	211	812	.26	1	11	B	
		④							

HiCAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	10/28/03
Agency or Company		Major Street	RICE ST
Analysis Period/Year	2003 PMEX	Minor Street	EIWA ST
Comment	2003 EXISTING PM PEAK HR		

Site Information

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)		T			TR						R	
Lane 2		LT			T						L	
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	230	515			605	95				35		270
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	256	572			672	106				39		300
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1								
	2								
	3								
SB	1	R	300	607	.494	3	16.6	C	24.3
	2	L	35	75	.469	2	90.1	F	
	3								C
		①	256	828	.309	1	11.3	B	
		④							

HiCAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company		Major Street	RICE ST
Analysis Period/Year	PMAMB1 2015	Minor Street	EIWA ST
Comment	2105 AMBIENT PM PK HR FORECAST		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)		T			TR							R
Lane 2		LT			T							L
Lane 3												

	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	265	615			720	105				30		310
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	294	683			800	117				33		344
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1								
	2								
	3								
SB	1	R	344	547	.629	4	22.1	C	41.1
	2	L	35	43	.817	3	228.4	F	
	3								E
		①	294	734	.401	2	13.2	B	
		④							

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company		Major Street	RICE ST
Analysis Period/Year	PMAMB2 2015	Minor Street	EIWA ST
Comment	2105 AMBPMFC W/KUHIO-HARDY SIGNAL		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)		T			TR							R
Lane 2		LT			T							L
Lane 3												

	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	265	510			720	105				30		210
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	294	567			800	117				33		233
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1								
	2								
	3								
SB	1	R	233	547	.426	2	16.4	C	39.7
	2	L	35	47	.746	3	195.1	F	
	3								E
		①	294	734	.401	2	13.2	B	
		④							

HICAP 2000 ™
©Catalina Engineering, Inc.

RICE STREET/KELE STREET/COUNTY DRIVEWAY

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/16/05
Agency or Company	M&E	Major Street	RICE ST
Analysis Period/Year	2003 AMEX	Minor Street	KELE ST
Comment	2003 EXISTING AM PK HR		

Site Information

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)		TR			T			LTR				
Lane 2		T			LT							
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		710	40	35	630		15	0	30			
PHF		.9	.9	.9	.9		.9	.9	.9			
Proportion of heavy vehicles, HV		3	3	3	3		3	3	3			
Flow rate		789	44	39	700		17	0	33			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	LTR	50	259	.193	1	22.2	C	22.2
	2								
	3								C
SB	1		15						
	2								
	3								
		①							
		④	39	789	.049	<1	9.8	A	

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/24/05
Agency or Company	M&E	Major Street	RICE ST
Analysis Period/Year	AM AMB1 2015	Minor Street	KELE ST
Comment	2015 AMBIENT AM FORECAST		

Site Information

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)		TR			T			LTR				
Lane 2		T			LT							
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		820	40	35	750		15	0	30			
PHF		.9	.9	.9	.9		.9	.9	.9			
Proportion of heavy vehicles, HV		3	3	3	3		3	3	3			
Flow rate		911	44	39	833		17	0	33			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	LTR	50	198	.252	1	29.2	D	29.2
	2								
	3								D
SB	1		15						
	2								
	3								
		①							
		④	39	709	.055	<1	10.4	B	

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/24/05
Agency or Company	M&E	Major Street	RICE ST
Analysis Period/Year	AM AMB2 2015	Minor Street	KELE ST
Comment	2015 AMBPMFC W/KUHIO-HARDY SIGNAL		

Site Information

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)	TR			T			LTR					
Lane 2	T			LT								
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		760	40	35	635		15	0	30			
PHF		.9	.9	.9	.9		.9	.9	.9			
Proportion of heavy vehicles, HV		3	3	3	3		3	3	3			
Flow rate		844	44	39	706		17	0	33			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	LTR	50	238	.21	1	24.1	C	24.1
	2								
	3								C
SB	1		15						
	2								
	3								
		①							
		④	39	752	.052	<1	10.1	B	

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/15/05
Agency or Company	M&E	Major Street	RICE ST
Analysis Period/Year	2015 AM20RE	Minor Street	KELE ST/COUNTY DRIVEWAY
Comment	2015 RECMNDED 20% AM PK HR		

Site Information

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)	TR			TR			LTR			LTR		
Lane 2	LT			LT								
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	20	820	40	35	635	15	25		20	5		10
PHF	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
Proportion of heavy vehicles, HV	3	3	3	3	3	3	3	3	3	3	3	3
Flow rate	22	911	44	39	706	17	28		22	6		11
Flare storage (# of vehs)									0			0
Median storage (# of vehs)							0			0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	LTR	45	141	.318	1	41.9	E	41.9
	2								
	3								E
SB	1	LTR	16	248	.065	<1	20.5	C	20.5
	2								
	3								C
		①	22	869	.026	<1	9.3	A	
		④	39	709	.055	<1	10.4	B	

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/15/05
Agency or Company	M&E	Major Street	RICE ST
Analysis Period/Year	AM20RE RT 2015	Minor Street	KELE ST/COUNTY DRIVEWAY
Comment	2015 RECMNDED 20%AM PK HR W/RT ONLY		

Input Data

Lane Configuration	EB	WB	NB	SB
Lane 1 (curb)	TR	TR	LTR	LTR
Lane 2	LT	LT		
Lane 3				

	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	20	820	40	35	635	15	0		45	0		15
PHF	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
Proportion of heavy vehicles, HV	3	3	3	3	3	3	3	3	3	3	3	3
Flow rate	22	911	44	39	706	17	0		50	0		17
Flare storage (# of vehs)									0			0
Median storage (# of vehs)							0			0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	LTR	50	531	.094	<1	12.5	B	12.5
	2								
	3								B
SB	1	LTR	17	633	.027	<1	10.8	B	10.8
	2								
	3								B
		①	22	869	.026	<1	9.3	A	
		④	39	709	.055	<1	10.4	B	

HICAP 2000 ™

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst	WY	Jurisdiction/Date	1/16/05
Agency or Company	M&E	EB/WB Street	RICE ST
Analysis Period/Year	2015 20% AMRE	NB/SB Street	KELE ST/CO
Comment	2015 RECMNDED 20% AM PK HR		

Intersection Data

Area type Other Analysis period .25 h Signal type Actuated-Field % Back of queue 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	20	820	40	35	635	15	25	0	20	5	0	10
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)	50			50			50			50		
Approach bicycle volume (bic/h)	0			0			0			0		
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		LTRP						
SB		LTR						
Green (s)	50	20						
Yellow + All red (s)	5	5						

Cycle (s) 80 Lost time per cycle (s) 10 Critical v/c Ratio .375

Intersection Performance

	EB	WB	NB	SB
Lane group configuration	LTR	LTR	LTR	LTR
No. of lanes	2	2	1	1
Flow rate (veh/h)	957	745	49	16
Capacity (veh/h)	2036	1908	356	373
Adjusted saturation flow (veh/h)	3257	3054	1423	1491
v/c ratio	.47	.39	.137	.044
g/C ratio	.625	.625	.25	.25
Average back of queue (veh)	6.5	4.7	.9	.3
Uniform delay (s)	8	7.4	23.3	22.7
Incremental delay (s)	.1	0	0	0
Initial queue delay (s)	0	0	0	0
Delay (s)	8.1	7.4	23.3	22.7
LOS	A	A	C	C
Approach delay (s)/LOS	8.1 / A	7.4 / A	23.3 / C	22.7 / C
Intersection delay (s)/ LOS	8.4 / A			

HICAP 2000 ™

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/16/05
Agency or Company	M&E	Major Street	RICE ST
Analysis Period/Year	2003 PMEX	Minor Street	KELE ST
Comment	2003 EXISTING PM PK HR		

Input Data

Lane Configuration	EB	WB	NB	SB
Lane 1 (curb)	TR	T	LTR	
Lane 2	T	LT		
Lane 3				

	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		720	30	40	925		30		80			
PHF		.9	.9	.9	.9		.9	.9	.9			
Proportion of heavy vehicles, HV		3	3	3	3		3	3	3			
Flow rate		800	33	44	1028		33		89			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	LTR	149	182	.817	6	78.3	F	78.3
	2								
	3								F
SB	1		25						
	2								
	3								
		①							
		④	44	789	.056	<1	9.8	A	

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	RICE ST
Analysis Period/Year	PM AMB1 2015	Minor Street	KELE ST
Comment	2015 AMBIENT PM PK HR FORECAST		

Input Data

Lane Configuration	EB	WB	NB	SB
Lane 1 (curb)	TR	T	LTR	
Lane 2	T	LT		
Lane 3				

	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		850	30	40	1090		30		80			
PHF		.9	.9	.9	.9		.9	.9	.9			
Proportion of heavy vehicles, HV		3	3	3	3		3	3	3			
Flow rate		944	33	44	1211		33		89			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	LTR	149	126	1.185	9	205.5	F	205.5
	2								
	3								F
SB	1		25						
	2								
	3								
		①							
		④	44	695	.064	<1	10.5	B	

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	RICE ST
Analysis Period/Year	PM AMB2 2015	Minor Street	KELB ST
Comment	2015 AMBPMFC W/KUHIO-HARDY SIGNAL		

Site Information

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)		TR			T			LTR				
Lane 2		T			LT							
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		790	30	40	980		30		80			
PHF		.9	.9	.9	.9		.9	.9	.9			
Proportion of heavy vehicles, HV		3	3	3	3		3	3	3			
Flow rate		878	33	44	1089		33		89			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	LTR	149	154	.969	7	122.6	F	122.6
	2								
	3								F
SB	1		25						
	2								
	3								
		①							
		④	44	737	.06	<1	10.2	B	

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/11/05
Agency or Company	M&E	Major Street	RICE ST
Analysis Period/Year	2015 PMRE	Minor Street	KELE ST/COUNTY DRIVEWAY
Comment	2015 RECMNDED PM PK HR		

Site Information

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)		TR			TR			LTR			LTR	
Lane 2		LT			LT							
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	10	695	30	40	885	6	60		50	5		20
PHF	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
Proportion of heavy vehicles, HV	3	3	3	3	3	3	3	3	3	3	3	3
Flow rate	11	772	33	44	983	7	67		56	6		22
Flare storage (# of vehs)									0			0
Median storage (# of vehs)							0			0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	LTR	110	148	.743	4	78.6	F	78.6
	2								
	3								F
SB	1	LTR	25	235	.107	<1	22.2	C	22.2
	2								
	3								C
		①	11	688	.016	<1	10.3	B	
		④	44	808	.055	<1	9.7	A	

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/15/05
Agency or Company	M&E	Major Street	RICE ST
Analysis Period/Year	2015 PMRE RT	Minor Street	KELE ST/COUNTY DRIVEWAY
Comment	2015 RECMNDED PM PK HR W/RT ONLY		

Input Data

Lane Configuration	EB	WB	NB	SB
Lane 1 (curb)	TR	TR	LTR	LTR
Lane 2	LT	LT		
Lane 3				

	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	10	695	30	40	885	6	0		110	0		25
PHF	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
Proportion of heavy vehicles, HV	3	3	3	3	3	3	3	3	3	3	3	3
Flow rate	11	772	33	44	983	7	0		122	0		28
Flare storage (# of vehs)									0			0
Median storage (# of vehs)							0			0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	LTR	122	594	.205	1	12.6	B	12.6
	2								
	3								B
SB	1	LTR	28	517	.054	<1	12.4	B	12.4
	2								
	3								B
		①	11	688	.016	<1	10.3	B	
		④	44	808	.055	<1	9.7	A	

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst	WY	Jurisdiction/Date	1/11/05
Agency or Company	M&E	EB/WB Street	RICE ST
Analysis Period/Year	2015 PMRE	NB/SB Street	KELE ST/CO
Comment	2015 RECMNDED PM PK HR		

Intersection Data

Area type Other Analysis period .25 h Signal type Actuated-Field % Back of queue 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	10	695	30	40	885	6	60	0	50	5	0	20
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)	50			50			50			50		
Approach bicycle volume (bic/h)	0			0			0			0		
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		LTRP						
SB		LTR						
Green (s)	50	20						
Yellow + All red (s)	5	5						

