DRAFT (REV.1)
NEW KAUAʻI LANDFILL
TRAFFIC AND ROADWAYS ENGINEERING FEASIBILITY STUDY

County of Kauaʻi
Department of Public Works
Solid Waste Division
4444 Rice Street, Room 275
Līhuʻe, Kauaʻi, Hawaiʻi

January 2014

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Prepared for:

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EXECUTIVE SUMMARY

This Traffic and Roadways Engineering Feasibility Study (TREFS) analyzes traffic impacts, recommended roadway improvements, and potential social impacts of six potential access routes between Kūhiō Highway and the site of the County of Kaua‘i’s proposed new municipal solid waste landfill (MSWLF) and resource recovery park (RRP) at Ma‘alo (the Project), north of Līhu‘e town. The County seeks to establish a new MSWLF to fulfill its responsibility for properly managing and disposing of municipal solid waste on the island, and the County’s existing sole MSWLF at Kekaha is project to reach capacity in the coming years.

An Environmental Impact Statement (EIS) is being prepared to evaluate the environmental impacts of and alternatives to the proposed Project, and the choice of access routes to the Project site has emerged as an important public consideration. The proposed access route will be further analyzed in the overall project EIS. Each alternative access route consists of a “road” (labelled A–D) and a “driveway” (labelled 1–3) and connects to regional access at one of four study intersections:

- **Routes A1, A2:** via Ma‘alo Road and Driveway 1 or Driveway 2. The study intersection is Ma‘alo Road / Kūhiō Highway, a stop-sign-controlled T-intersection. Total route length is 4.7–4.8 miles.
- **Routes B1, B2:** via ‘Ehiku Street, Ma‘alo Road, and Driveway 1 or 2. The study intersection is ‘Ehiku Street / Kūhiō Highway, a signalized intersection. Total route length is 5.6–5.7 miles.
- **Route C3:** via Laulima Street and Driveway 3. The study intersection is Laulima Street / Kūhiō Highway, a stop-sign-controlled four-legged intersection. Total route length is 1.7 miles.
- **Route D3:** via Roberts Hawaii Driveway and Driveway 3. The study intersection is Roberts Hawaii Driveway / Kūhiō Highway (a stop-sign-controlled T-intersection). Total route length is 2.2 miles.

In addition, the traffic assessment evaluated the currently signalized Kapule Highway / Kūhiō Highway intersection, to evaluate potential traffic queuing issues resulting from operation of the D3 alternative access route.

Traffic Assessment. The assessment evaluated existing traffic conditions (including intersection operating conditions) and future conditions, both at Project implementation (i.e., opening year) and in the long term (i.e., 20 years after opening year). Each future condition evaluation assessed three future scenarios:

- Projected baseline conditions (i.e., without Project implementation)
- Projected baseline conditions plus operation of the MSWLF
- Projected baseline conditions plus operation of the MSWLF and the RRP (because the RRP component may be implemented separately or in phases)

The evaluation included an assessment of traffic impacts at each study intersection with Project vehicles both using and not using that intersection for access.

All access scenarios analyzed present traffic impacts at their respective Kūhiō Highway intersection that should be addressed via physical and operational improvements:

- **A1, A2:** Would require significant intersection modifications and other significant improvements.
- **B1, B2:** Would require significant improvements along the length of the route; and would result in impacts to the residential portion of the route.
- **C3:** Would require signalizing the intersection, and other improvements to the route.
- **D3:** Would require signalizing the intersection and synchronizing it with existing signalization at the nearby Kapule Highway intersection to accommodate vehicle queuing there during the PM peak hour.

The traffic assessment concluded that Route C3 is the most implementable, feasible, and cost-effective Project-access alternative, with the least-adverse impacts on traffic. Signalization of Route C3 is expected to have a positive traffic-related impact for some users.

Infrastructure Improvements Assessment. The assessment evaluated existing conditions and recommended improvements, as well as permitting, land use, and land acquisition requirements and related costs for each proposed access route. All access scenarios involve paving of most or all of the potential route, and providing utility service to the Project site.

The planning-level cost estimates for requisite roadway and infrastructure improvements under each access scenario are:

- **A1:** $36.7 million
- **A2:** $35.3 million
- **B1:** $43.3 million
- **B2:** $41.8 million
- **C3:** $12.5 million
- **D3:** $14.3 million

The infrastructure improvements assessment concluded that Route C3 is the shortest and most direct, implementable, feasible, and cost-effective Project access alternative.

Social Impacts Assessment. The preliminary social impacts assessment (SIA) evaluated advantages and disadvantages for each proposed access route, including potential public safety, traffic, and nuisance concerns. Sources for the assessment include interviews previously conducted for the overall Project EIS, interviews with landowners and transportation specialists conducted for this TREFS, examination of traffic engineering reports and existing roadway characteristics, and review of route maps and social characteristics of nearby communities. Findings include:

- **A1, A2:** Second longest route; avoids residential areas; increased truck traffic could negatively impact Wailua Falls tourist traffic, which uses Ma'alo Road.
- **B1, B2:** Longest route; may result in impacts to the residential portion of the route; improved roadway and infrastructure improvements would benefit all users; currently the intersection with the least traffic-related issues of all the alternatives.

- **C3:** Shortest route; signalization of intersection could benefit the Hanamā‘ulu community for which it serves as a point of egress; potential impacts to the residential street the route runs behind.
- **D3:** Second shortest route; improved roadway would benefit all users; potential impacts to residents near the route.

The SIA is preliminary and thus did not reach a conclusion. Rather, the preliminary SIA is intended to initiate public feedback and a discussion of relevant issues that should be considered in choosing the proposed access route.

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ACRONYMS AND ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ACB	asphalt concrete base
ACP	asphalt concrete pavement
ADA	American Disabilities Act
DOH	Department of Health, State of Hawai‘i
DOT	Department of Transportation, State of Hawai‘i
DPW	Department of Public Works, County of Kaua‘i
EB	eastbound
EIS	environmental impact statement
FS	feasibility study
ft	feet or foot
gpd	gallons per day
HCM	Highway Capacity Manual
LOS	level of service
MG	million gallons
MSW	municipal solid waste
MSWLF	municipal solid waste landfill
MUTCD	Manual on Uniform Traffic Control Devices
NB	northbound
NPDES	National Pollutant Discharge Elimination System
ROW	right-of-way
RRP	resource recovery park
SB	southbound
SIA	social impacts assessment
SWD	Solid Waste Division, County of Kaua‘i Department of Public Works
TREFS	traffic and roadways engineering feasibility study
USACE	United States Army Corps of Engineers
WB	westbound

1.0 INTRODUCTION

The County of Kaua‘i (County) Department of Public Works (DPW) Solid Waste Division (SWD) is responsible for properly managing and disposing of municipal solid waste (MSW) on the island. The existing Kekaha Municipal Solid Waste Landfill (MSWLF) is projected to reach capacity in the coming years. Therefore, a new landfill facility will be required to achieve the overall project objective of providing for the safe and proper disposal of all forms of MSW that cannot practicably be further reused, recycled, or otherwise recovered.

Based on previous facility siting efforts spanning over 12 years and culminating in a Landfill Siting Study completed in 2012 (AECOM 2012), the County proposes to develop a new MSWLF and resource recovery park (RRP) north of Līhu‘e town, makai of Ma‘alo Road (the Project). Potential recycling and waste diversion facilities that may be implemented at the RRP were evaluated and presented to the public in the RRP Feasibility Study (FS) (AECOM 2013). In order to provide the County additional flexibility, two implementation options for the overall Project are being considered:

- MSWLF and RRP located on the same 264-acre parcel
- MSWLF located on the 264-acre parcel, and RRP located on an alternate 80-acre nearby parcel

An Environmental Impact Statement (EIS) is being prepared to evaluate the environmental impacts of and alternatives to the proposed Project. As a result of the initial public scoping and outreach conducted to date, the choice of access routes has emerged as an important consideration, due to potential impacts such as traffic, noise, and safety. Therefore, this Traffic and Roadways Engineering Feasibility Study (TREFS) conducts an analysis of several feasible access route alternatives to assist in the decision-making process and provide a rational basis for selecting the proposed Project access route. For each access route, the TREFS analyzes traffic impacts, required improvements and related costs, and social impacts, including safety and nuisance concerns. The proposed access route will be further analyzed in the overall project EIS.