Cycle (s) 80 Lost time per cycle (s) 10 Critical v/c Ratio .47

Intersection Performance

	EB	WB	NB	SB
Lane group configuration	LTR	LTR	LTR	LTR
No. of lanes	2	2	1	1
Flow rate (veh/h)	799	1012	120	27
Capacity (veh/h)	2058	1957	340	371
Adjusted saturation flow (veh/h)	3293	3131	1359	1483
v/c ratio	.388	.517	.352	.073
g/C ratio	.625	.625	.25	.25
Average back of queue (veh)	5	7.2	2.4	.5
Uniform delay (s)	7.4	8.3	24.7	22.9
Incremental delay (s)	0	.2	0	0
Initial queue delay (s)	0	0	0	0
Delay (s)	7.4	8.5	24.7	22.9
LOS	A	A	C	C
Approach delay (s)/LOS	7.4 / A	8.5 / A	24.7 / C	22.9 / C
Intersection delay (s)/ LOS	9.3 / A			

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

RICE STREET/COUNTY DRIVEWAY

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/16/05
Agency or Company		Major Street	RICE ST
Analysis Period/Year	2003AMEX	Minor Street	DRIVEWAY TO SOUTH PARKING
Comment	2003 EXISTING AM PK HR		

Input Data

Lane Configuration	EB	WB	NB	SB
Lane 1 (curb)	T	TR		LR
Lane 2	LT	T		
Lane 3				

	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	50	690			670	25				4		10
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	56	767			744	28				4		11
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1								
	2								
	3								
SB	1	LR	11	609	.018	<1	11	B	11
	2								
	3								B
		①	56	832	.067	<1	9.6	A	
		④							

HiCAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/24/05
Agency or Company		Major Street	RICE ST
Analysis Period/Year	2015 AMAMB1	Minor Street	DRIVEWAY TO SOUTH PARKING
Comment	AMBIENT AM PK HR FORECAST		

Input Data

Lane Configuration	EB	WB	NB	SB
Lane 1 (curb)	T	TR		LR
Lane 2	LT	T		
Lane 3				

	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	50	805			800	15				4		10
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	56	894			889	17				4		11
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1								
	2								
	3								
SB	1	LR	11	551	.02	<1	11.7	B	11.7
	2								
	3								B
		①	56	741	.075	<1	10.3	B	
		④							

HiCAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/24/05
Agency or Company		Major Street	RICE ST
Analysis Period/Year	2015 AMAMB2	Minor Street	DRIVEWAY TO SOUTH PARKING
Comment	2015 AMB AM FC W/KUHIO-HARDY SIGNAL		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)	T			TR						LR		
Lane 2	LT			T								
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	50	805			685	15				4		10
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	56	894			761	17				4		11
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1								
	2								
	3								
SB	1	LR	11	607	.018	<1	11	B	11
	2								
	3								B
		①	56	828	.067	<1	9.7	A	
		④							

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	2/23/04
Agency or Company		Major Street	RICE ST
Analysis Period/Year	2003EXPM	Minor Street	DRIVEWAY TO SOUTH PARKING
Comment	EXISTING 2003 PM AT SOUTH DRIVEWAY		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)	T			TR						LR		
Lane 2	LT			T								
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	25	675			870	10				4		65
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	28	750			967	11				4		72
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1								
	2								
	3								
SB	1	LR	72	522	.138	<1	13	B	13
	2								
	3								B
		①	28	695	.04	<1	10.4	B	
		④							

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/24/05
Agency or Company		Major Street	RICE ST
Analysis Period/Year	2015 PM AMB1	Minor Street	DRIVEWAY TO SOUTH PARKING
Comment	2015 AMBIENT PM PK HR FORECAST		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)		T			TR							LR
Lane 2		LT			T							
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	25	795			1025	10				4		65
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	28	883			1139	11				4		72
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1								
	2								
	3								
SB	1	LR	72	459	.157	1	14.3	B	14.3
	2								
	3								B
		①	28	598	.046	<1	11.3	B	
		④							

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/24/05
Agency or Company		Major Street	RICE ST
Analysis Period/Year	2015 PM AMB2	Minor Street	DRIVEWAY TO SOUTH PARKING
Comment	2015 AMBPMFC W/KUHIO-HARDY SIGNAL		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)		T			TR							LR
Lane 2		LT			T							
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	25	735			920	10				4		65
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	28	817			1022	11				4		72
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1								
	2								
	3								
SB	1	LR	72	501	.144	<1	13.4	B	13.4
	2								
	3								B
		①	28	662	.042	<1	10.7	B	
		④							

HICAP 2000 ™
©Catalina Engineering, Inc.

RICE STREET/HALEKO ROAD

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	10/28/03
Agency or Company		Major Street	RICE ST
Analysis Period/Year	2003 AMEX	Minor Street	HALEKO ST
Comment	2003 EXISTING AM PEAK HR		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)		TR			T			R				
Lane 2					LT							
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		380	95	340	280				410			
PHF		.9	.9	.9	.9				.9			
Proportion of heavy vehicles, HV		3	3	3	3				3			
Flow rate		422	106	378	311				456			
Flare storage (# of vehs)												
Median storage (# of vehs)									0			

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	R	456	533	.855	9	39.6	E	39.6
	2								
	3								E
SB	1								
	2								
	3								
		①							
		④	378	1028	.367	2	10.5	B	

HiCAP 2000 ™

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	RICE ST
Analysis Period/Year	AM AMB1 2015	Minor Street	HALEKO ST
Comment	2015 AMBIENT AM PK HR FORECAST		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)		TR			T			R				
Lane 2					LT							
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		445	115	405	330				475			
PHF		.9	.9	.9	.9				.9			
Proportion of heavy vehicles, HV		3	3	3	3				3			
Flow rate		494	128	450	367				528			
Flare storage (# of vehs)									0			
Median storage (# of vehs)												

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	R	528	470	1.123	18	108.3	F	108.3
	2								
	3								F
SB	1								
	2								
	3								
		①							
		④	450	948	.475	3	12.2	B	

HiCAP 2000 ™

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	RICE ST
Analysis Period/Year	AM AMB2 2015	Minor Street	HALEKO ST
Comment	2015 AMBAMFC W/KUHIO-HARDY SIGNAL		

Site Information

Input Data

Lane Configuration	EB	WB	NB	SB
Lane 1 (curb)	TR	T	R	
Lane 2		LT		
Lane 3				

	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		385	115	405	230				475			
PHF		.9	.9	.9	.9				.9			
Proportion of heavy vehicles, HV		3	3	3	3				3			
Flow rate		428	128	450	256				528			
Flare storage (# of vehs)												
Median storage (# of vehs)									0			

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	R	528	520	1.015	15	71.7	F	71.7
	2								
	3								F
SB	1								
	2								
	3								
		①							
		④	450	1004	.448	2	11.5	B	

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/16/05
Agency or Company	M&E	Major Street	RICE ST
Analysis Period/Year	AM20%RE 2015	Minor Street	HALEKO ST
Comment	2015 RCMNDED 20% AM PEAK HR		

Site Information

Input Data

Lane Configuration	EB	WB	NB	SB
Lane 1 (curb)	TR	T	R	
Lane 2		LT		
Lane 3				

	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		385	135	355	285				485			
PHF		.9	.9	.9	.9				.9			
Proportion of heavy vehicles, HV		3	3	3	3				3			
Flow rate		428	150	394	317				539			
Flare storage (# of vehs)									0			
Median storage (# of vehs)												

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	R	539	511	1.054	16	83.2	F	83.2
	2								
	3								F
SB	1								
	2								
	3								
		①							
		④	394	985	.4	2	11.1	B	

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/15/05
Agency or Company	M&E	Major Street	RICE ST
Analysis Period/Year	AMRE 2EB 20% 2015	Minor Street	HALEKO ST
Comment	2015 RCMDED 20%AM PK HR W/2EB LANE		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)		R			T			R				
Lane 2		T			LT							
Lane 3												

	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		385	135	355	285				485			
PHF		.9	.9	.9	.9				.9			
Proportion of heavy vehicles, HV		3	3	3	3				3			
Flow rate		428	150	394	317				539			
Flare storage (# of vehs)												
Median storage (# of vehs)									0			

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	R	539	572	.941	12	51.4	F	51.4
	2								
	3								F
SB	1								
	2								
	3								
		①							
		④	394	985	.4	2	11.1	B	

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst	WY	Jurisdiction/Date	1/16/05
Agency or Company	M&E	EB/WB Street	RICE ST
Analysis Period/Year	2015 20% AMRE	NB/SB Street	HALEKO ST
Comment	2015 REC 20% AM PK HR		

Intersection Data

Area type Other Analysis period .25 h Signal type Actuated-Field % Back of queue 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)		385	135	355	285				485			
RTOR volume (veh/h)			0			0			40			
Peak-hour factor		.92	.92	.92	.92				.92			
Heavy vehicles (%)		2	2	2	2				2			
Start-up lost time, l_1 (s)		2	2	2	2				2			
Extension of effective green, e (s)		2	2	2	2				2			
Arrival type, AT		3	3	3	3				3			
Approach pedestrian volume (p/h)		50			0			50				
Approach bicycle volume (bic/h)		0			0			0				
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N		/	

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB		TRP						
WB	LT	LT						
NB			R					
SB								
Green (s)	8	30	27					
Yellow + All red (s)	5	5	5					

Cycle (s) 80 Lost time per cycle (s) 15 Critical v/c Ratio .886

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration		TR		Def	T				R			
No. of lanes		1		1	1				1			
Flow rate (veh/h)		565		386	310				440			
Capacity (veh/h)		669		809	993				491			
Adjusted saturation flow (veh/h)		1783		1770	1848				1455			
v/c ratio		.845		.477	.312				.897			
g/C ratio		.375		.538	.538				.338			
Average back of queue (veh)		13.8		5.5	4.1				11.9			
Uniform delay (s)		22.9		16.3	10.3				25.2			
Incremental delay (s)		9.8		.4	0				19			
Initial queue delay (s)		0		0	0				0			
Delay (s)		32.7		16.7	10.3				44.2			
LOS		C		B	B				D			
Approach delay (s)/LOS	32.7 / C			13.8 / B			44.2 / D			/		
Intersection delay (s)/ LOS	27.9 / C											

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	10/28/03
Agency or Company		Major Street	RICE ST
Analysis Period/Year	2003 PMEX	Minor Street	HALEKO ST
Comment	2003 EXISTING PM PEAK HR		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)		TR			T			R				
Lane 2					LT							
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		330	230	545	385				390			
PHF		.9	.9	.9	.9				.9			
Proportion of heavy vehicles, HV		3	3	3	3				3			
Flow rate		367	256	606	428				433			
Flare storage (# of vehs)												
Median storage (# of vehs)									0			

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	R	433	518	.836	8	38.1	E	38.1
	2								E
	3								
SB	1								
	2								
	3								
		①							
		④	606	948	.639	5	15.3	C	

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	RICE ST
Analysis Period/Year	PM AMB1 2015	Minor Street	HALEKO ST
Comment	2015 AMBIENT PM PK HR FORECAST		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)		TR			T			R				
Lane 2					LT							
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		385	275	635	450				460			
PHF		.9	.9	.9	.9				.9			
Proportion of heavy vehicles, HV		3	3	3	3				3			
Flow rate		428	306	706	500				511			
Flare storage (# of vehs)												
Median storage (# of vehs)									0			

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	R	511	455	1.124	18	109.8	F	109.8
	2								F
	3								
SB	1								
	2								
	3								
		①							
		④	706	861	.82	9	25.1	D	

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	RICE ST
Analysis Period/Year	PM AMB2 2015	Minor Street	HALEKO ST
Comment	2015 AMBPMFC W/KUHIO-HARDY SIGNAL		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)		TR			T			R				
Lane 2					LT							
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		325	275	635	340				460			
PHF		.9	.9	.9	.9				.9			
Proportion of heavy vehicles, HV		3	3	3	3				3			
Flow rate		361	306	706	378				511			
Flare storage (# of vehs)									0			
Median storage (# of vehs)												

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	R	511	503	1.016	14	73.1	F	73.1
	2								
	3								F
SB	1								
	2								
	3								
		①							
		④	706	912	.774	8	21	C	

HICAP 2000 ™
©Catalina Engineering, Inc.
1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/10/05
Agency or Company		Major Street	RICE ST
Analysis Period/Year	2015 PMRE	Minor Street	HALEKO ST
Comment	2015 RECMNDED PM PEAK HR		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)		TR			T			R				
Lane 2					LT							
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		260	390	555	335				470			
PHF		.9	.9	.9	.9				.9			
Proportion of heavy vehicles, HV		3	3	3	3				3			
Flow rate		289	433	617	372				522			
Flare storage (# of vehs)									0			
Median storage (# of vehs)												

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	R	522	509	1.025	15	75.1	F	75.1
	2								
	3								F
SB	1								
	2								
	3								
		①							
		④	617	869	.71	6	18.6	C	

HICAP 2000 ™
©Catalina Engineering, Inc.
1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/15/05
Agency or Company		Major Street	RICE ST
Analysis Period/Year	2015 PMRE 2EB	Minor Street	HALEKO ST
Comment	2015 RECMNDED PM PEAK HR W/2EB LAN		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)		R			T			R				
Lane 2		T			LT							
Lane 3												

Movement	EB			WB			NB			SB		
	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		260	390	555	335				470			
PHF		.9	.9	.9	.9				.9			
Proportion of heavy vehicles, HV		3	3	3	3				3			
Flow rate		289	433	617	372				522			
Flare storage (# of vehs)									0			
Median storage (# of vehs)												

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	R	522	705	.741	7	23.2	C	23.2
	2								
	3								C
SB	1								
	2								
	3								
		①							
		④	617	869	.71	6	18.6	C	

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst	WY	Jurisdiction/Date	1/16/05
Agency or Company	M&E	EB/WB Street	RICE ST
Analysis Period/Year	2015 PMRE	NB/SB Street	HALEKO ST
Comment	2015 REC PM PK HR		

Intersection Data

Area type Other Analysis period .25 h Signal type Actuated-Field % Back of queue 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)		260	390	555	335				470			
RTOR volume (veh/h)			50			0			40			
Peak-hour factor		.92	.92	.92	.92				.92			
Heavy vehicles (%)		2	2	2	2				2			
Start-up lost time, l_1 (s)		2	2	2	2				2			
Extension of effective green, e (s)		2	2	2	2				2			
Arrival type, AT		3	3	3	3				3			
Approach pedestrian volume (p/h)		50			0			50				
Approach bicycle volume (bic/h)		0			0			0				
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N		/	

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB		TRP						
WB	LT	LT						
NB			R					
SB								
Green (s)	9	31	25					
Yellow + All red (s)	5	5	5					

Cycle (s) 80 Lost time per cycle (s) 15 Critical v/c Ratio .928

Intersection Performance

	EB		WB		NB		SB	
Lane group configuration	TR		Def	T		R		
No. of lanes	1		1	1		1		
Flow rate (veh/h)	598		603	364		424		
Capacity (veh/h)	665		842	1040		452		
Adjusted saturation flow (veh/h)	1717		1770	1848		1445		
v/c ratio	.899		.716	.35		.939		
g/C ratio	.388		.563	.563		.313		
Average back of queue (veh)	15.7		10.4	4.8		12.3		
Uniform delay (s)	23		20	9.5		26.8		
Incremental delay (s)	15.2		2.9	0		27.6		
Initial queue delay (s)	0		0	0		0		
Delay (s)	38.2		22.9	9.5		54.4		
LOS	D		C	A		D		
Approach delay (s)/LOS	38.2 / D		17.9 / B		54.4 / D		/	
Intersection delay (s)/ LOS	31.8 / C							

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

RICE STREET/KUHIO HIGHWAY

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: 2003 AMEX
Comment: 2003 EXISTING AM PEAK HOUR

Site Information

Jurisdiction/Date: 10/28/03
EB/WB Street: RICE ST
NB/SB Street: KUHIO/KAMU

Intersection Data

Area type: Other Analysis period: .25 h Signal type: Pretimed % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)				225		60		765		215	745	
RTOR volume (veh/h)						50			0			0
Peak-hour factor				.9	.9	.9	.9	.9	.9	.9	.9	.9
Heavy vehicles (%)				2		2		2		2	2	
Start-up lost time, l_1 (s)				2		2		2		2	2	
Extension of effective green, e (s)				2		2		2		2	2	
Arrival type, AT				3		3		3		3	3	
Approach pedestrian volume (p/h)					0			10			10	
Approach bicycle volume (bic/h)					0			0			0	
Left/right parking (Y or N)		/		N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB								
WB			LR					
NB		T						
SB	LT	LT						
Green (s)	5	41	17					
Yellow + All red (s)	6	6	5					

Cycle (s): 80 Lost time per cycle (s): 6 Critical v/c Ratio: .521

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration				L		R		T		L	T	
No. of lanes				1		1		2		1	2	
Flow rate (veh/h)				250		11		850		239	828	
Capacity (veh/h)				380		340		1799		379	2328	
Adjusted saturation flow (veh/h)				1787		1599		3511		1787	3582	
v/c ratio				.658		.033		.472		.63	.356	
g/C ratio				.213		.213		.513		.65	.65	
Average back of queue (veh)				6.1		.2		7.3		3.5	5.1	
Uniform delay (s)				28.8		25		12.5		7.3	6.4	
Incremental delay (s)				8.6		.2		.9		7.7	.4	
Initial queue delay (s)				0		0		0		0	0	
Delay (s)				37.4		25.2		13.4		15	6.8	
LOS				D		C		B		B	A	
Approach delay (s)/LOS		/		36.9	/	D	13.4	/	B	8.6	/	A
Intersection delay (s)/ LOS	13.9			/			B					

HICAP 2000 ™
©Catalina Engineering, Inc.
1 of 1

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company: M&E
Analysis Period/Year: 2015 AM AMB1
Comment: 2015 AMBIENT AM PK HR FORECAST

Site Information

Jurisdiction/Date: 1/21/05
EB/WB Street: RICE ST
NB/SB Street: KUHIO/KAMU

Intersection Data

Area type: Other Analysis period: .25 h Signal type: Pretimed % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)				265		70		910		250	895	
RTOR volume (veh/h)						50			0			0
Peak-hour factor				.9	.9	.9	.9	.9	.9	.9	.9	.9
Heavy vehicles (%)				2		2		2		2	2	
Start-up lost time, l_1 (s)				2		2		2		2	2	
Extension of effective green, e (s)				2		2		2		2	2	
Arrival type, AT				3		3		3		3	3	
Approach pedestrian volume (p/h)					0			10			10	
Approach bicycle volume (bic/h)					0			0			0	
Left/right parking (Y or N)		/		N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB								
WB			LR					
NB		T						
SB	LT	LT						
Green (s)	5	41	17					
Yellow + All red (s)	6	6	5					

Cycle (s): 80 Lost time per cycle (s): 6 Critical v/c Ratio: .76

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration				L		R		T		L	T	
No. of lanes				1		1		2		1	2	
Flow rate (veh/h)				294		22		1011		278	994	
Capacity (veh/h)				380		340		1799		317	2328	
Adjusted saturation flow (veh/h)				1787		1599		3511		1787	3582	
v/c ratio				.775		.065		.562		.877	.427	
g/C ratio				.213		.213		.513		.65	.65	
Average back of queue (veh)				7.8		.4		9.3		6.3	6.5	
Uniform delay (s)				29.7		25.2		13.4		9.6	6.8	
Incremental delay (s)				14.3		.4		1.3		27.2	.6	
Initial queue delay (s)				0		0		0		0	0	
Delay (s)				44		25.6		14.7		36.8	7.4	
LOS				D		C		B		D	A	
Approach delay (s)/LOS		/		42.7	/	D	14.7	/	B	13.8	/	B
Intersection delay (s)/ LOS	17.7			/			B					

HICAP 2000 ™
©Catalina Engineering, Inc.
1 of 1

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company: M&E
Analysis Period/Year: 2015 AM AMB2
Comment: 2015 AMBAMFC W/KUHIO-HARDY SIGNAL

Site Information

Jurisdiction/Date: 1/21/05
EB/WB Street: RICE ST
NB/SB Street: KUHIO/KAMU

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Pretimed | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)				155		70		910		190	1005	
RTOR volume (veh/h)						50			0			0
Peak-hour factor				.9	.9	.9	.9	.9	.9	.9	.9	.9
Heavy vehicles (%)				2		2		2		2	2	
Start-up lost time, l_1 (s)				2		2		2		2	2	
Extension of effective green, e (s)				2		2		2		2	2	
Arrival type, AT				3		3		3		3	3	
Approach pedestrian volume (p/h)					0			10			10	
Approach bicycle volume (bic/h)					0			0			0	
Left/right parking (Y or N)		/		N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB								
WB			LR					
NB		T						
SB	LT	LT						
Green (s)	5	41	17					
Yellow + All red (s)	6	6	5					

Cycle (s): 80 | Lost time per cycle (s): 12 | Critical v/c Ratio: .526

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration				L		R		T		L	T	
No. of lanes				1		1		2		1	2	
Flow rate (veh/h)				172		22		1011		211	1117	
Capacity (veh/h)				380		340		1799		317	2328	
Adjusted saturation flow (veh/h)				1787		1599		3511		1787	3582	
v/c ratio				.453		.065		.562		.667	.48	
g/C ratio				.213		.213		.513		.65	.65	
Average back of queue (veh)				3.8		.4		9.3		3.3	7.7	
Uniform delay (s)				27.5		25.2		13.4		8.3	7.1	
Incremental delay (s)				3.9		.4		1.3		10.6	.7	
Initial queue delay (s)				0		0		0		0	0	
Delay (s)				31.4		25.6		14.7		18.9	7.8	
LOS				C		C		B		B	A	
Approach delay (s)/LOS		/		30.7	/	C	14.7	/	B	9.6	/	A
Intersection delay (s)/ LOS		13.2			/			B				

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company: M&E
Analysis Period/Year: 2015 AM20RE
Comment: 2015 20% AM PK HR W/RCMNDED PLAN

Site Information

Jurisdiction/Date: 1/15/05
EB/WB Street: RICE ST
NB/SB Street: KUHIO/KAMU

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Pretimed | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)				220		70		1065		280	1005	
RTOR volume (veh/h)						50			0			0
Peak-hour factor				.9	.9	.9	.9	.9	.9	.9	.9	.9
Heavy vehicles (%)				2		2		2		2	2	
Start-up lost time, l_1 (s)				2		2		2		2	2	
Extension of effective green, e (s)				2		2		2		2	2	
Arrival type, AT				3		3		3		3	3	
Approach pedestrian volume (p/h)					0			10			10	
Approach bicycle volume (bic/h)					0			0			0	
Left/right parking (Y or N)		/		N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB								
WB			LR					
NB		T						
SB	LT	LT						
Green (s)	8	43	17					
Yellow + All red (s)	6	6	5					

Cycle (s): 85 | Lost time per cycle (s): 6 | Critical v/c Ratio: .872

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration				L		R		T		L	T	
No. of lanes				1		1		2		1	2	
Flow rate (veh/h)				244		22		1183		311	1117	
Capacity (veh/h)				357		320		1776		310	2402	
Adjusted saturation flow (veh/h)				1787		1599		3511		1787	3582	
v/c ratio				.684		.069		.666		1.002	.465	
g/C ratio				.2		.2		.506		.671	.671	
Average back of queue (veh)				6.4		.5		12.9		10.9	7.7	
Uniform delay (s)				31.5		27.6		15.7		17.7	6.7	
Incremental delay (s)				10.2		.4		2		51.7	.6	
Initial queue delay (s)				0		0		0		0	0	
Delay (s)				41.7		28		17.7		69.4	7.3	
LOS				D		C		B		E	A	
Approach delay (s)/LOS		/		40.6	/	D	17.7	/	B	20.8	/	C
Intersection delay (s)/ LOS		21.4			/			C				

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: 2003 PMEX
Comment: 2003 EXISTING PM PEAK HOUR

Site Information

Jurisdiction/Date: 10/28/03
EB/WB Street: RICE ST
NB/SB Street: KUHIO/KAMU

Intersection Data

Area type: Other Analysis period: .25 h Signal type: Pretimed % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)				300		90		900		180	730	
RTOR volume (veh/h)						70			0			0
Peak-hour factor				.9	.9	.9	.9	.9	.9	.9	.9	.9
Heavy vehicles (%)				2		2		2		2	2	
Start-up lost time, l_1 (s)				2		2		2		2	2	
Extension of effective green, e (s)				2		2		2		2	2	
Arrival type, AT				3		3		3		3	3	
Approach pedestrian volume (p/h)				0			10			10		
Approach bicycle volume (bic/h)				0			0			0		
Left/right parking (Y or N)		/		N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB								
WB			LR					
NB		T						
SB	LT	LT						
Green (s)	5	40	18					
Yellow + All red (s)	6	6	5					

Cycle (s): 80 Lost time per cycle (s): 12 Critical v/c Ratio: .628

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration				L		R		T		L	T	
No. of lanes				1		1		2		1	2	
Flow rate (veh/h)				333		22		1000		200	811	
Capacity (veh/h)				402		360		1756		311	2284	
Adjusted saturation flow (veh/h)				1787		1599		3511		1787	3582	
v/c ratio				.829		.062		.57		.643	.355	
g/C ratio				.225		.225		.5		.638	.638	
Average back of queue (veh)				9.2		.4		9.4		3.1	5.1	
Uniform delay (s)				29.5		24.4		14		8.6	6.8	
Incremental delay (s)				17.6		.3		1.3		9.8	.4	
Initial queue delay (s)				0		0		0		0	0	
Delay (s)				47.1		24.7		15.3		18.4	7.2	
LOS				D		C		B		B	A	
Approach delay (s)/LOS		/		45.7	/	D	15.3	/	B	9.4	/	A
Intersection delay (s)/ LOS		17.3		/			B					