Because the RRP may undergo phased implementation over time, for the purpose of this TREFS, two proposed Project scenarios are analyzed for each potential access route:

- MSWLF only
- MSWLF plus RRP

Figure 1 shows the proposed MSWLF site, the alternate RRP site (collectively, the “Project site”), and the potential access routes analyzed in this TREFS. Each potential route consists of a “road” designated with a letter and a “driveway” designated with a number, as shown in Figure 1. Generally, the “driveways” are former cane haul (“dirt”) roads, and several of the “roads” are paved public roadways. Based on initial feedback received, the County has identified six alternative access routes from Kūhiō Highway to the Project site:

- Route A1: via Ma‘alo Road and Driveway 1
- Route A2: via Ma‘alo Road and Driveway 2
- Route B1: via ‘Ehiku Street, Ma‘alo Road, and Driveway 1
- Route B2: via ‘Ehiku Street, Ma‘alo Road, and Driveway 2
- Route C3: via Laulima Street and Driveway 3
- Route D3: via Roberts Hawaii Driveway and Driveway 3

All these alternative access routes connect to Kūhiō Highway for regional access at one of the following four study intersections evaluated in this study:

- Ma'alo Road / Kūhiō Highway (stop-sign-controlled T-intersection) (Route A)
- 'Ehiku Street / Kūhiō Highway (signalized intersection) (Route B)
- Laulima Street / Kūhiō Highway (stop-sign-controlled four-legged intersection) (Route C)
- Roberts Hawaii Driveway / Kūhiō Highway (stop-sign-controlled T-intersection) (Route D)

The following intersection is evaluated as a fifth study intersection. Although this intersection does not connect to the proposed Project, it is assessed here because it is located near the Roberts Hawaii Driveway / Kūhiō Highway intersection, and queuing at this intersection may affect the operation of the potential Roberts Hawaii Drive access route:

- Kapule Highway / Kūhiō Highway (signalized intersection)

Upon completion of this TREFS and following solicitation of public feedback, the County will choose the proposed access route, which will become part of the proposed Project that will be analyzed in the EIS process.

1.1 ORGANIZATION OF THIS REPORT

- Section 1.0 describes the background and purpose of this study, and the overall organization of this report.
- Section 2.0 presents the traffic impacts assessment for the five study intersections under the various Project-access scenarios.
- Section 3.0 presents the infrastructure improvements assessment for the six alternative access routes.
- Section 4.0 presents the social impacts assessment for the six alternative access routes.
- Section 5.0 compares the six alternative access routes.
- Section 6.0 presents a list of references cited in this document.

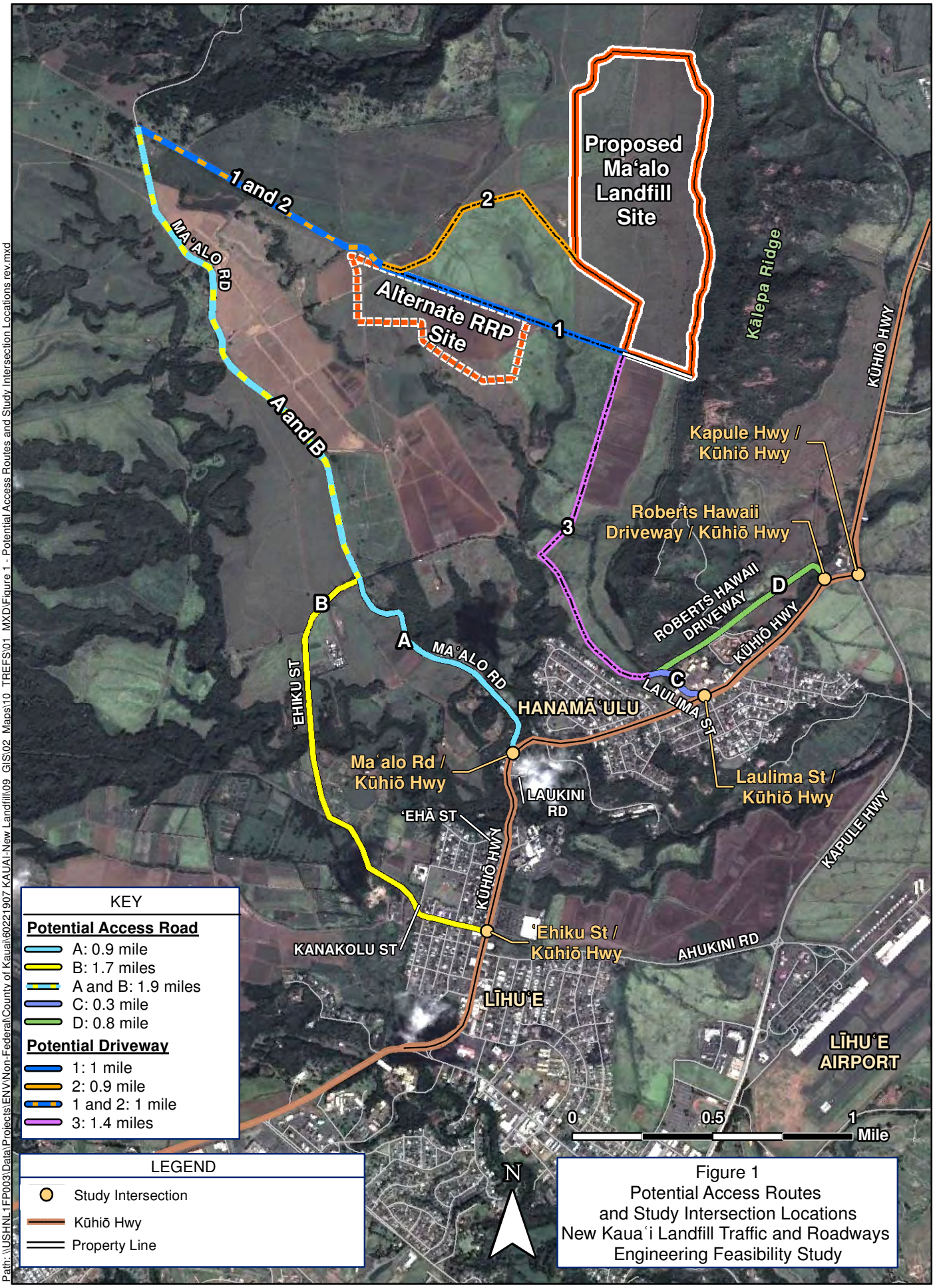


Figure 1
Potential Access Routes
and Study Intersection Locations
New Kaua'i Landfill Traffic and Roadways
Engineering Feasibility Study

Path: \\USHNL1FP003\Data\Projects\ENV\Non-Federal\County of Kauai\60221907 KAUAI-New Landfill\09_GIS\02_Maps\10_TREFS\01_MXD\Figure 1 - Potential Access Routes and Study Intersection Locations rev.mxd

2.0 TRAFFIC ASSESSMENT

The objective of this traffic assessment is to quantify the Project’s effects on traffic operations, identify potential mitigation actions, and assess the relative traffic-related impacts of each access alternative. The assessment evaluates traffic-related impacts of the Project at each of the five study intersections with Kūhiō Highway (‘Ehiku Street, Ma‘alo Road, Laulima Street, Roberts Hawaii Driveway, and Kapule Highway), assuming the implementation of each of the Project alternatives via one of the six proposed alternative access routes, for the following horizon years/scenarios:

- Existing Conditions (2013)
- Future Opening Year (assumed to be approximately 9 years from now) and Future Long-Range Year (20 years after opening) Conditions:
  - Baseline (i.e., without Project)
  - Baseline plus MSWLF
  - Baseline plus MSWLF plus RRP

The location of the Project site, the five study intersections, and the six alternative access routes are shown on Figure 1.

2.1 EXISTING CONDITIONS

Conditions at the four access routes for the current year (2013) are evaluated below.

2.1.1 Transportation Network

The following key roadways are located throughout the Project study area:

- Kūhiō Highway is a State Highway traversing the northern and eastern shores of Kaua‘i, extending from Ha‘ena State Park in the northwest to Rice Street (Līhu‘e) in the southeast, where it becomes Kaumuali‘i Highway. Within the study area, Kūhiō Highway runs with a southwest-northeast orientation, is designated State Highway 56, and provides between one and two travel lanes in each direction. North of ‘Ehā Street (Līhu‘e), sidewalks are generally not provided on either side of Kūhiō Highway within the Project study area. South of Ehā Street to Kaumuali‘i Highway, sidewalks are generally provided on both sides of the highway, with some intermittent gaps.
- Ma‘alo Road is a north-south-running State Highway extending from Kūhiō Highway in the south to Wailua River State Park in the north, where it terminates. Within the study area, Ma‘alo Road is a paved roadway that provides one travel lane in each direction, and is designated as State Route 583. The Project’s proposed Driveway 1 and Driveway 2 would be accessible from Ma‘alo Road approximately 1 mile north of its intersection at Kūhiō Highway. No sidewalks are provided along Ma‘alo Road.
- ‘Ehiku Street is generally a north-south-running roadway extending from Kūhiō Highway in the south (opposite Walmart) to Ma‘alo Road in the north. Within the study area, ‘Ehiku Street is paved and provides one travel lane in each direction. ‘Ehiku Street has no sidewalks.
- Laulima Street is a southeast-northwest-running roadway extending from Lawehana Street makai of Kūhiō Highway in the east to a privately owned cane haul road in the west. The cane haul road continues to Driveway 3 and onto Ma‘alo Road in the west, across from the intersection with ‘Ehiku Street. Within the study area, Laulima Street is mostly a gravel road that provides one travel lane in each direction. No sidewalks are provided along Laulima Street.