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company: M&E
Analysis Period/Year: 2015 PM AMB1
Comment: 2015 AMBINET PM PK HR FORECAST

Site Information

Jurisdiction/Date: 1/21/05
EB/WB Street: RICE ST
NB/SB Street: KUHIO/KAMU

Intersection Data

Area type: Other Analysis period: .25 h Signal type: Pretimed % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)				350		105		1075		215	870	
RTOR volume (veh/h)						70			0			0
Peak-hour factor				.9	.9	.9	.9	.9	.9	.9	.9	.9
Heavy vehicles (%)				2		2		2		2	2	
Start-up lost time, l_1 (s)				2		2		2		2	2	
Extension of effective green, e (s)				2		2		2		2	2	
Arrival type, AT				3		3		3		3	3	
Approach pedestrian volume (p/h)				0			10			10		
Approach bicycle volume (bic/h)				0			0			0		
Left/right parking (Y or N)		/		N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB								
WB			LR					
NB		T						
SB	LT	LT						
Green (s)	8	34	21					
Yellow + All red (s)	6	6	5					

Cycle (s): 80 Lost time per cycle (s): 12 Critical v/c Ratio: .774

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration				L		R		T		L	T	
No. of lanes				1		1		2		1	2	
Flow rate (veh/h)				389		39		1194		239	967	
Capacity (veh/h)				469		420		1492		273	2149	
Adjusted saturation flow (veh/h)				1787		1599		3511		1787	3582	
v/c ratio				.829		.093		.8		.876	.45	
g/C ratio				.263		.263		.425		.6	.6	
Average back of queue (veh)				10.6		.7		15.2		6.1	7.1	
Uniform delay (s)				27.8		22.3		20		18.4	8.8	
Incremental delay (s)				15.5		.4		4.6		30.2	.7	
Initial queue delay (s)				0		0		0		0	0	
Delay (s)				43.3		22.7		24.6		48.6	9.5	
LOS				D		C		C		D	A	
Approach delay (s)/LOS		/		41.4	/	D	24.6	/	C	17.2	/	B
Intersection delay (s)/ LOS		24		/			C					

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company: M&E
Analysis Period/Year: 2015 PM AMB2
Comment: 2015 AMB PM FC W/KUHIO-HARDY SIGNAL

Site Information

Jurisdiction/Date: 1/21/05
EB/WB Street: RICE ST
NB/SB Street: KUHIO/KAMU

Intersection Data

Area type: Other Analysis period: .25 h Signal type: Pretimed % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)				240		105		1075		155	980	
RTOR volume (veh/h)						70			0			0
Peak-hour factor				.9	.9	.9	.9	.9	.9	.9	.9	.9
Heavy vehicles (%)				2		2		2		2	2	
Start-up lost time, l_1 (s)				2		2		2		2	2	
Extension of effective green, e (s)				2		2		2		2	2	
Arrival type, AT				3		3		3		3	3	
Approach pedestrian volume (p/h)				0			10			10		
Approach bicycle volume (bic/h)				0			0			0		
Left/right parking (Y or N)		/		N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB								
WB			LR					
NB		T						
SB	LT	LT						
Green (s)	5	40	18					
Yellow + All red (s)	6	6	5					

Cycle (s): 80 Lost time per cycle (s): 12 Critical v/c Ratio: .649

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration				L		R		T		L	T	
No. of lanes				1		1		2		1	2	
Flow rate (veh/h)				267		39		1194		172	1089	
Capacity (veh/h)				402		360		1756		249	2284	
Adjusted saturation flow (veh/h)				1787		1599		3511		1787	3582	
v/c ratio				.663		.108		.68		.693	.477	
g/C ratio				.225		.225		.5		.638	.638	
Average back of queue (veh)				6.4		.7		12.6		3	7.7	
Uniform delay (s)				28.2		24.6		15.2		10.5	7.6	
Incremental delay (s)				8.4		.6		2.2		14.8	.7	
Initial queue delay (s)				0		0		0		0	0	
Delay (s)				36.6		25.2		17.4		25.3	8.3	
LOS				D		C		B		C	A	
Approach delay (s)/LOS		/		35.2	/	D	17.4	/	B	10.6	/	B
Intersection delay (s)/ LOS		16.2		/		B						

HICAP 2000 ™
©Catalina Engineering, Inc.
1 of 1

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company: M&E
Analysis Period/Year: 2015 PMRE
Comment: 2015 PM PEAK HOUR W/RECOMNDED PLAN

Site Information

Jurisdiction/Date: 1/10/05
EB/WB Street: RICE ST
NB/SB Street: KUHIO/KAMU

Intersection Data

Area type: Other Analysis period: .25 h Signal type: Pretimed % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)				205		65		915		260	940	
RTOR volume (veh/h)						70			0			0
Peak-hour factor				.9	.9	.9	.9	.9	.9	.9	.9	.9
Heavy vehicles (%)				2		2		2		2	2	
Start-up lost time, l_1 (s)				2		2		2		2	2	
Extension of effective green, e (s)				2		2		2		2	2	
Arrival type, AT				3		3		3		3	3	
Approach pedestrian volume (p/h)				0			10			10		
Approach bicycle volume (bic/h)				0			0			0		
Left/right parking (Y or N)		/		N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB								
WB			LR					
NB		T						
SB	LT	LT						
Green (s)	5	40	18					
Yellow + All red (s)	6	6	5					

Cycle (s): 80 Lost time per cycle (s): 6 Critical v/c Ratio: .774

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration				L		R		T		L	T	
No. of lanes				1		1		2		1	2	
Flow rate (veh/h)				228		-6		1017		289	1044	
Capacity (veh/h)				402		360		1756		305	2284	
Adjusted saturation flow (veh/h)				1787		1599		3511		1787	3582	
v/c ratio				.566		-.015		.579		.946	.457	
g/C ratio				.225		.225		.5		.638	.638	
Average back of queue (veh)				5.2		-.1		9.7		7.9	7.2	
Uniform delay (s)				27.5		23.9		14.1		11.6	7.4	
Incremental delay (s)				5.7		0		1.4		39.5	.7	
Initial queue delay (s)				0		0		0		0	0	
Delay (s)				33.2		23.9		15.5		51.1	8.1	
LOS				C		C		B		D	A	
Approach delay (s)/LOS		/		33.5	/	C	15.5	/	B	17.4	/	B
Intersection delay (s)/ LOS		18		/		B						

HICAP 2000 ™
©Catalina Engineering, Inc.
1 of 1

HARDY STREET/KUHIO HIGHWAY

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	10/28/03
Agency or Company		Major Street	KUHIO HWY
Analysis Period/Year	2003 AMEX	Minor Street	HARDY ST
Comment	2003 EXISTING AM PEAK HOUR		

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)		T			TR						R	
Lane 2		L			T						L	
Lane 3												
	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	355	945			615	190				30		230
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	394	1050			683	211				33		256
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	256	556	.46	2	16.9	C	211.1
	2	L	30	9	3.337	5	1868	F	
	3								F
		①	394	748	.527	3	15.1	C	
		④							

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	KUHIO HWY
Analysis Period/Year	2015 AM AMB1	Minor Street	HARDY ST
Comment	2015 AMBIENT AM PK HR FORECAST		

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)		T			TR						R	
Lane 2		L			T						L	
Lane 3												
	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	395	1130			730	225				35		255
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	439	1256			811	250				39		283
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	283	490	.577	4	21.9	C	627.6
	2	L	30	3	10.044	5	6342	F	
	3								F
		①	439	646	.679	5	21.5	C	
		④							

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company: M&E
Analysis Period/Year: 2015 AM AMB2
Comment: 2015 AMB PM FC W/KUHIO-HARDY SIGNAL

Site Information

Jurisdiction/Date: 1/21/05
EB/WB Street: HARDY ST
NB/SB Street: KUHIO HWY

Intersection Data

Area type: Other Analysis period: .25 h Signal type: Actuated-Field % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)				150		255		730	225	455	1035	
RTOR volume (veh/h)						50			80			0
Peak-hour factor				.92		.92		.92	.92	.92	.92	
Heavy vehicles (%)				2		2		2	2	2	2	
Start-up lost time, l_1 (s)				2		2		2	2	2	2	
Extension of effective green, e (s)				2		2		2	2	2	2	
Arrival type, AT				4	4	4	4	4	4	4	4	4
Approach pedestrian volume (p/h)					50			50			50	
Approach bicycle volume (bic/h)					0			0			0	
Left/right parking (Y or N)		/		N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB								
WB	LRP							
NB			TRP					
SB		LT	LT					
Green (s)	20	13	32					
Yellow + All red (s)	5	5	5					

Cycle (s): 80 Lost time per cycle (s): 10 Critical v/c Ratio: .887

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration				L		R		T	R	L	T	
No. of lanes				1		1		2	1	1	2	
Flow rate (veh/h)				163		223		793	158	495	1125	
Capacity (veh/h)				447		376		1404	627	493	2239	
Adjusted saturation flow (veh/h)				1787		1503		3511	1567	1787	3582	
v/c ratio				.365		.593		.565	.251	1.003	.502	
g/C ratio				.25		.25		.4	.4	.625	.625	
Average back of queue (veh)				3		4.6		6.9	2.1	10	4.5	
Uniform delay (s)				24.8		26.4		18.6	16	13.5	8.2	
Incremental delay (s)				0		2.5		.5	0	41.1	.2	
Initial queue delay (s)				0		0		0	0	0	0	
Delay (s)				24.8		28.9		17.1	14.3	48	4.4	
LOS				C		C		B	B	D	A	
Approach delay (s)/LOS		/		27.2	/	C	16.7	/	B	17.7	/	B
Intersection delay (s)/ LOS		18.6		/			B					

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company: M&E
Analysis Period/Year: 2015 AM20RE
Comment: 2015 20% AM PK HR PLAN RECMNDED PLA

Site Information

Jurisdiction/Date: 1/15/05
EB/WB Street: HARDY ST
NB/SB Street: KUHIO HWY

Intersection Data

Area type: Other Analysis period: .25 h Signal type: Actuated-Field % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)				175		270		740	275	430	1125	
RTOR volume (veh/h)						50			80			0
Peak-hour factor				.92		.92		.92	.92	.92	.92	
Heavy vehicles (%)				2		2		2	2	2	2	
Start-up lost time, l_1 (s)				2		2		2	2	2	2	
Extension of effective green, e (s)				2		2		2	2	2	2	
Arrival type, AT				4	4	4	4	4	4	4	4	4
Approach pedestrian volume (p/h)					50			50			50	
Approach bicycle volume (bic/h)					0			0			0	
Left/right parking (Y or N)		/		N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB								
WB	LRP							
NB			TRP					
SB		LT	LT					
Green (s)	20	12	38					
Yellow + All red (s)	5	5	5					

Cycle (s): 85 Lost time per cycle (s): 10 Critical v/c Ratio: .852

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration				L		R		T	R	L	T	
No. of lanes				1		1		2	1	1	2	
Flow rate (veh/h)				190		239		804	212	467	1223	
Capacity (veh/h)				421		352		1570	701	493	2318	
Adjusted saturation flow (veh/h)				1787		1497		3511	1567	1787	3582	
v/c ratio				.452		.679		.512	.302	.947	.528	
g/C ratio				.235		.235		.447	.447	.647	.647	
Average back of queue (veh)				3.9		5.6		6.4	2.7	7.3	4.7	
Uniform delay (s)				27.8		29.6		16.9	15	10	8	
Incremental delay (s)				.5		5.2		.3	0	27.7	.2	
Initial queue delay (s)				0		0		0	0	0	0	
Delay (s)				28.3		34.8		14.5	12.6	32.2	3.8	
LOS				C		C		B	B	C	A	
Approach delay (s)/LOS		/		31.9	/	C	14.1	/	B	11.6	/	B
Intersection delay (s)/ LOS		15.2		/			B					

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY
Agency or Company	
Analysis Period/Year	2003 PMEX
Comment	2003 EXISTING PM PEAK HOUR

Site Information

Jurisdiction/Date	10/28/03
Major Street	KUHIO HWY
Minor Street	HARDY ST

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)		T			TR							R
Lane 2		L			T							L
Lane 3												
	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	240	930			845	107				70		335
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	267	1033			939	119				78		372
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	372	492	.757	6	31.7	D	453.9
	2	L	70	12	5.653	10	2697.7	F	
	3								F
		①	267	648	.411	2	14.4	B	
		④							

HiCAP 2000 ™

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY
Agency or Company	M&E
Analysis Period/Year	2015 PM AMB1
Comment	2015 AMBINET PM PK HR FORECAST

Site Information

Jurisdiction/Date	1/21/05
Major Street	KUHIO HWY
Minor Street	HARDY ST

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)		T			TR							R
Lane 2		L			T							L
Lane 3												
	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	260	1115			1005	120				80		335
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	289	1239			1117	133				89		372
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	372	425	.875	9	49.5	E	1512.2
	2	L	80	5	16.266	12	8313.7	F	
	3								F
		①	289	547	.528	3	18.7	C	
		④							

HiCAP 2000 ™

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company: M&E
Analysis Period/Year: 2015 PM AMB2
Comment: 2015 AMB PM FC W/KUHIO-HARDY SIGNAL

Site Information

Jurisdiction/Date: 1/21/05
EB/WB Street: HARDY ST
NB/SB Street: KUHIO HWY

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Actuated-Field | % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)				240		335		1005	120	320	1055	
RTOR volume (veh/h)						50			80			0
Peak-hour factor				.92		.92		.92	.92	.92	.92	
Heavy vehicles (%)				2		2		2	2	2	2	
Start-up lost time, l_1 (s)				2		2		2	2	2	2	
Extension of effective green, e (s)				2		2		2	2	2	2	
Arrival type, AT				4	4	4	4	4	4	4	4	4
Approach pedestrian volume (p/h)				50			50			50		
Approach bicycle volume (bic/h)				0			0			0		
Left/right parking (Y or N)		/		N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB								
WB	LRP							
NB			TRP					
SB		LT	LT					
Green (s)	22	12	30					
Yellow + All red (s)	5	5	5					

Cycle (s): 79 | Lost time per cycle (s): 10 | Critical v/c Ratio: .815

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration				L		R		T	R	L	T	
No. of lanes				1		1		2	1	1	2	
Flow rate (veh/h)				261		310		1092	43	348	1147	
Capacity (veh/h)				498		421		1333	595	367	2131	
Adjusted saturation flow (veh/h)				1787		1513		3511	1567	1787	3582	
v/c ratio				.524		.735		.819	.073	.948	.538	
g/C ratio				.278		.278		.38	.38	.595	.595	
Average back of queue (veh)				4.9		6.9		12.7	.5	6.5	5.6	
Uniform delay (s)				24.1		25.9		22.1	15.6	21	9.5	
Incremental delay (s)				1		6.6		4.2	0	33.8	.3	
Initial queue delay (s)				0		0		0	0	0	0	
Delay (s)				25.1		32.5		24.4	14.3	46.1	5.9	
LOS				C		C		C	B	D	A	
Approach delay (s)/LOS		/		29.1	/	C	24	/	C	15.3	/	B
Intersection delay (s)/ LOS		20.8			/			C				

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company: M&E
Analysis Period/Year: 2015 PMRE
Comment: 2015 RECMNDED PM PK HR PLAN

Site Information

Jurisdiction/Date: 1/11/05
EB/WB Street: HARDY ST
NB/SB Street: KUHIO HWY

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Actuated-Field | % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)				320		355		1025	240	285	1115	
RTOR volume (veh/h)						50			80			0
Peak-hour factor				.92		.92		.92	.92	.92	.92	
Heavy vehicles (%)				2		2		2	2	2	2	
Start-up lost time, l_1 (s)				2		2		2	2	2	2	
Extension of effective green, e (s)				2		2		2	2	2	2	
Arrival type, AT				4	4	4	4	4	4	4	4	4
Approach pedestrian volume (p/h)				50			50			50		
Approach bicycle volume (bic/h)				0			0			0		
Left/right parking (Y or N)		/		N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB								
WB	LRP							
NB			TRP					
SB		LT	LT					
Green (s)	25	10	30					
Yellow + All red (s)	5	5	5					

Cycle (s): 80 | Lost time per cycle (s): 10 | Critical v/c Ratio: .851

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration				L		R		T	R	L	T	
No. of lanes				1		1		2	1	1	2	
Flow rate (veh/h)				348		332		1114	174	310	1212	
Capacity (veh/h)				559		476		1317	588	317	2015	
Adjusted saturation flow (veh/h)				1787		1522		3511	1567	1787	3582	
v/c ratio				.623		.697		.846	.296	.976	.601	
g/C ratio				.313		.313		.375	.375	.563	.563	
Average back of queue (veh)				6.8		7		13.7	2.5	6.8	7.4	
Uniform delay (s)				23.5		24.2		22.9	17.6	20.9	11.6	
Incremental delay (s)				2.2		4.4		5.3	0	43.8	.5	
Initial queue delay (s)				0		0		0	0	0	0	
Delay (s)				25.1		28		26.4	16.2	57.5	8.1	
LOS				C		C		C	B	E	A	
Approach delay (s)/LOS		/		26.5	/	C	25	/	C	18.2	/	B
Intersection delay (s)/ LOS		22.3			/			C				

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

HARDY STREET/BIG SAVE-COUNTY DRIVEWAY

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	HARDY ST
Analysis Period/Year	2004 AM EX	Minor Street	BIG SAVE DRIVEWAY
Comment	2004 EXISTING AM		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)		TR			LT			LR				
Lane 2												
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		480	55	45	225		25		35			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		533	61	50	250		28		39			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	LR	67	389	.172	1	16.2	C	16.2
	2								
	3								C
SB	1								
	2								
	3								
		①							
		④	50	977	.051	<1	8.9	A	

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	HARDY ST
Analysis Period/Year	2015 AM AMBI	Minor Street	BIG SAVE DRIVEWAY
Comment	2015 AMBIENT AM PK HR FORECAST		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)		TR			LT			LR				
Lane 2												
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		565	45	55	255		20		45			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		628	50	61	283		22		50			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	LR	72	355	.203	1	17.7	C	17.7
	2								
	3								C
SB	1								
	2								
	3								
		①							
		④	61	909	.067	<1	9.2	A	

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	HARDY ST
Analysis Period/Year	2015 AM AMB2	Minor Street	BIG SAVE DRIVEWAY
Comment	2015 AMB AMFC W/KUHIO-HARDY SIGNAL		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)		TR			LT			LR				
Lane 2												
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		625	45	55	370		20		45			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		694	50	61	411		22		50			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	LR	72	297	.242	1	21	C	21
	2								
	3								C
SB	1								
	2								
	3								
		①							
		④	61	859	.071	<1	9.5	A	

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	HARDY ST
Analysis Period/Year	2015 AM RE	Minor Street	BIG SAVE DRIVEWAY
Comment	2015 RECOMMENDED AM PK HR FORECAST		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)		TR			LT			LR				
Lane 2												
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		675	30		445				45			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		750	33	0	494		0		50			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	LR	50	401	.125	<1	15.3	C	15.3
	2								
	3								C
SB	1								
	2								
	3								
		①							
		④	0						

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	HARDY ST
Analysis Period/Year	2015 AM RE	Minor Street	BIG SAVE DRIVEWAY
Comment	2015 RECOMMENDED AM PK HR FORECAST IF LTS PERMITTED		

Input Data

Lane Configuration	EB	WB	NB	SB
Lane 1 (curb)	TR	LT	LR	
Lane 2				
Lane 3				

	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		675	30	55	445		20		45			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		750	33	61	494		22		50			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	LR	72	261	.276	1	23.9	C	23.9
	2								
	3								C
SB	1								
	2								
	3								
		①							
		④	61	830	.074	<1	9.7	A	

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	HARDY ST
Analysis Period/Year	2004 PM EX	Minor Street	BIG SAVE DRIVEWAY
Comment	2004 EXISTING PM		

Input Data

Lane Configuration	EB	WB	NB	SB
Lane 1 (curb)	TR	LT	LR	
Lane 2				
Lane 3				

	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		345	70	40	325		70		75			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		383	78	44	361		78		83			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	LR	161	417	.386	2	19	C	19
	2								
	3								C
SB	1								
	2								
	3								
		①							
		④	44	1095	.041	<1	8.4	A	

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	HARDY ST
Analysis Period/Year	2015 PM AMB1	Minor Street	BIG SAVE DRIVEWAY
Comment	2015 AMBIENT PM PK HR FORECAST		

Input Data

Lane Configuration	EB	WB	NB	SB
Lane 1 (curb)	TR	LT	LR	
Lane 2				
Lane 3				

	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		405	60	50	350		50		100			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		450	67	56	389		56		111			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	LR	167	411	.406	2	19.6	C	19.6
	2								
	3								C
SB	1								
	2								
	3								
		①							
		④	56	1044	.053	<1	8.6	A	

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	HARDY ST
Analysis Period/Year	2015 PM AMB2	Minor Street	BIG SAVE DRIVEWAY
Comment	2015 AMB PM FC W/ KUHIO-HARDY SIGNA		

Input Data

Lane Configuration	EB	WB	NB	SB
Lane 1 (curb)	TR	LT	LR	
Lane 2				
Lane 3				

	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		465	60	50	405		50		100			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		517	67	56	450		56		111			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	LR	167	358	.466	2	23.5	C	23.5
	2								
	3								C
SB	1								
	2								
	3								
		①							
		④	56	986	.056	<1	8.9	A	

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	HARDY ST
Analysis Period/Year	2015 PM RE	Minor Street	BIG SAVE DRIVEWAY
Comment	2015 RECOMMENDED PM PK HR FORECAST		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)	TR			LT			LR					
Lane 2												
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		595	65	0	555				35			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		661	72	0	617		0		39			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	LR	39	439	.089	<1	14	B	14
	2								
	3								B
SB	1								
	2								
	3								
		①							
		④	0						

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	HARDY ST
Analysis Period/Year	PM RE W/LT 2015	Minor Street	BIG SAVE DRIVEWAY
Comment	2015 REC PM FC W/ LT'S PERMITTED		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)	TR			LT			LR					
Lane 2												
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		595	65	50	555		50		35			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		661	72	56	617		56		39			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	LR	95	193	.491	2	40.4	E	40.4
	2								
	3								E
SB	1								
	2								
	3								
		①							
		④	56	867	.064	<1	9.4	A	

HICAP 2000 ™
©Catalina Engineering, Inc.

HARDY STREET/AKAHI STREET/COUNTY DRIVEWAY

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/24/05
Agency or Company		Major Street	HARDY ST
Analysis Period/Year	2003 AMEX	Minor Street	AKAHI ST
Comment	2003 EXISTING AM PEAK HR		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)		LT			TR						LR	
Lane 2												
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	45	500			230	45				70		65
PHF	.85	.85			.85	.85				.85		.85
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	53	588			271	53				82		76
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1								
	2								
	3								
SB	1	LR	76	740	.103	<1	10.4	B	10.4
	2								
	3								B
		①	53	1231	.043	<1	8.1	A	
		④							

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary —

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company		Major Street	HARDY ST
Analysis Period/Year	2015 AM AMB1	Minor Street	AKAHI ST
Comment	2015 AMBIENT AM PK HR FORECAST		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)		LT			TR						LR	
Lane 2												
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	55	590			265	55				85		75
PHF	.85	.85			.85	.85				.85		.85
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	65	694			312	65				100		88
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1								
	2								
	3								
SB	1	LR	173	315	.549	3	29.5	D	29.5
	2								
	3								D
		①	65	1177	.055	<1	8.2	A	
		④							

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/24/05
Agency or Company		Major Street	HARDY ST
Analysis Period/Year	2015 AM AMB2	Minor Street	AKAHI ST
Comment	2015 AMB AM FC W/KUHIO-HARDY SIGNAL		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)	LT			TR						LR		
Lane 2												
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	55	650			380	55				85		75
PHF	.85	.85			.85	.85				.85		.85
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	65	765			447	65				100		88
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1								
	2								
	3								
SB	1	LR	173	241	.718	5	50.5	F	50.5
	2								
	3								F
		①	65	1048	.062	<1	8.7	A	
		④							