- Roberts Hawaii Driveway extends from the north side of Kūhiō Highway to Driveway 3. The Roberts Hawaii Driveway is mostly a gravel road, with a short paved section near its intersection with Kūhiō Highway, approximately 400 feet west of the intersection of Kapule Highway / Kūhiō Highway.
- Kapule Highway is a north-south-running highway extending from Rice Street in the south and merging into Kūhiō Highway in the north (i.e., is named Kūhiō Highway to the north of the intersection of Kapule Highway / Kūhiō Highway). The highway generally provides one traffic lane in each direction.

  A temporary traffic management plan is implemented each weekday morning at the intersection of Kapule Highway / Kūhiō Highway in order to increase the capacity of the predominant southbound traffic at this intersection. The traffic management plan implements a contra-flow traffic arrangement that extends the length of the southbound right-turn lane. This results in some southbound motorists on Kūhiō Highway who are desiring to continue southbound on Kapule Highway being 'funneled' into the right-turn lane and conducting a U-turn maneuver while travelling westbound on Kūhiō Highway at the intersection of Roberts Hawaii Driveway to travel back toward the intersection of Kapule Highway / Kūhiō Highway and turn right to travel southbound. Recent surveys recorded 119 U-turn maneuvers at this location during the AM peak hour.

The Kūhiō Highway intersections at 'Ehiku Street, Ma'alo Road, Laulima Street, and Roberts Hawaii Driveway do not have crosswalks across Kūhiō Highway. With the exception of 'Ehiku Street, the cross-streets also have no crosswalks.

2.1.2 Intersection Operating Conditions

This intersection analysis uses the 2000 *Highway Capacity Manual* (HCM) methodology (TRB 2000), which is based on Level of Service (LOS). The LOS methodology is a qualitative description of the performance of an intersection based on average delay per vehicle. For signalized intersections, the HCM methodology determines the capacity of each lane group approaching the intersection. The LOS is then determined based on the average delay (in seconds per vehicle) incurred for the various movements within the intersection. Adjustments are typically made to the capacity of each intersection to account for local conditions. A combined weighted average delay and LOS are then presented for the intersection. For unsignalized intersections (i.e., stop-controlled), LOS is based on the average delay experienced at the worst-operating stop-controlled approaches. LOS ranges from LOS A, which indicates free-flow or excellent conditions with short delays, to LOS F, which indicates congested or overloaded conditions with extremely long delays. An explanation of the LOS, including delay ranges, for signalized and unsignalized intersections is provided in Table 1.

Table 1: Criteria for Intersection Level of Service

Unsignalized Intersection			Signalized Intersection	
Description	**Average Total Vehicle Delay (Seconds)**	**LOS Grade**	**Average Control Vehicle Delay (Seconds)**	**Description**
No delay for stop-controlled approaches.	≤10.0	**A**	≤10.0	**Insignificant** delays: No approach phase is fully utilized, and no vehicle waits longer than one red indication.
Operations with minor delays.	>10.0 and ≤15.0	**B**	>10.0 and ≤20.0	**Minimal** delays: An occasional approach phase is fully utilized. Drivers begin to feel restricted.
Operations with moderate delays.	>15.0 and ≤25.0	**C**	>20.0 and ≤35.0	**Acceptable** delays: Major approach phase may become fully utilized. Most drivers feel somewhat restricted.
Operations with some delays.	>25.0 and ≤35.0	**D**	>35.0 and ≤55.0	**Tolerable** delays: Drivers may wait through more than one red indication. Queues may develop but dissipate rapidly, without excessive delays.
Operations with high delays and long queues.	>35.0 and ≤50.0	**E**	>55.0 and ≤80.0	**Significant** delays: Volumes approaching capacity. Vehicles may wait through several signal cycles, and long vehicle queues form upstream.
Operation with extreme congestion, with very high delays and long queues unacceptable to most drivers.	>50.0	**F**	>80.0	**Excessive** delays: Represents conditions at capacity, with extremely long delays. Queues may block upstream intersections.

Source: Transportation Research Board, *Highway Capacity Manual* (2000).

Major input data contributing to the calculation of LOS include traffic volumes, existing lane configurations, traffic control types, signal operation, and traffic speeds.

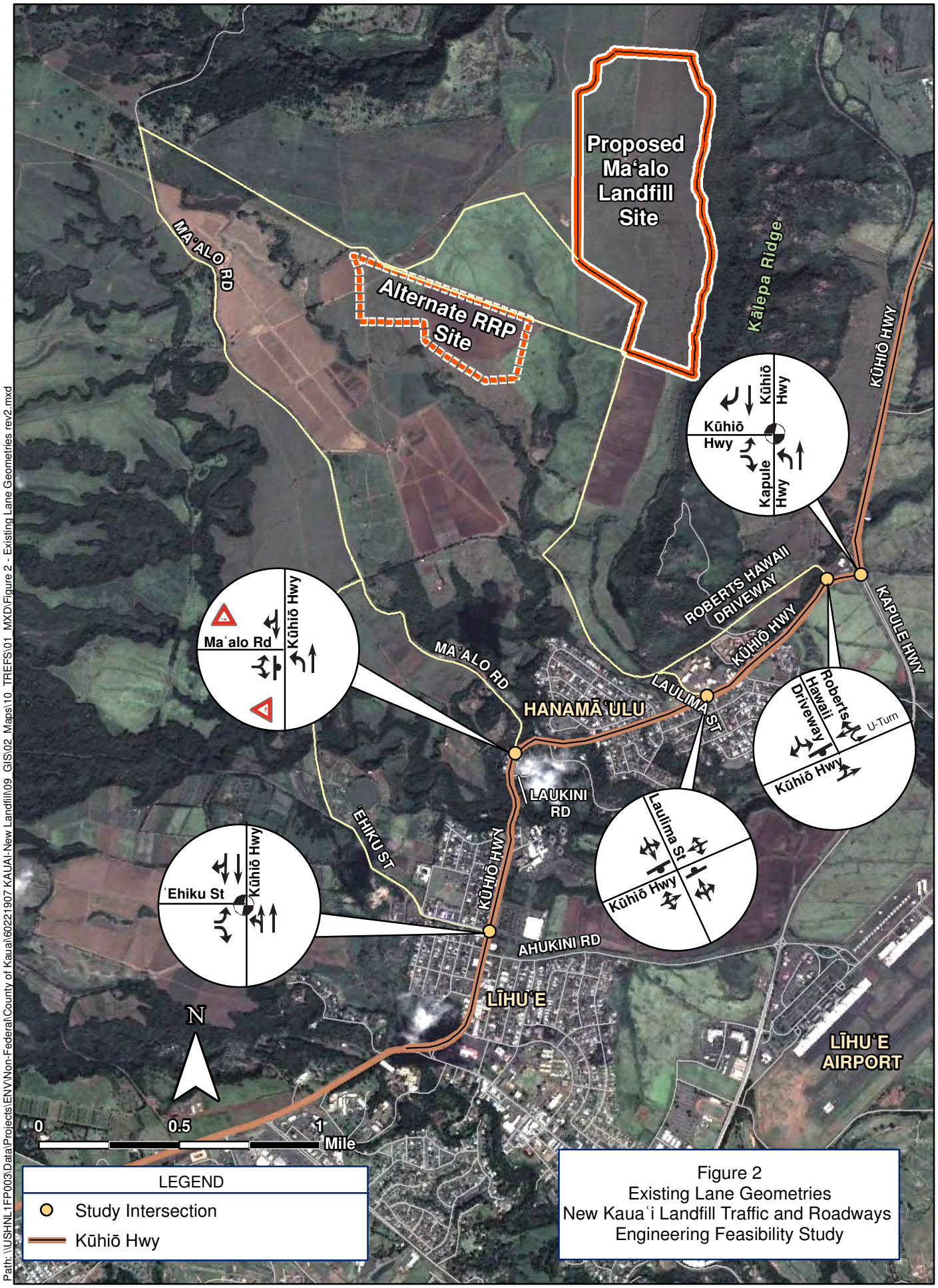
Intersection turning movement counts were collected at the five study intersections on Tuesday July 16, Wednesday July 17, Tuesday October 29, and Wednesday October 30, 2013, during the AM and PM commuter peak periods. From these data, the commuter peak hours were determined, which are defined as the highest-volume 1-hour (four consecutive 15-minute intervals) periods between the hours of 7:00–9:00 AM and 4:00–6:00 PM, respectively. Field observations were taken during these periods to collect existing lane configurations, traffic control types, signal operations, and traffic speeds. These collected traffic data and roadway and intersection attributes were then input into the Synchro 8.0 software package, which is used to calculate the LOS using the 2000 HCM methodology (TRB 2000). Attachment A summarizes the data input to and output from Synchro. The existing lane geometries of the study intersections are shown on Figure 2**,** and existing peak-hour traffic volumes for AM and PM peak hours are shown on Figure 3. Existing LOS at each study intersection for both peak hours are summarized in Table 2 and discussed below:

Table 2: Level of Service – Existing Conditions

Kūhiō Highway Intersection [a]	Traffic Control	AM Peak Hour		PM Peak Hour	
		LOS	Delay	LOS	Delay
Ma‘alo Road	Stop Sign [b]	C	21.9 (EB)	D	31.7 (EB)
‘Ehiku Street	Traffic Signal	A	4.1	A	3.7
Laulima Street	Stop Sign [c]	E	38.5 (WB)	**F**	**63.8 (WB)**
Roberts Hawaii Driveway	Stop Sign [d]	D	27.2 (SB)	C	19.6 (SB)
Kapule Highway	Traffic Signal	C	20.6	D	35.2

Source: AECOM (2013).
Note: **Shaded bold** cell indicates LOS F (congested or overloaded conditions with extremely long delays).
[a] Kūhiō Highway approaches are defined as Northbound (NB) and Southbound (SB) approaches at intersections # 1–3, and as Eastbound (EB) and Westbound (WB) approaches at intersections # 4–5.
[b] The worst stop-controlled approach at this intersection is the eastbound (EB) approach.
[c] The worst stop-controlled approach at this intersection is the westbound (WB) Laulima Street approach.
[d] The worst stop-controlled approach at this intersection is the southbound (SB) Roberts Highway Driveway approach.

- **Ma‘alo Road / Kūhiō Highway intersection:** The eastbound stop-controlled approach to the Ma‘alo Road / Kūhiō Highway intersection currently operates at LOS C during the weekday AM peak hour, and LOS D during the weekday PM peak hour.
- ‘**Ehiku Street / Kūhiō Highway intersection:** The signalized ‘Ehiku Street / Kūhiō Highway intersection currently operates at LOS A during both peak hours based on the traffic volumes processed through the intersection. Field observations identified vehicle queuing in the Līhu‘e-bound direction during the AM peak hour that started from Ahukini Road and extended almost to the ‘Ehiku Street intersection.
- **Laulima Street/ Kūhiō Highway intersection:** The westbound stop-controlled approach to the Laulima Street / Kūhiō Highway intersection currently operates at LOS E during the weekday AM peak hour, and LOS F during the weekday PM peak hour. However, the traffic volume at this approach is insufficient to require signalization.
- **Roberts Hawaii Driveway / Kūhiō Highway intersection:** The southbound stop-controlled approach to the Roberts Hawaii Driveway / Kūhiō Highway intersection currently operates at LOS D during the weekday AM peak hour and LOS C during the weekday PM peak hour.
- **Kapule Highway / Kūhiō Highway intersection:** The signalized Kapule Highway / Kūhiō Highway intersection currently operates at LOS C during the weekday AM peak hour and LOS D during the weekday PM peak hour.


Proposed Ma'alo Landfill Site
Alternate RRP Site
MA'ALO RD
Kālepa Ridge
KŪHIŌ HWY
KAPULE HWY
ROBERTS HAWAII DRIVEWAY
HANAMĀ'ULU
LAULIMA ST
LAUKINI RD
'EHIKU ST
AHUKINI RD
LĪHU'E
LĪHU'E AIRPORT
Kūhiō Hwy
Kapule Hwy
Ma'alo Rd
'Ehiku St
Laulima St
Roberts Hawaii Driveway
U-Turn
N
0
0.5
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Mile
LEGEND
Study Intersection
Kūhiō Hwy
Figure 2
Existing Lane Geometries
New Kaua'i Landfill Traffic and Roadways
Engineering Feasibility Study
Path: \\USHNL1FP003\Data\Projects\ENV\Non-Federal\County of Kauai\60221907 KAUAI-New Landfill\09_GIS\02_Maps\10_TREFS\01_MXD\Figure 2 - Existing Lane Geometries rev2.mxd

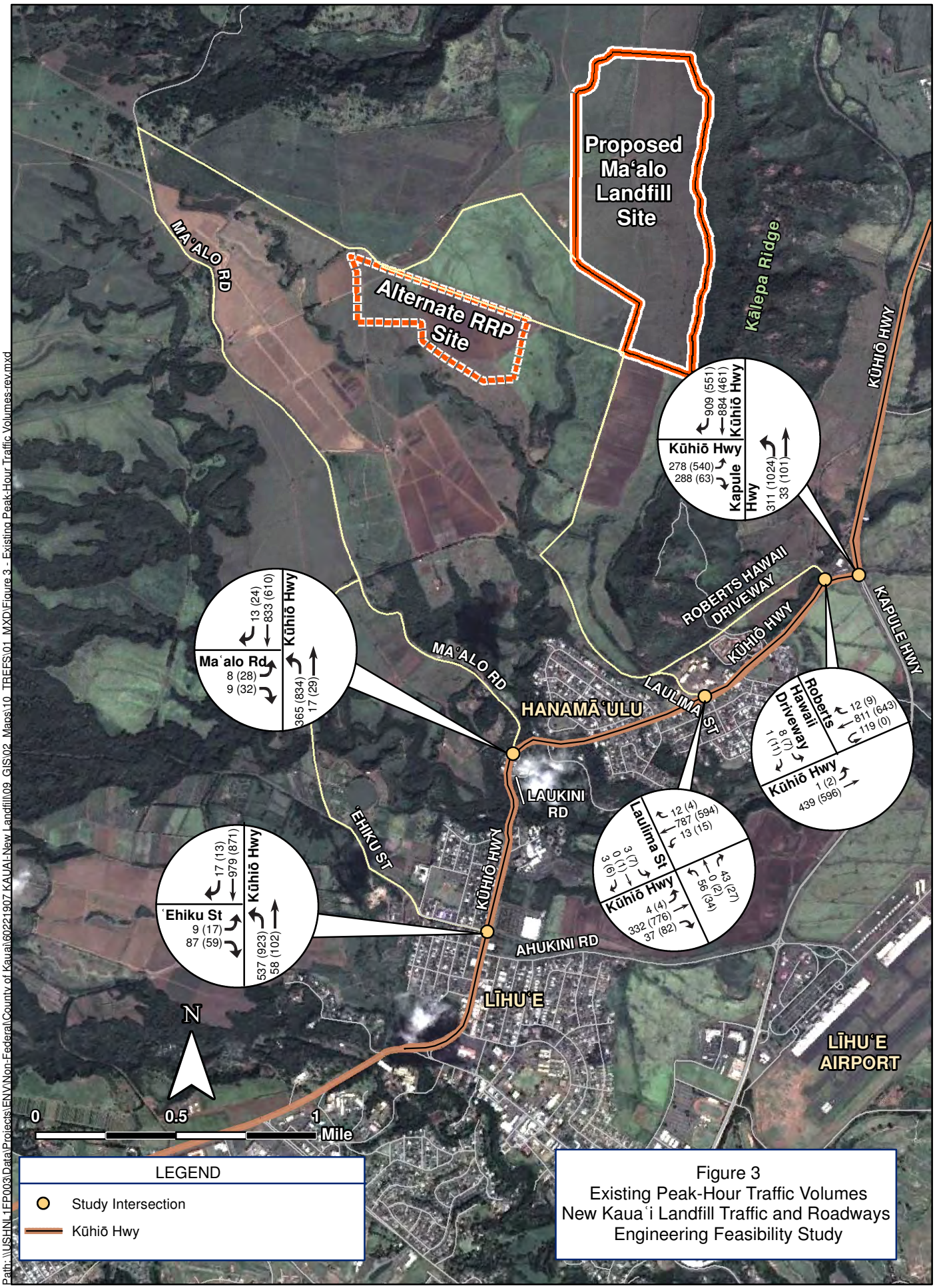


Figure 3
Existing Peak-Hour Traffic Volumes
New Kaua'i Landfill Traffic and Roadways
Engineering Feasibility Study

2.2 FUTURE CONDITIONS

Future conditions are projected for baseline traffic volumes without the Project and for traffic volumes with the Project operating. Two future project scenarios are analyzed: operation of the MSWLF only; and operation of both the MSWLF and the RRP. Conditions are projected for the year that operations would commence at the proposed Project (Future Opening Year) and for 20 years after operations would commence (Future Long-Range Year).