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/10/05
Agency or Company	M&E	Major Street	HARDY ST
Analysis Period/Year	2015 AMRE	Minor Street	AKAHI ST
Comment	2015 RECMNDED AM PEAK HR		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)	LTR			LTR			TR			LTR		
Lane 2							L					
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	45	550	55	95	265	45	65	10	30	75	15	60
PHF	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
Proportion of heavy vehicles, HV	3	3	3	3	3	3	3	3	3	3	3	3
Flow rate	50	611	61	106	294	50	72	11	33	83	17	67
Flare storage (# of vehs)									0			0
Median storage (# of vehs)							0			0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	TR	44	285	.155	1	19.9	C	69.8
	2	L	65	94	.692	3	103.5	F	
	3								F
SB	1	LTR	148	172	.86	6	89.6	F	89.6
	2								
	3								F
		①	50	1209	.041	<1	8.1	A	
		④	106	914	.116	<1	9.5	A	

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/15/05
Agency or Company	M&E	Major Street	HARDY ST
Analysis Period/Year	2015 AMRE2	Minor Street	AKAHI ST
Comment	2015 RECMNDED AM PEAK HR W/ LT		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)		TR			TR			TR			LTR	
Lane 2		L			L			L				
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	45	550	55	95	265	45	65	10	30	75	15	60
PHF	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
Proportion of heavy vehicles, HV	3	3	3	3	3	3	3	3	3	3	3	3
Flow rate	50	611	61	106	294	50	72	11	33	83	17	67
Flare storage (# of vehs)									0			0
Median storage (# of vehs)							0			0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	TR	44	293	.15	1	19.5	C	64.8
	2	L	65	98	.664	3	95.4	F	
	3								F
SB	1	LTR	153	183	.836	6	81.3	F	81.3
	2								
	3								F
		①	50	1209	.041	<1	8.1	A	
		④	106	914	.116	<1	9.5	A	

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - AWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/15/05
Agency or Company	M&E	EB-WB Street	HARDY STREET
Analysis Period/Year	AMRE4WAY 2015	NB-SB Street	AKAHI STREET
Comment	2015 AM REC W/4WAY STOP		

Input Data

		EB		WB		NB		SB	
		Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2
Lane code (Lane 1 is curb lane)		LTR		LTR		LTR		LTR	
Volume (veh/h)	Left-turn	45		95		65		75	
	Through	550		265		10		15	
	Right-turn	55		45		30		60	
Peak-hour factor		.9		.9		.9		.9	
% Heavy vehicles		3		3		3		3	

Outputs

	EB		WB		NB		SB	
	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2
Total lane flow rate (veh/h)	722		450		117		167	
Departure headway, h_d (s)	5.85		6.06		7.44		7.15	
Degree of utilization, x	1.174		.758		.241		.331	
Move-up time, m (s)	2		2		2		2	
Service time, t_s (s)	3.85		4.06		5.44		5.15	
Capacity (veh/h)	610		586		444		470	
Delay (s) (Equation 17-55)	115.9		25.6		12.8		13.6	
Level of service (Exhibit 17-22)	F		D		B		B	
Delay (s), approach	115.9		25.6		12.8		13.6	
Level of service, approach	F		D		B		B	
Delay (s), intersection	68							
Level of service, intersection	F							

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - AWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/15/05
Agency or Company	M&E	EB-WB Street	HARDY STREET
Analysis Period/Year	AMRB4WAY LT 2015	NB-SB Street	AKAHI STREET
Comment	2015 AM REC W/4WAY STOP & LT LANES		

Input Data

		EB		WB		NB		SB	
		Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2
Lane code (Lane 1 is curb lane)		TR	L	TR	L	TR	L	LTR	
Volume (veh/h)	Left-turn		45		95		65	75	
	Through	550		265		10		15	
	Right-turn	55		45		30		60	
Peak-hour factor		.9	.9	.9	.9	.9	.9	.9	
% Heavy vehicles		3	3	3	3	3	3	3	

Outputs

	EB		WB		NB		SB	
	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2
Total lane flow rate (veh/h)	672	50	344	106	44	72	167	
Departure headway, h_d (s)	6.13	6.7	6.29	6.88	7.2	8.21	6.12	
Degree of utilization, x	1.144	.093	.601	.202	.089	.165	.283	
Move-up time, m (s)	2.3	2.3	2.3	2.3	2.3	2.3	2.3	
Service time, t_s (s)	3.83	4.4	3.99	4.58	4.9	5.91	3.82	
Capacity (veh/h)	587	556	574	546	488	427	669	
Delay (s) (Equation 17-55)	106	10.1	18	11.3	10.6	12.5	11.2	
Level of service (Exhibit 17-22)	F	B	C	B	B	B	B	
Delay (s), approach	99.4		16.4		11.8		11.2	
Level of service, approach	F		C		B		B	
Delay (s), intersection	56.6							
Level of service, intersection	F							

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst	WY	Jurisdiction/Date	1/15/05
Agency or Company	M&E PAC	EB/WB Street	HARDY ST
Analysis Period/Year	2015 AM20RE	NB/SB Street	AKAHI ST/C
Comment	2015 RECPLAN 20% AM PK HR W/2LANE		

Intersection Data

Area type Other Analysis period .25 h Signal type Actuated-Field % Back of queue 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	50	585	55	95	280	50	65	10	30	75	15	60
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92
Heavy vehicles (%)	2	2	2	2	2	2	1	1	1	1	1	1
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)	50			50			50			50		
Approach bicycle volume (bic/h)	0			0			0			0		
Left/right parking (Y or N)	N / N			N / N			N / N			N / N		

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		LTRP						
SB		LTRP						
Green (s)	40	20						
Yellow + All red (s)	5	5						

Cycle (s) 70 Lost time per cycle (s) 10 Critical v/c Ratio .651

Intersection Performance

	EB	WB	NB		SB
Lane group configuration	LTR	LTR	L	TR	LTR
No. of lanes	1	1	1	1	1
Flow rate (veh/h)	750	462	71	43	163
Capacity (veh/h)	979	779	330	442	388
Adjusted saturation flow (veh/h)	1714	1364	1155	1548	1359
v/c ratio	.766	.593	.214	.098	.42
g/C ratio	.571	.571	.286	.286	.286
Average back of queue (veh)	12.9	6.6	1.1	.7	2.8
Uniform delay (s)	11.4	9.7	19	18.4	20.3
Incremental delay (s)	3.7	1.2	0	0	.3
Initial queue delay (s)	0	0	0	0	0
Delay (s)	15.1	10.9	19	18.4	20.6
LOS	B	B	B	B	C
Approach delay (s)/LOS	15.1 / B	10.9 / B	18.8 / B		20.6 / C
Intersection delay (s)/ LOS	14.7 / B				

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company: M&E PAC
Analysis Period/Year: AM20RE 2015
Comment: 2015 RECPLAN 20% AM PK HR W/LT LANE

Site Information

Jurisdiction/Date: 1/15/05
EB/WB Street: HARDY ST
NB/SB Street: AKAHI ST/C

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Actuated-Field | % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	50	585	55	95	280	50	65	10	30	75	15	60
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92
Heavy vehicles (%)	2	2	2	2	2	2	1	1	1	1	1	1
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)	50			50			50			50		
Approach bicycle volume (bic/h)	0			0			0			0		
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		LTRP						
SB		LTRP						
Green (s)	40	20						
Yellow + All red (s)	5	5						

Cycle (s): 70 | Lost time per cycle (s): 10 | Critical v/c Ratio: .587

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration	L	TR		L	TR		L	TR			LTR	
No. of lanes	1	1		1	1		1	1			1	
Flow rate (veh/h)	54	696		103	359		71	43			163	
Capacity (veh/h)	532	1039		274	1025		330	442			388	
Adjusted saturation flow (veh/h)	931	1818		480	1794		1155	1548			1359	
v/c ratio	.102	.67		.376	.35		.214	.098			.42	
g/C ratio	.571	.571		.571	.571		.286	.286			.286	
Average back of queue (veh)	.5	10.6		1.3	4.1		1.1	.7			2.8	
Uniform delay (s)	6.8	10.4		8.2	8		19	18.4			20.3	
Incremental delay (s)	0	1.7		.1	0		0	0			.3	
Initial queue delay (s)	0	0		0	0		0	0			0	
Delay (s)	6.8	12.1		8.3	8		19	18.4			20.6	
LOS	A	B		A	A		B	B			C	
Approach delay (s)/LOS	11.7	/	B	8.1	/	A	18.8	/	B	20.6	/	C
Intersection delay (s)/ LOS	12.1	/	B									

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: 2003 PMEX
Comment: 2003 EXISTING PM PEAK HR

Site Information

Jurisdiction/Date: 10/28/03
Major Street: HARDY ST
Minor Street: AKAHI ST

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)	LT			TR						LR		
Lane 2												
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	30	405			290	45				125		50
PHF	.85	.85			.85	.85				.85		.85
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	35	476			341	53				147		59
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2: ft | Movement 5: ft
Length of study period (h): .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1								
	2								
	3								
SB	1	LR	59	676	.087	<1	10.8	B	10.8
	2								
	3								B
		①	35	1159	.03	<1	8.2	A	
		④							

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	HARDY ST
Analysis Period/Year	2015 PM AMB1	Minor Street	AKAHI ST
Comment	2015 AMBIENT PM PK HR FORECAST		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)	LT			TR						LR		
Lane 2												
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	35	490			305	50				150		60
PHF	.85	.85			.85	.85				.85		.85
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	41	576			359	59				176		71
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1								
	2								
	3								
SB	1	LR	247	296	.834	7	57	F	57
	2								
	3								F
		①	41	1136	.036	<1	8.3	A	
		④							

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	HARDY ST
Analysis Period/Year	2015 PM AMB2	Minor Street	AKAHI ST
Comment	2015 AMB PM FC W/KUHIO-HARDY SIGNAL		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)	LT			TR						LR		
Lane 2												
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	35	550			305	50				150		60
PHF	.85	.85			.85	.85				.85		.85
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	41	647			359	59				176		71
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1								
	2								
	3								
SB	1	LR	247	272	.908	8	74	F	74
	2								
	3								F
		①	41	1136	.036	<1	8.3	A	
		④							

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/15/05
Agency or Company	M&E	Major Street	HARDY ST
Analysis Period/Year	2015 PMRE	Minor Street	AKAHI ST
Comment	2015 RECMNDED PM PEAK HR		

Site Information

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)	LTR			LTR			TR			LTR		
Lane 2							L					
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	45	530	30	70	275	45	225	10	45	145	10	55
PHF	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
Proportion of heavy vehicles, HV	3	3	3	3	3	3	1	1	1	1	1	1
Flow rate	50	589	33	78	306	50	250	11	50	161	11	61
Flare storage (# of vehs)									0			0
Median storage (# of vehs)							0			0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	TR	56	346	.162	1	17.4	C	481.2
	2	L	250	119	2.106	21	585.1	F	
	3								F
SB	1	LTR	233	153	1.523	16	319.3	F	319.3
	2								
	3								F
		①	50	1198	.042	<1	8.1	A	
		④	78	954	.082	<1	9.1	A	

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/15/05
Agency or Company	M&E	Major Street	HARDY ST
Analysis Period/Year	2015 PMRE2	Minor Street	AKAHI ST
Comment	2015 RCMND PM PK HR W/ LT LANE		

Site Information

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)	TR			TR			TR			LTR		
Lane 2	L			L			L					
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	45	530	30	70	275	45	225	10	45	145	10	55
PHF	.85	.9	.9	.9	.85	.85	.9	.9	.9	.9	.9	.9
Proportion of heavy vehicles, HV	1	3	1	1	1	1	1	1	1	1	1	1
Flow rate	53	589	33	78	324	53	250	11	50	161	11	61
Flare storage (# of vehs)									0			0
Median storage (# of vehs)							0			0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	TR	61	355	.172	1	17.2	C	402.4
	2	L	225	117	1.921	18	506.8	F	
	3								F
SB	1	LTR	233	151	1.541	16	327.4	F	327.4
	2								
	3								F
		①	53	1188	.045	<1	8.2	A	
		④	78	964	.081	<1	9.1	A	

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 17 - AWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/15/05
Agency or Company	M&E	EB-WB Street	HARDY ST
Analysis Period/Year	PMRE4WAY 2015	NB-SB Street	AKAHI ST
Comment	2105 PM REC W/4 WAY STOP		

Input Data

		EB		WB		NB		SB	
		Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2
Lane code (Lane 1 is curb lane)		LTR		LTR		LTR		LTR	
Volume (veh/h)	Left-turn	45		70		225		145	
	Through	530		275		10		10	
	Right-turn	30		45		45		55	
Peak-hour factor		.9		.9		.9		.9	
% Heavy vehicles		3		3		3		3	

Outputs

	EB		WB		NB		SB	
	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2
Total lane flow rate (veh/h)	672		433		311		233	
Departure headway, h_d (s)	7.9		7.84		8.47		8.8	
Degree of utilization, x	1.476		.944		.732		.57	
Move-up time, m (s)	2		2		2		2	
Service time, t_s (s)	5.9		5.84		6.47		6.8	
Capacity (veh/h)	445		456		414		393	
Delay (s) (Equation 17-55)	247.2		57.3		31.3		22.8	
Level of service (Exhibit 17-22)	F		F		D		C	
Delay (s), approach	247.2		57.3		31.3		22.8	
Level of service, approach	F		F		D		C	
Delay (s), intersection	124.9							
Level of service, intersection	F							

HiCAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 17 - AWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/15/05
Agency or Company	M&E	EB-WB Street	HARDY WT
Analysis Period/Year	PMRE4WAY LT 2015	NB-SB Street	AKAHI ST
Comment	2015 PM REC W/4WAY STOP & LT LANES		

Input Data

		EB		WB		NB		SB	
		Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2
Lane code (Lane 1 is curb lane)		TR	L	TR	L	TR	L	LTR	
Volume (veh/h)	Left-turn		45		70		225	145	
	Through	530		275		10		10	
	Right-turn	30		45		45		55	
Peak-hour factor		.9	.9	.9	.9	.9	.9	.9	
% Heavy vehicles		3	3	3	3	3	3	3	

Outputs

	EB		WB		NB		SB	
	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2
Total lane flow rate (veh/h)	622	50	356	78	61	250	233	
Departure headway, h_d (s)	7.47	8.02	7.57	8.17	7.55	8.6	6.6	
Degree of utilization, x	1.29	.111	.748	.176	.128	.598	.428	
Move-up time, m (s)	2.3	2.3	2.3	2.3	2.3	2.3	2.3	
Service time, t_s (s)	5.17	5.72	5.27	5.87	5.25	6.3	4.3	
Capacity (veh/h)	480	474	475	466	497	414	622	
Delay (s) (Equation 17-55)	168.3	11.7	29.5	12.6	11.4	23.3	14.1	
Level of service (Exhibit 17-22)	F	B	D	B	B	C	B	
Delay (s), approach	156.6		26.4		20.9		14.1	
Level of service, approach	F		D		C		B	
Delay (s), intersection	76.7							
Level of service, intersection	F							

HiCAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company: M&E PAC
Analysis Period/Year: 2015 PMRE
Comment: 2015 RECPLAN PM PK HR W/2LANE

Site Information

Jurisdiction/Date: 1/15/05
EB/WB Street: HARDY ST
NB/SB Street: AKAHI ST/C

Intersection Data

Area type: Other Analysis period: .25 h Signal type: Actuated-Field % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	45	530	30	70	275	45	225	10	45	145	10	55
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92
Heavy vehicles (%)	2	2	2	2	2	2	1	1	1	1	1	1
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)	50			50			50			50		
Approach bicycle volume (bic/h)	0			0			0			0		
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		LTRP						
SB		LTRP						
Green (s)	40	20						
Yellow + All red (s)	5	5						

Cycle (s): 70 Lost time per cycle (s): 10 Critical v/c Ratio: .693

Intersection Performance

	EB	WB	NB		SB
Lane group configuration	LTR	LTR	L	TR	LTR
No. of lanes	1	1	1	1	1
Flow rate (veh/h)	658	424	245	60	228
Capacity (veh/h)	989	846	327	434	359
Adjusted saturation flow (veh/h)	1731	1481	1145	1520	1257
v/c ratio	.665	.501	.748	.138	.636
g/C ratio	.571	.571	.286	.286	.286
Average back of queue (veh)	10	5.5	5.2	.9	4.4
Uniform delay (s)	10.4	9	22.7	18.6	21.8
Incremental delay (s)	1.7	.5	9.2	0	3.7
Initial queue delay (s)	0	0	0	0	0
Delay (s)	12.1	9.5	31.9	18.6	25.5
LOS	B	A	C	B	C
Approach delay (s)/LOS	12.1 / B	9.5 / A	29.3 / C		25.5 / C
Intersection delay (s)/ LOS	16.5 / B				

HICAP 2000 ™

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company: M&E PAC
Analysis Period/Year: 2015 PMRE LT
Comment: 2015 RECPLAN PM PK HR W/LT LANE

Site Information

Jurisdiction/Date: 1/15/05
EB/WB Street: HARDY ST
NB/SB Street: AKAHI ST/C

Intersection Data

Area type: Other Analysis period: .25 h Signal type: Actuated-Field % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	45	530	30	70	275	45	225	10	45	145	10	55
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92
Heavy vehicles (%)	2	2	2	2	2	2	1	1	1	1	1	1
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)	50			50			50			50		
Approach bicycle volume (bic/h)	0			0			0			0		
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		LTRP						
SB		LTRP						
Green (s)	40	20						
Yellow + All red (s)	5	5						

Cycle (s): 70 Lost time per cycle (s): 10 Critical v/c Ratio: .637

Intersection Performance

	EB		WB		NB		SB
Lane group configuration	L	TR	L	TR	L	TR	LTR
No. of lanes	1	1	1	1	1	1	1
Flow rate (veh/h)	49	609	76	348	245	60	228
Capacity (veh/h)	541	1045	337	1028	327	434	359
Adjusted saturation flow (veh/h)	947	1829	590	1798	1145	1520	1257
v/c ratio	.09	.582	.226	.339	.748	.138	.636
g/C ratio	.571	.571	.571	.571	.286	.286	.286
Average back of queue (veh)	.5	8.4	.8	3.9	5.2	.9	4.4
Uniform delay (s)	6.8	9.6	7.4	8	22.7	18.6	21.8
Incremental delay (s)	0	.8	0	0	9.2	0	3.7
Initial queue delay (s)	0	0	0	0	0	0	0
Delay (s)	6.8	10.4	7.4	8	31.9	18.6	25.5
LOS	A	B	A	A	C	B	C
Approach delay (s)/LOS	10.2 / B		7.9 / A		29.3 / C		25.5 / C
Intersection delay (s)/ LOS	15.3 / B						

HICAP 2000 ™

HARDY STREET/EIWA STREET

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	10/28/03
Agency or Company		Major Street	HARDY ST
Analysis Period/Year	2003 AMEX	Minor Street	EIWA ST
Comment	2003 EXISTING AM PEAK HR		

Input Data

Lane Configuration	EB	WB	NB	SB
Lane 1 (curb)	TR	LT	LR	
Lane 2				
Lane 3				

	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		495	85	165	220		65		110			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		550	94	183	244		72		122			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	LR	122	501	.244	1	14.5	B	14.5
	2								
	3								B
SB	1								
	2								
	3								
		①							
		④	183	936	.196	1	9.8	A	

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company		Major Street	HARDY ST
Analysis Period/Year	2015 AM AMB1	Minor Street	EIWA ST
Comment	2015 AMBIENT AM PK HR FORECAST		

Input Data

Lane Configuration	EB	WB	NB	SB
Lane 1 (curb)	TR	LT	LR	
Lane 2				
Lane 3				

	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		600	85	200	265		70		135			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		667	94	222	294		78		150			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	LR	228	209	1.089	10	136.3	F	136.3
	2								
	3								F
SB	1								
	2								
	3								
		①							
		④	222	846	.263	1	10.8	B	

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company		Major Street	HARDY ST
Analysis Period/Year	2015 AM AMB2	Minor Street	EIWA ST
Comment	2015 AMB AM FC W/KUHIO-HARDY SIGNAL		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)	TR			LT			LR					
Lane 2												
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		660	45	130	340		70		135			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		733	50	144	378		78		150			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	LR	228	227	1.006	9	106.9	F	106.9
	2								
	3								F
SB	1								
	2								
	3								
		①							
		④	144	830	.174	1	10.2	B	

HICAP 2000 ™

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	10/28/03
Agency or Company		Major Street	HARDY ST
Analysis Period/Year	2003 PMEX	Minor Street	EIWA ST
Comment	2003 EXISTING PM PEAK HR		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)	TR			LT			LR					
Lane 2												
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		365	85	120	205		130		180			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		406	94	133	228		144		200			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	LR	200	605	.331	1	13.9	B	13.9
	2								
	3								B
SB	1								
	2								
	3								
		①							
		④	133	1059	.126	<1	8.9	A	

HICAP 2000 ™

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	HARDY ST
Analysis Period/Year	2015 PM AMB1	Minor Street	EIWA ST
Comment	2015 AMBIENT PM PK HR FORECAST		

Site Information

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)		TR			LT			LR				
Lane 2												
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		455	130	150	255		115		245			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		506	144	167	283		128		272			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	LR	400	310	1.289	19	186.5	F	186.5
	2								
	3								F
SB	1								
	2								
	3								
		①							
		④	167	931	.179	1	9.7	A	

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	HARDY ST
Analysis Period/Year	2015 PM AMB2	Minor Street	EIWA ST
Comment	2015 AMB PM FC W/KUHIO-HARDY SIGNAL		

Site Information

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)		TR			LT			LR				
Lane 2												
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		515	80	95	310		115		245			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		572	89	106	344		128		272			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	LR	400	322	1.24	18	165.9	F	165.9
	2								
	3								F
SB	1								
	2								
	3								
		①							
		④	106	923	.114	<1	9.4	A	

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

HARDY STREET/UMI STREET

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	ANALYST	Jurisdiction/Date	10/28/03
Agency or Company		Major Street	HARDY ST
Analysis Period/Year	2003 AMEX	Minor Street	UMI ST
Comment	2003 EXISTING AM PEAK HR		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)	LTR			LTR			R			LTR		
Lane 2							LT					
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	55	255	185	45	160	40	70	55	65	15	85	125
PHF	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
Proportion of heavy vehicles, HV	3	3	3	3	3	3	3	3	3	3	3	3
Flow rate	61	283	206	50	178	44	78	61	72	17	94	139
Flare storage (# of vehs)									0			0
Median storage (# of vehs)							0			0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	R	72	660	.109	<1	11.1	B	54.7
	2	LT	133	168	.79	5	78.2	F	
	3								F
SB	1	LTR	239	414	.578	4	25	C	25
	2								
	3								C
		①	61	1341	.046	<1	7.8	A	
		④	50	1069	.047	<1	8.5	A	

HiCAP 2000 ™

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	HARDY ST
Analysis Period/Year	2015 AM AMB1	Minor Street	UMI ST
Comment	2015 AMBIENT AM PK HR FORECAST		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)	LTR			LTR			R			LTR		
Lane 2							LT					
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	65	315	220	50	205	50	85	65	80	20	100	135
PHF	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
Proportion of heavy vehicles, HV	3	3	3	3	3	3	3	3	3	3	3	3
Flow rate	72	350	244	56	228	56	94	72	89	22	111	150
Flare storage (# of vehs)									0			0
Median storage (# of vehs)							0			0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	R	89	590	.151	1	12.2	B	294.1
	2	LT	166	96	1.733	13	445.2	F	
	3								F
SB	1	LTR	283	280	1.01	10	96.6	F	96.6
	2								
	3								F
		①	72	1273	.057	<1	8	A	
		④	56	977	.057	<1	8.9	A	

HiCAP 2000 ™

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	HARDY ST
Analysis Period/Year	2015 AM AMB2	Minor Street	UMI ST
Comment	2015 AMB AM FC W/KUHIO-HARDY SIGNAL		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)	LTR			LTR			R			LTR		
Lane 2							LT					
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	65	345	250	50	205	50	85	65	80	20	100	135
PHF	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
Proportion of heavy vehicles, HV	3	3	3	3	3	3	3	3	3	3	3	3
Flow rate	72	383	278	56	228	56	94	72	89	22	111	150
Flare storage (# of vehs)									0			0
Median storage (# of vehs)							0			0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	R	89	553	.161	1	12.8	B	401
	2	LT	166	80	2.075	15	609.2	F	
	3								F
SB	1	LTR	283	257	1.103	12	128.7	F	128.7
	2								
	3								F
		①	72	1273	.057	<1	8	A	
		④	56	923	.06	<1	9.2	A	

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/16/05
Agency or Company		Major Street	HARDY ST
Analysis Period/Year	2015 20AMRE	Minor Street	UMI ST
Comment	2015 RCMND 20% AM PEAK HR		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)	LTR			LTR			R			LTR		
Lane 2							LT					
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	65	200	245	85	140	50	120	95	130	15	130	170
PHF	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
Proportion of heavy vehicles, HV	3	3	3	3	3	3	3	3	3	3	3	3
Flow rate	72	222	272	94	156	56	133	106	144	17	144	189
Flare storage (# of vehs)									0			0
Median storage (# of vehs)							0			0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	R	72	684	.105	<1	10.9	B	255.2
	2	LT	133	85	1.562	11	387.4	F	
	3								F
SB	1	LTR	289	400	.723	6	34.2	D	34.2
	2								
	3								D
		①	72	1353	.053	<1	7.8	A	
		④	94	1064	.089	<1	8.7	A	

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - ROUNDABOUTS WORKSHEET

General Information

Analyst	wy	Jurisdiction/Date	Jurisdiction 1/15/05
Agency or Company	me	EB-WB Street	hardy st
Analysis Period/Year	am20%re 2015	NB-SB Street	umi st
Comment	2015 20% am peak hr forecastII		

Volume Adjustments

		EB	WB	NB	SB
LT Traffic	Volume, veh/h	65	85	120	20
	PHF	0.90	0.90	0.90	0.90
	Flow rate, veh/h	72	94	133	22
TH Traffic	Volume, veh/h	200	140	95	130
	PHF	0.90	0.90	0.90	0.90
	Flow rate, veh/h	222	156	106	144
RT Traffic	Volume, veh/h	245	50	130	170
	PHF	0.90	0.90	0.90	0.90
	Flow rate, veh/h	272	56	144	189

Approach Flow Computation / **Circulating Flow Computation**

Approach Flow (veh/h)	v_a (veh/h)	Approach Flow (veh/h)	v_c (veh/h)
$v_{a,E} = v_1 + v_2 + v_3$	567	$v_{c,E} = v_4 + v_{10} + v_{11}$	261
$v_{a,W} = v_4 + v_5 + v_6$	306	$v_{c,W} = v_1 + v_7 + v_8$	311
$v_{a,N} = v_7 + v_8 + v_9$	383	$v_{c,N} = v_1 + v_2 + v_{10}$	317
$v_{a,S} = v_{10} + v_{11} + v_{12}$	356	$v_{c,S} = v_4 + v_5 + v_7$	383

Gap Acceptance Parameters

☐ Field data?