2.2.1 Future Baseline Conditions

Baseline (background) traffic volumes were assumed to increase by 1 percent per year (compounded) from the Existing Conditions traffic volumes presented in Section 2.1. This growth rate is based on the population growth of Kaua'i for the 2010–2012 period, as reported in the *2012 State of Hawaii Data Book*, Table 1.07 (DBEDT 2012), which is consistent with the analysis performed for the RRP FS. Summaries of the assumed Future Opening Year and Future Long-Range Year baseline traffic volumes are illustrated on Figure 4 and Figure 5, respectively, for the AM and PM peak periods.

2.2.2 Future Conditions with Project Implemented

Projected trip generation conditions estimate the vehicular traffic expected to be generated by the proposed Project (MSWLF and RRP). The County provided landfill trip generation data based on the Kekaha MSWLF, and traffic projections presented in the RRP FS (AECOM 2013) provided RRP trip generation estimates. These were used to project weekday AM peak, PM peak, and daily vehicle-trip totals to and from the Project site for both the Future Opening Year Conditions and Future Long-Range Year Conditions scenarios.

The traffic predictions in this study are conservative because they do not account for the fact that vehicles currently use these intersections on their way to the Kekaha MSWLF.

The RRP trip generation estimates for ultimate operations were used for both the Opening Year and Future Year projections, making the RRP projections for the Opening Year conservatively high. Additionally, some RRP-generated vehicle trips would travel to the MSWLF; for this study, these trips were treated as external trips, again resulting in conservatively large estimates of trip generation for both scenarios. Table 3 summarizes the projected trip generation from the proposed MSWLF and RRP.

Table 3: Projected Trip Generation Conditions for the Project for Future Opening and Future Long-Range Years

	Future Opening Year					Future Long-Range Year				
		AM Peak Hour		PM Peak Hour			AM Peak Hour		PM Peak Hour	
Project Component	Daily	In-bound	Out-bound	In-bound	Out-bound	Daily	In-bound	Out-bound	In-bound	Out-bound
MSWLF	220	15	15	12	15	270	19	18	15	18
RRP	517	130	26	22	130	517	130	26	22	130
Total	737	145	41	34	145	787	149	44	37	148

Sources:
MSWLF data based on County of Kaua'i Department of Public Works, Solid Waste Division data from the Kekaha Landfill (2012–2013).
RRP data based on the RRP FS (AECOM 2013).

The expected distribution pattern of Project trips is based primarily on the general population distribution of the Island of Kaua'i as documented in the *2012 State of Hawaii Data Book*, Table 1.17

(DBEDT 2012). Also considered were the anticipated origins and destinations of trucks. Based on this information, the distribution of trips generated by the Project would be as follows:

- To and from the south (via Kūhiō Highway): 55%
- To and from the north (via Kūhiō Highway): 45%

These percentages were applied to the trip generation to develop projected turning movements for MSWLF- and RRP-generated traffic at the evaluated intersections.

The projected Project-related vehicle trips were then added onto the Future Opening Year and Future Long-Range Year baseline traffic volumes to result in traffic volumes for the conditions "Baseline," "Baseline Plus MSWLF," and "Baseline plus MSWLF plus RRP."

Evaluating each traffic volume scenario using the Synchro 8.0 software allows for the calculation of LOS using the 2000 HCM methodology (TRB 2000). Attachment A summarizes the data input to and output from Synchro. The LOS results at each study intersection during both peak hours for each analysis scenario are summarized in Table 4.

Projected operating conditions at each study intersection for the Future Opening Year and Future Long-Range Year Conditions, under each analysis scenario, are summarized in Table 5**.**

2.2.3 Traffic Assessment Summary and Conclusion

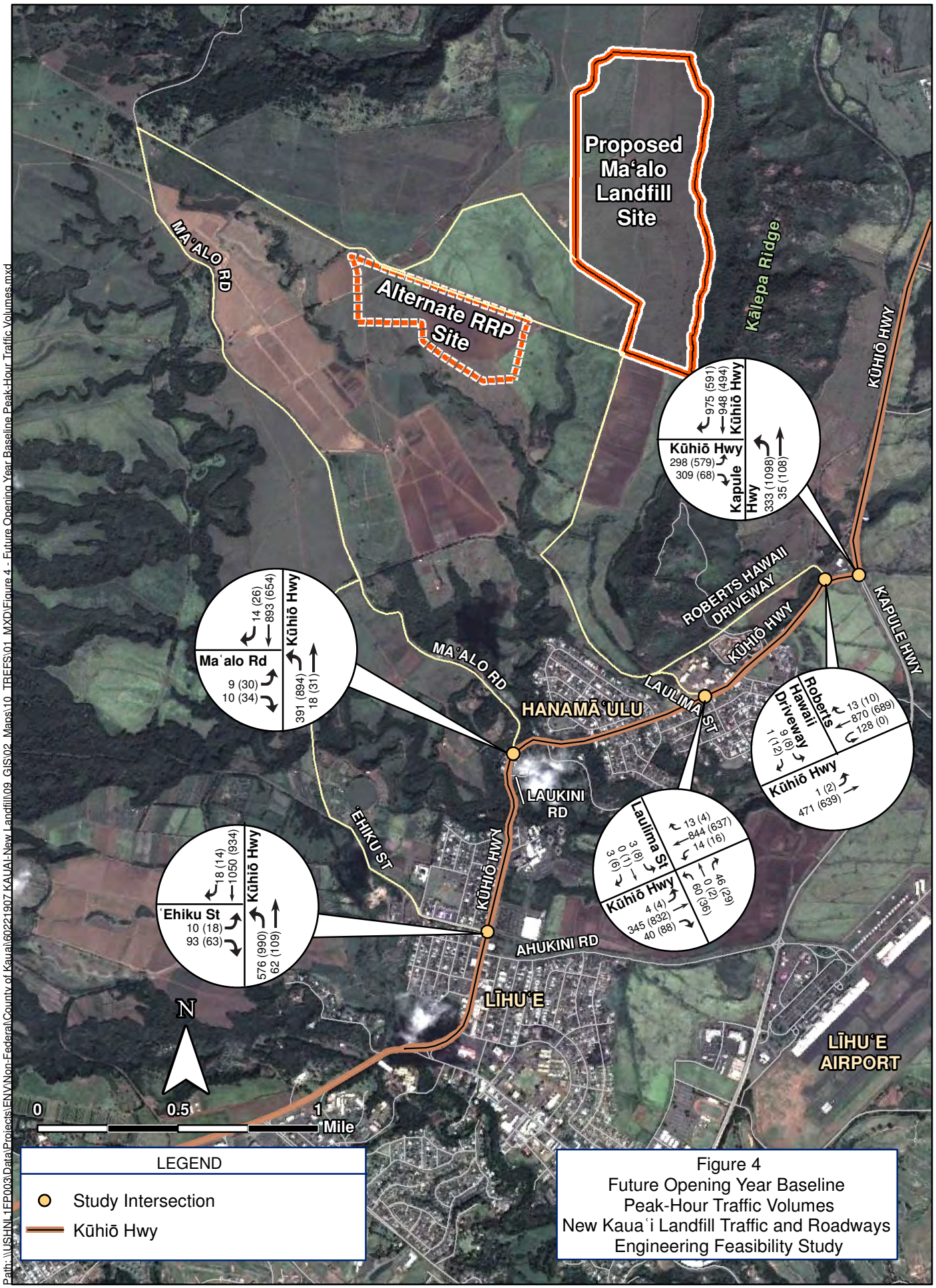
All access scenarios analyzed present traffic issues that would require addressing via physical and operational improvements at their respective Kūhiō Highway intersection. Table 6 compares recommended improvements and identified issues for four Kūhiō Highway intersections, and Table 7 summarizes recommended signalization improvements for the five intersections under the various access route scenarios. Where signalization of the intersection is recommended or projected to be required, Table 7 includes a summary of the projected LOS and delay for the worst approach during the critical PM peak hour. The summaries below conservatively assume construction of both the MSWLF and the RRP:

- The Ma'alo Road access alternative would require significant intersection modifications, likely including significantly expensive improvements, as further detailed in Section 3.0.
- The 'Ehiku Street access alternative would result in minor impacts to intersection operations. Observed large-vehicle maneuvers at the intersection would require modifications of the curb return radii for the 'Ehiku Street leg. Other intersection improvements would be required to address concerns detailed in Section 3.0. Operational improvements would be minimal, although traffic queuing from the adjacent Ahukini Road / Kūhiō Highway intersection during the AM peak period could negatively impact operations at this intersection in the future. The 'Ehiku Street access could produce significant traffic impacts to the residential area it now serves and has the potential for safety and nuisance impacts along the residential segment between Kūhiō Highway and Kanakolu Street, as described in Section 4.0.
- The Laulima Street / Kūhiō Highway traffic issues would be mitigated by intersection modifications and traffic signalization. Signalizing this intersection would also have the benefit of improving traffic conditions for existing traffic accessing Kūhiō Highway from Laulima Street. These vehicles currently experience delays entering Kūhiō Highway during peak periods, and signalization would make it easier for these vehicles to enter the traffic flow on Kūhiō Highway. This access route also yields the shortest path to the proposed Project location, by a significant margin. Under all access scenarios, this intersection will require signalization in the long-term future.

- The Roberts Hawaii Driveway access alternative is a variation of the Laulima Street alternative that locates the access interface with Kūhiō Highway further away from Hanamā‘ulu town. It would require the signalization of the Roberts Hawaii Driveway / Kūhiō Highway intersection, as well as coordination and optimization of the signals at the two intersections. This alternative will need to accommodate vehicle queuing from the Kapule Highway / Kūhiō Highway during the PM peak hour. This access route yields the second-shortest path to the proposed Project location, significantly shorter than either the Ma‘alo or ‘Ehiku access options.

Conclusion. Although intersection operation is not the only factor in evaluating the alternative access routes, the traffic assessment indicates that the Laulima Street / Kūhiō Highway access alternative is the most implementable, feasible, and cost-effective alternative access route. Construction of a traffic signal at this intersection would have the added benefit of improving service for the residential subdivision located makai of Kūhiō Highway. The Roberts Hawaii Driveway alternative could also be a viable alternative to the Laulima access route if Kapule Highway / Kūhiō Highway vehicle-queuing issues can be addressed to the satisfaction of the State of Hawai‘i Department of Transportation (DOT).

The ‘Ehiku Street access alternative is predicted to have the least-negative traffic impacts and may also provide a cost effective alternative for access. However, this alternative has potential impacts to the adjacent residential area that should be addressed.


Proposed Ma'alo Landfill Site
Alternate RRP Site
MA'ALO RD
Kālepa Ridge
KŪHIŌ HWY
KAPULE HWY
ROBERTS HAWAII DRIVEWAY
HANAMĀ'ULU
LAULIMA ST
LAUKINI RD
'EHIKU ST
AHUKINI RD
LĪHU'E
LĪHU'E AIRPORT
975 (591)
948 (494)
Kūhiō Hwy
298 (579)
309 (68)
Kapule Hwy
333 (1098)
35 (108)
14 (26)
893 (654)
Ma'alo Rd
9 (30)
10 (34)
391 (894)
18 (31)
13 (10)
870 (689)
128 (0)
Roberts Hawaii Driveway
9 (8)
1 (12)
1 (2)
471 (639)
13 (4)
844 (637)
14 (16)
Laulima St
3 (8)
0 (1)
3 (6)
4 (4)
345 (832)
40 (88)
46 (29)
0 (2)
60 (36)
18 (14)
1050 (934)
'Ehiku St
10 (18)
93 (63)
576 (990)
62 (109)
N
0
0.5
1
Mile
LEGEND
Study Intersection
Kūhiō Hwy
Figure 4
Future Opening Year Baseline
Peak-Hour Traffic Volumes
New Kaua'i Landfill Traffic and Roadways
Engineering Feasibility Study
Path: \\USHN1FP003\Data\Projects\ENV\Non-Federal\County of Kauai\60221907 KAUAI-New Landfill\09_GIS\02_Maps\10_TREES\01_MXD\Figure 4 - Future Opening Year Baseline Peak-Hour Traffic Volumes.mxd

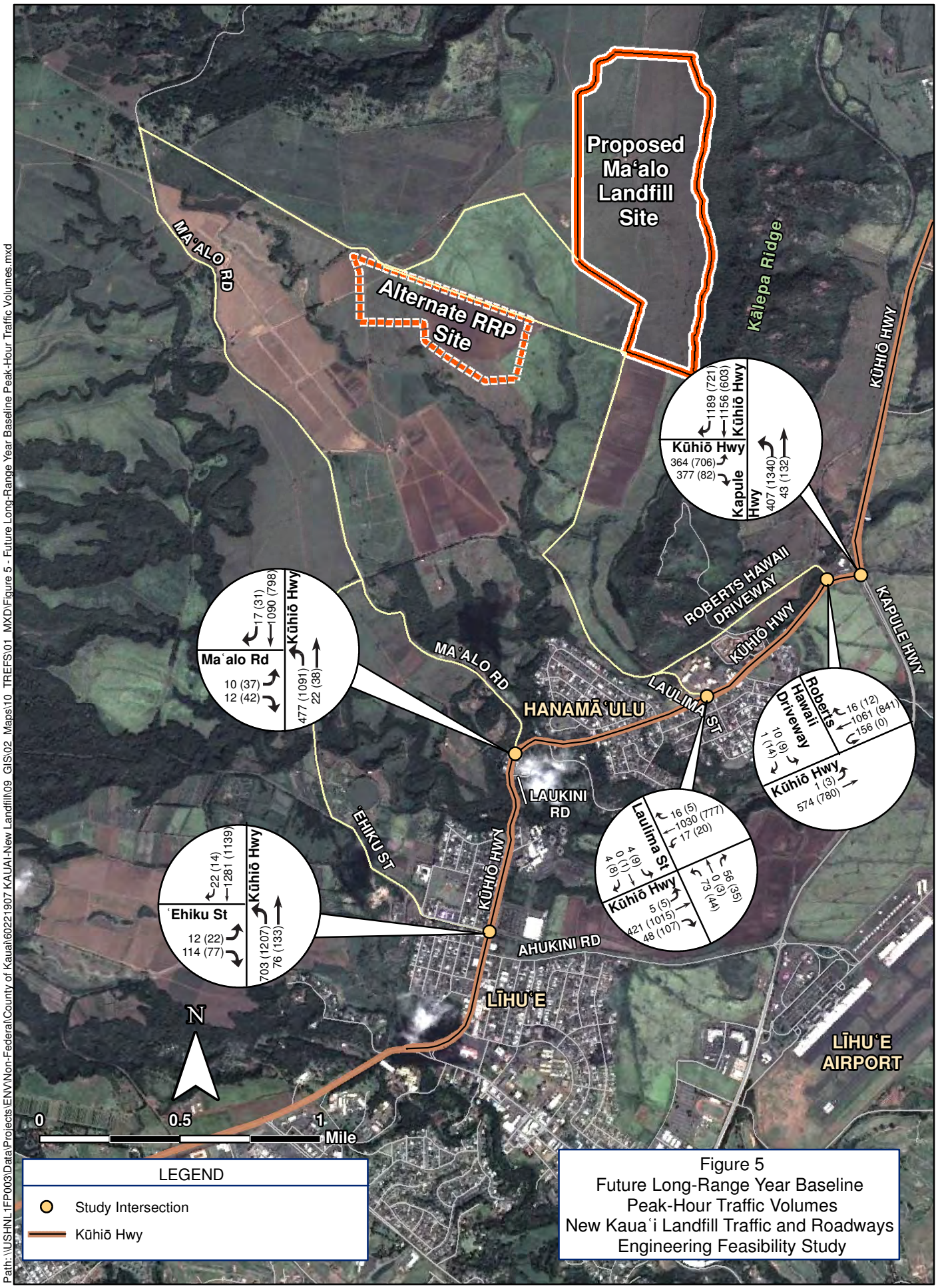


Figure 5
Future Long-Range Year Baseline
Peak-Hour Traffic Volumes
New Kaua'i Landfill Traffic and Roadways
Engineering Feasibility Study

Path: \\USHNL1FP003\Data\Projects\ENV\Non-Federal\County of Kauai\60221907 KAUAI-New Landfill\09_GIS\02_Maps\10_TREFS\01_MXD\Figure 5 - Future Long-Range Year Baseline Peak-Hour Traffic Volumes.mxd

Table 4: Projected Level of Service Conditions during AM and PM Peak Hours at Five Study Intersections for Project-Access Scenarios in Future Opening and Future Long-Range Years