	Critical Gap (s)	Follow-up Time (s)
Upperbound value	4.1	2.6
Lowerbound value	4.6	3.1

Capacity Computation

		EB	WB	NB	SB
Capacity (Equation 17-70) (veh/h)	Upperbound	1128	1085	1080	1024
	Lowerbound	929	890	885	835
v/c Ratio	Upperbound	0.502	0.282	0.355	0.347
	Lowerbound	0.610	0.343	0.433	0.426

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	ANALYST	Jurisdiction/Date	10/28/03
Agency or Company		Major Street	HARDY ST
Analysis Period/Year	2003 PMEX	Minor Street	UMI ST
Comment	2003 EXISTING PM PEAK HR		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)	LTR			LTR			R			LTR		
Lane 2							LT					
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	105	235	105	30	170	40	65	95	35	8	40	60
PHF	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
Proportion of heavy vehicles, HV	3	3	3	3	3	3	3	3	3	3	3	3
Flow rate	117	261	117	33	189	44	72	106	39	9	44	67
Flare storage (# of vehs)									0			0
Median storage (# of vehs)							0			0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	R	41	719	.057	<1	10.3	B	45.4
	2	LT	160	222	.721	5	54.4	F	
	3								E
SB	1	LTR	167	338	.494	3	25.6	D	25.6
	2								
	3								D
		①	117	1328	.088	<1	8	A	
		④	33	1175	.028	<1	8.2	A	

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	HARDY ST
Analysis Period/Year	2015 PM AMB1	Minor Street	UMI ST
Comment	2015 AMBIENT PM PK HR FORECAST		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)	LTR			LTR			R			LTR		
Lane 2							LT					
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	120	325	125	35	220	50	75	115	45	10	45	65
PHF	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
Proportion of heavy vehicles, HV	3	3	3	3	3	3	3	3	3	3	3	3
Flow rate	133	361	139	39	244	56	83	128	50	11	50	72
Flare storage (# of vehs)									0			0
Median storage (# of vehs)							0			0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	R	50	623	.08	<1	11.3	B	239.8
	2	LT	211	145	1.451	14	294	F	
	3								F
SB	1	LTR	133	233	.571	3	39.3	E	39.3
	2								
	3								E
		①	133	1255	.106	<1	8.2	A	
		④	39	1059	.037	<1	8.5	A	

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	HARDY ST
Analysis Period/Year	2015 PM AMB2	Minor Street	UMI ST
Comment	2015 AMB PM FC W/KUHIO-HARDY SIGNAL		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)	LTR			LTR			R			LTR		
Lane 2							LT					
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	120	355	125	35	220	50	75	115	45	10	45	65
PHF	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
Proportion of heavy vehicles, HV	3	3	3	3	3	3	3	3	3	3	3	3
Flow rate	133	394	139	39	244	56	83	128	50	11	50	72
Flare storage (# of vehs)									0			0
Median storage (# of vehs)							0			0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	R	50	596	.084	<1	11.6	B	273.8
	2	LT	211	137	1.543	15	336	F	
	3								F
SB	1	LTR	133	216	.616	4	45.2	E	45.2
	2								
	3								E
		①	133	1255	.106	<1	8.2	A	
		④	39	1029	.038	<1	8.6	A	

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - ROUNDABOUTS WORKSHEET

General Information | **Site Information**

Analyst	wy	Jurisdiction/Date	Jurisdiction 1/15/05
Agency or Company	me	EB-WB Street	hardy st
Analysis Period/Year	am 2015	NB-SB Street	umi st
Comment	2015 forecast pm peak hrll		

Volume Adjustments

		EB	WB	NB	SB
LT Traffic	Volume, veh/h	160	70	160	10
	PHF	0.90	0.90	0.90	0.90
	Flow rate, veh/h	178	78	178	11
TH Traffic	Volume, veh/h	320	170	175	75
	PHF	0.90	0.90	0.90	0.90
	Flow rate, veh/h	356	189	194	83
RT Traffic	Volume, veh/h	155	50	100	45
	PHF	0.90	0.90	0.90	0.90
	Flow rate, veh/h	172	56	111	50

Approach Flow Computation | **Circulating Flow Computation**

Approach Flow (veh/h)	v_a (veh/h)	Approach Flow (veh/h)	v_c (veh/h)
$v_{a,E} = v_1 + v_2 + v_3$	706	$v_{c,E} = v_4 + v_{10} + v_{11}$	172
$v_{a,W} = v_4 + v_5 + v_6$	322	$v_{c,W} = v_1 + v_7 + v_8$	550
$v_{a,N} = v_7 + v_8 + v_9$	483	$v_{c,N} = v_1 + v_2 + v_{10}$	544
$v_{a,S} = v_{10} + v_{11} + v_{12}$	144	$v_{c,S} = v_4 + v_5 + v_7$	444

Gap Acceptance Parameters

☐ Field data?

	Critical Gap (s)	Follow-up Time (s)
Upperbound value	4.1	2.6
Lowerbound value	4.6	3.1

Capacity Computation

		EB	WB	NB	SB
Capacity (Equation 17-70) (veh/h)	Upperbound	1210	897	901	976
	Lowerbound	1003	722	726	792
v/c Ratio	Upperbound	0.583	0.359	0.537	0.148
	Lowerbound	0.704	0.446	0.686	0.182

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information | **Site Information**

Analyst	WY	Jurisdiction/Date	1/16/05
Agency or Company		Major Street	HARDY ST
Analysis Period/Year	2015 PMRE	Minor Street	UMI ST
Comment	2015 REC 20% PM PEAK HR		

Input Data

Lane Configuration	EB			WB			NB			SB		
Lane 1 (curb)	LTR			LTR			R			LTR		
Lane 2							LT					
Lane 3												
	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	160	320	155	70	170	50	160	175	100	10	75	45
PHF	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
Proportion of heavy vehicles, HV	3	3	3	3	3	3	3	3	3	3	3	3
Flow rate	178	356	172	78	189	56	178	194	111	11	83	50
Flare storage (# of vehs)									0			0
Median storage (# of vehs)							0			0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1	R	41	614	.067	<1	11.3	B	407.9
	2	LT	160	86	1.86	14	509.5	F	
	3								F
SB	1	LTR	150	176	.85	6	86.3	F	86.3
	2								
	3								F
		①	178	1316	.135	<1	8.2	A	
		④	78	1034	.075	<1	8.8	A	

UMI STREET/COUNTY-STATE DRIVEWAY

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	UMI STREET
Analysis Period/Year	2003 AMEX	Minor Street	COUNTY/STATE DRIVEWAY
Comment	2003 EXISTING AM PK HR		

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)	TR			LT			LR					
Lane 2												
Lane 3												
	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	0	230	25	0	170		7		15			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		256	28	0	189		8		17			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1	LR	25	685	.036	<1	10.5	B	10.5
	2								B
	3								
WB	1								
	2								
	3								
		①							
		④	0	1273	0	<1	7.8	A	

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	UMI STREET
Analysis Period/Year	2003 AMEX	Minor Street	COUNTY/STATE DRIVEWAY
Comment	2003 EXISTING AM PK HR		

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)	TR			LT			LR					
Lane 2												
Lane 3												
	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	0	300	0	0	170		7		15			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		333	0	0	189		8		17			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1	LR	25	630	.04	<1	10.9	B	10.9
	2								B
	3								
WB	1								
	2								
	3								
		①							
		④	0	1220	0	<1	7.9	A	

HICAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	UMI STREET
Analysis Period/Year	2015 AM AMB2	Minor Street	COUNTY/STATE DRIVEWAY
Comment	2015 AMB AM FC W/KUHIO-HARDY SIGNAL		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	TR	LT	LR	
Lane 2				
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		330	0	0	205		7		15			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		367	0	0	228		8		17			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1	LR	25	591	.042	<1	11.4	B	11.4
	2								
	3								B
WB	1								
	2								
	3								
		①							
		④	0	1186	0	<1	8	A	

HiCAP 2000 ™

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/15/05
Agency or Company	M&E	Major Street	UMI STREET
Analysis Period/Year	2015 AM20RE	Minor Street	COUNTY/STATE DRIVEWAY
Comment	2015 RECMNDED 20% AM PK HR		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	TR	LT	R	
Lane 2			L	
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		365	60	165	305		10		25			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		406	67	183	339		11		28			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1	R	28	616	.045	<1	11.1	B	15.3
	2	L	11	183	.06	<1	26	D	
	3								C
WB	1								
	2								
	3								
		①							
		④	183	1084	.169	1	9	A	

HiCAP 2000 ™

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	UMI STREET
Analysis Period/Year	2003 PMEX	Minor Street	COUNTY/STATE DRIVEWAY
Comment	2003 EXISTING PM PK HR		

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)	TR			LT			LR					
Lane 2												
Lane 3												
	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	0	205	0	0	130		11		20			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		228	0	0	144		12		22			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1	LR	31	733	.042	<1	10.1	B	10.1
	2								
	3								B
WB	1								
	2								
	3								
		①							
		④	0	1335	0	<1	7.7	A	

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	UMI STREET
Analysis Period/Year	2015 PM AMB1	Minor Street	COUNTY/STATE DRIVEWAY
Comment	2015 AMBIENT PM PK HR		

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)	TR			LT			LR					
Lane 2												
Lane 3												
	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	0	245	0	0	155		15		15			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		272	0	0	172		17		17			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1	LR	34	652	.052	<1	10.8	B	10.8
	2								
	3								B
WB	1								
	2								
	3								
		①							
		④	0	1285	0	<1	7.8	A	

HICAP 2000 ™
©Catalina Engineering, Inc.

1 of 1

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/21/05
Agency or Company	M&E	Major Street	UMI STREET
Analysis Period/Year	2015 PM AMB2	Minor Street	COUNTY/STATE DRIVEWAY
Comment	2015 AMB PM FC W/KUHIO-HARDY SIGNAL		

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)	TR			LT			LR					
Lane 2												
Lane 3												
	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	0	275	0	0	155		15		15			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		306	0	0	172		17		17			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1	LR	34	624	.054	<1	11.1	B	11.1
	2								
	3								B
WB	1								
	2								
	3								
		①							
		④	0	1250	0	<1	7.9	A	

HiCAP 2000 ™
©Catalina Engineering, Inc.

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/11/05
Agency or Company	M&E	Major Street	UMI STREET
Analysis Period/Year	2015 PMRE	Minor Street	COUNTY/STATE DRIVEWAY
Comment	2015 RECMNDED PM PK HR		

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)	TR			LT			R					
Lane 2							L					
Lane 3												
	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		330	10	95	355		10		95			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		367	11	106	394		11		106			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1	R	106	672	.158	1	11.4	B	12.2
	2	L	11	252	.044	<1	19.9	C	
	3								B
WB	1								
	2								
	3								
		①							
		④	106	1175	.09	<1	8.4	A	

HiCAP 2000 ™
©Catalina Engineering, Inc.