Scenario	Kūhiō Highway Intersection [a]	Existing Traffic Control	Future Opening Year								Future Long-Range Year							
			Ma'alo Road Scenarios (A1, A2)		'Ehiku Street Scenarios (B1, B2)		Laulima Street Scenario (C3)		Roberts Hawaii Driveway Scenario (D3)		Ma'alo Road Scenarios (A1, A2)		'Ehiku Street Scenarios (B1, B2)		Laulima Street Scenario (C3)		Roberts Hawaii Driveway Scenario (D3)	
			LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
AM Peak Hour																		
Baseline	Ma'alo Road	One-way stop [b]	C	24.4 (EB)	C	24.4 (EB)	C	24.4 (EB)	C	24.4 (EB)	D	35.0 (EB)	D	35.0 (EB)	D	35.0 (EB)	D	35.0 (EB)
	'Ehiku Street	Signalized	A	4.2	A	4.2	A	4.2	A	4.2	A	5.5	A	5.5	A	5.5	A	5.5
	Laulima Street	Two-way stop [c]	**F**	**50.3 (WB)**	**F**	**50.3 (WB)**	**F**	**50.3 (WB)**	**F**	**50.3 (WB)**	**F**	**206.3 (WB)**	**F**	**206.3 (WB)**	**F**	**206.3 (WB)**	**F**	**206.3 (WB)**
	Roberts Hawaii Driveway	One-way stop [d]	D	31.1 (SB)	D	31.1 (SB)	D	31.1 (SB)	D	31.1 (SB)	E	48.6 (SB)	E	48.6 (SB)	E	48.6 (SB)	E	48.6 (SB)
	Kapule Hwy	Signalized	C	23.7	C	23.7	C	23.7	C	23.7	E	57.7	E	57.7	E	57.7	E	57.7
Baseline plus MSWLF	Ma'alo Road	One-way stop [b]	D	25.6 (EB)	C	24.8 (EB)	C	24.8 (EB)	C	24.8 (EB)	E	40.8 (EB)	E	35.8 (EB)	E	36.0 (EB)	E	36.0 (EB)
	'Ehiku Street	Signalized	A	4.2	A	4.7	A	4.2	A	4.2	A	5.5	A	6.0	A	5.5	A	5.5
	Laulima Street	Two-way stop [c]	**F**	**52.6 (WB)**	**F**	**52.6 (WB)**	**F**	**58.9 (WB)**	**F**	**53.0 (WB)**	**F**	**219.8 (WB)**	**F**	**219.8 (WB)**	**F**	**267.9 (WB)**	**F**	**223.4 (WB)**
	Roberts Hawaii Driveway	One-way stop [d]	D	31.6 (SB)	D	31.6 (SB)	D	31.6 (SB)	D	29.7 (SB)	E	49.9 (SB)	E	49.9 (SB)	E	49.9 (SB)	**F**	**51.1 (SB)**
	Kapule Hwy	Signalized	C	24.1	C	24.1	C	24.1	C	24.1	E	59.4	E	59.4	E	59.4	E	59.4
Baseline plus MSWLF plus RRP	Ma'alo Road	One-way stop [b]	E	38.4 (EB)	D	27.0 (EB)	D	27.0 (EB)	D	27.0 (EB)	**F**	**77.0 (EB)**	E	39.6 (EB)	E	39.8 (EB)	E	39.8 (EB)
	'Ehiku Street	Signalized	A	4.1	A	5.6	A	4.1	A	4.1	A	5.6	A	7.3	A	5.6	A	5.6
	Laulima Street	Two-way stop [c]	**F**	**66.2 (WB)**	**F**	**66.2 (WB)**	**F**	**161.0 (WB)**	**F**	**71.9 (WB)**	**F**	**286.6 (WB)**	**F**	**286.6 (WB)**	**F**	**655.8 (WB)**	**F**	**310.1 (WB)**
	Roberts Hawaii Driveway	One-way stop [d]	D	34.9 (SB)	D	34.9 (SB)	D	34.9 (SB)	E	48.9 (SB)	**F**	**55.8 (SB)**	**F**	**55.8 (SB)**	**F**	**55.8 (SB)**	**F**	**117.2 (SB)**
	Kapule Hwy	Signalized	C	25.5	C	25.5	C	25.5	C	25.5	E	66.4	E	66.4	E	66.4	E	66.4
PM Peak Hour																		
Baseline	Ma'alo Road	One-way stop [b]	E	39.1 (EB)	E	39.1 (EB)	E	39.1 (EB)	E	39.1 (EB)	**F**	**126.8 (EB)**	**F**	**126.8 (EB)**	**F**	**126.8 (EB)**	**F**	**126.8 (EB)**
	'Ehiku Street	Signalized	A	3.9	A	3.9	A	3.9	A	3.9	A	5.4	A	5.4	A	5.4	A	5.4
	Laulima Street	Two-way stop [c]	**F**	**92.6 (WB)**	**F**	**92.6 (WB)**	**F**	**92.6 (WB)**	**F**	**92.6 (WB)**	**F**	**422.1 (WB)**	**F**	**422.1 (WB)**	**F**	**422.1 (WB)**	**F**	**422.1 (WB)**
	Roberts Hawaii Driveway	One-way stop [d]	C	21.9 (SB)	C	21.9 (SB)	C	21.9 (SB)	C	21.9 (SB)	D	31.3 (SB)	D	31.3 (SB)	D	31.3 (SB)	D	31.3 (SB)
	Kapule Hwy	Signalized	D	42.3	D	42.3	D	42.3	D	42.3	E	67.5	E	67.5	E	67.5	E	67.5
Baseline plus MSWLF	Ma'alo Road	One-way stop [b]	E	44.6 (EB)	E	40.0 (EB)	E	40.2 (EB)	E	40.2 (EB)	**F**	**209.6 (EB)**	**F**	**133.6 (EB)**	**F**	**135.0 (EB)**	**F**	**135.0 (EB)**
	'Ehiku Street	Signalized	A	3.9	A	4.3	A	3.9	A	3.9	A	5.4	A	6.1	A	5.4	A	5.4
	Laulima Street	Two-way stop [c]	**F**	**96.4 (WB)**	**F**	**96.4 (WB)**	**F**	**105.4 (WB)**	**F**	**97.3 (WB)**	**F**	**442.0 (WB)**	**F**	**442.0 (WB)**	**F**	**487.3 (WB)**	**F**	**445.9 (WB)**
	Roberts Hawaii Driveway	One-way stop [d]	C	22.2 (SB)	C	22.2 (SB)	C	22.2 (SB)	C	24.0 (SB)	D	31.9 (SB)	D	31.9 (SB)	D	31.9 (SB)	E	38.2 (SB)
	Kapule Hwy	Signalized	D	43.9	D	43.9	D	43.9	D	43.9	E	69.8	E	69.8	E	69.8	E	69.8
Baseline plus MSWLF plus RRP	Ma'alo Road	One-way stop [b]	**F**	**380.6 (EB)**	E	45.3 (EB)	E	47.7 (EB)	E	47.7 (EB)	**F**	**941.7 (EB)**	**F**	**177.8 (EB)**	**F**	**191.8 (EB)**	**F**	**191.8 (EB)**
	'Ehiku Street	Signalized	A	4.0	A	7.7	A	4.0	A	4.0	A	5.8	B	11.5	A	5.8	A	5.8
	Laulima Street	Two-way stop [c]	**F**	**122.5 (WB)**	**F**	**122.5 (WB)**	**F**	**415.2 (EB)**	**F**	**128.0 (WB)**	**F**	**544.9 (WB)**	**F**	**544.9 (WB)**	**F**	**916.9 (WB)**	**F**	**567.0 (WB)**
	Roberts Hawaii Driveway	One-way stop [d]	C	23.7 (SB)	C	23.7 (SB)	C	23.7 (SB)	**F**	**77.5 (SB)**	D	34.5 (SB)	D	34.5 (SB)	D	34.5 (SB)	**F**	**251.6 (SB)**
	Kapule Hwy	Signalized	E	57.9	E	57.9	E	57.9	E	57.9	**F**	**85.1**	**F**	**85.1**	**F**	**85.1**	**F**	**85.1**

Note: **Shaded bold** cell indicates LOS F (congested or overloaded conditions with extremely long delays).
[a] Kūhiō Highway approaches are defined as Northbound (NB) and Southbound (SB) approaches.
[b] The worst stop-controlled approach at this intersection is the eastbound (EB) approach.
[c] The worst stop-controlled approach at this intersection is the westbound (WB) approach.

Table 5: Projected Operating Conditions at Four Study Intersections for Project-Access Scenarios in Future Opening and Future Long-Range Years

Kūhiō Hwy Intersection:		**Ma'alo Road**	**'Ehiku Street**	**Laulima Street**	**Roberts Hawaii Driveway**
Current Traffic Control:		*One-Way Stop*	*Signalized*	*Two-Way Stop*	*One-Way Stop*
Critical Approach:		*Eastbound*	*(not applicable)*	*Westbound*	*Southbound*
Future Opening Year Conditions					
Baseline		Would operate at LOS E during PM peak hour (with average vehicle delay of approximately 39 seconds) for the projected 64 vehicles per hour approaching the intersection.	Would operate at LOS A during AM and PM peak hours (with average vehicle delay of approximately 4–5 seconds).	Would operate at LOS F during the AM and PM peak hours (with average vehicle delay of approximately 50 and 93 seconds respectively) for the projected 106 and 67 vehicles per hour using the westbound approach in the AM and PM peak hour respectively. This westbound approach is the opposite side of the intersection from the Project site, and would not receive increased traffic volumes as a result of implementation of the Project.	Would operate at LOS D during the AM peak hour and LOS C during the PM peak hour.
Baseline plus MSWLF	Project Vehicles NOT Using Intersection	Would experience negligible change in LOS (LOS E).	Would continue to operate at LOS A during AM and PM peak hours regardless of which access option is implemented.	Would experience minor change in LOS (LOS F during AM, PM peak).	Would experience minor change in LOS (LOS D during AM peak, LOS C during PM peak).
	Project Vehicles Using Intersection	Would increase average vehicle delay marginally to 45 seconds during PM peak (LOS E), based on a projected 15 additional (79 total) vehicles per hour approaching the intersection.		Would increase average vehicle delay modestly to approximately 59 seconds during the AM peak hour (LOS F) and 105 seconds during the PM peak hour (LOS F).	
Baseline plus MSWLF plus RRP	Project Vehicles NOT Using Intersection	Would experience a marginal change in LOS (LOS F during PM peak).	Would continue to operate at LOS A during AM and PM peak hours regardless of which access option is implemented.	Would experience reasonable change in LOS (LOS F), with average vehicle delay from the westbound Laulima Street approach increasing to 66 seconds during the AM peak hour and 123 seconds during PM peak hour.	Would experience minor change in LOS (LOS D during AM peak, LOS C during PM peak).
	Project Vehicles Using Intersection	Would increase average vehicle delay significantly to more than 6 minutes during the PM peak (LOS F), based on a projected 145 additional (209 total) vehicles per hour approaching the intersection. Would meet MUTCD warrants for signalization.		Would increase average vehicle delay significantly to approximately 161 seconds during the AM peak hour and almost 7 minutes during the PM peak hour. Would meet MUTCD warrants for signalization.	Would operate at LOS E during the AM peak hour and LOS F (78 seconds average delay) during the PM peak hour. Would meet MUTCD warrants for signalization.
Overall Summary of Future Opening Year Conditions		Under Baseline conditions, would operate at LOS E during PM peak hour, with average vehicle delay of approximately 39 seconds. If the Project is not implemented, then MUTCD warrants for signalization would not be met by the Future Opening Year. If the full MSWLF plus RRP option is implemented and Ma'alo Road is selected as the proposed access route, then signalizing this intersection prior to opening the Project is recommended. If only the MSWLF component of the Project is implemented, then signalization is not required.	Would operate at LOS A during the Future Opening Year under all analysis scenarios, and under all access alternatives based on projected volumes. As noted in the discussion on existing conditions, future conditions at this intersection may be affected by vehicle queuing in the Līhu'e-bound direction starting at Ahukini Road.	Under Baseline conditions, would operate at LOS F with average vehicle delay of approximately 93 seconds during PM peak hour. With the addition of MSWLF and RRP traffic, MUTCD warrants for signalization would be met. If the full MSWLF plus RRP option is implemented, then average vehicle delay increases to 7 minutes during PM peak hour. Consequently, if the full MSWLF plus RRP site is implemented and Laulima St is selected as the proposed access route, then signalizing the intersection is recommended prior to opening the Project. If only the MSWLF component of the Project is implemented, then average vehicle delay would be approximately 105 seconds during PM peak hour and MUTCD signal warrants would not be met.	Under Baseline conditions, would operate at LOS D during the AM peak hour and LOS C during the PM peak hour. With the addition of MSWLF and RRP traffic, MUTCD warrants for signalization would be met. If the full MSWLF plus RRP option is implemented, then average vehicle delay increases to 78 seconds (LOS F) during the PM peak hour. Consequently, if the full MSWLF plus RRP site is implemented and Roberts Hawaii Driveway is selected as the proposed access route, then signalizing the intersection may be considered prior to opening the project. If only the MSWLF component of the Project is implemented, then average vehicle delay would be LOS D during the AM peak hour and LOS C during the PM peak hour.

Kūhiō Hwy Intersection:		**Ma'alo Road**	**'Ehiku Street**	**Laulima Street**	**Roberts Hawaii Driveway**
Current Traffic Control:		*One-Way Stop*	*Signalized*	*Two-Way Stop*	*One-Way Stop*
Critical Approach:		*Eastbound*	*(not applicable)*	*Westbound*	*Southbound*
Future Long-Range Year Conditions					
Baseline		Would operate at LOS F during PM peak hour (with average vehicle delay of approximately 127 seconds) for the projected 78 vehicles per hour approaching the intersection. Would not meet MUTCD warrants for signalization of the intersection.	Projected to operate at LOS A (with average vehicle delay of approximately 5 seconds) during AM and PM peak hours.	Would operate at LOS F during the AM and PM peak hour (with average vehicle delay of approximately 206 seconds during the AM peak and 7 minutes during the PM peak). The westbound approach volume is projected as 106 vehicles per hour during the AM peak and 82 vehicles per hour during the PM peak. This approach is the opposite side of the intersection from the Project site, and would not receive increased traffic volumes as a result of implementation of the Project. Would meet MUTCD warrants for signalization (during the AM peak hour) regardless of implementation of the Project.	Would operate at LOS E during the AM peak hour and LOS D during the PM peak hour. Would not meet MUTCD warrants for signalization of the intersection.
Baseline plus MSWLF	Project Vehicles NOT Using Intersection	Would experience minor change in LOS (LOS F during PM peak).	Would continue to operate at LOS A during AM and PM peak hours regardless of which access option is implemented.	Would experience minor change in LOS (LOS F during AM, PM peak).	Would experience minor change in LOS (LOS E during AM peak, LOS D during PM peak).
	Project Vehicles Using Intersection	Would increase average vehicle delay to approximately 210 seconds during PM peak (LOS F), based on a projected 18 additional (96 total) vehicles per hour approaching the intersection.		Would increase average vehicle delay modestly, to approximately 4.5 minutes during the AM peak hour and 8 minutes during PM peak hour (LOS F).	Would operate at LOS F (average delay of 51 seconds) during the AM peak hour and LOS E during the PM peak hour. Would not meet MUTCD warrants for signalization of the intersection.
Baseline plus MSWLF plus RRP	Project Vehicles NOT Using Intersection	Average vehicle delay would increase to approximately 3 minutes during PM peak hour (LOS F).	Would operate at LOS A or B during AM and PM peak hours regardless of which access option is implemented.	Would experience reasonable change in LOS, with average vehicle delay increasing to approximately 5 minutes during the AM peak hour and 9 minutes during the PM peak hour (LOS F).	Would operate at LOS F (average delay of 56 seconds) during the AM peak hour and LOS D during the PM peak hour. Would not meet MUTCD warrants for signalization of the intersection.
	Project Vehicles Using Intersection	Would increase average vehicle delay significantly to approximately 15–16 minutes during the PM peak (LOS F), based on a projected 148 additional (2,226 total) vehicles per hour approaching the intersection. Would meet MUTCD warrants for signalization.		Would increase average vehicle delay significantly to approximately 11 minutes during the AM peak hour (LOS F) and 15 minutes during the PM peak hour (LOS F).	Would operate at LOS F during the AM and PM peak hours, with average delay of 117 seconds and over 4 minutes, respectively. Would meet MUTCD warrants for signalization of the intersection.
Overall Summary of Future Long-Range Year Conditions		Under Baseline conditions, would operate at LOS F with average vehicle delay of 127 seconds during PM peak hour. With the addition of MSWLF and RRP traffic, average delay would be approximately 15–16 minutes during the PM peak hour and MUTCD warrants for signalization would be met. If only the MSWLF component of the Project is implemented, then average vehicle delay would be approximately 210 seconds during PM peak hour. However, peak-hour MUTCD signal warrants would not be met because the eastbound approach volume would be less than 100 vehicles per hour.	Would continue to operate at LOS A or B during the Future Long-Range Year, under all analysis scenarios and all access alternatives.	Under Baseline conditions, would operate at LOS F with average vehicle delay of 3.5 minutes during the AM peak hour and 7 minutes during PM peak hour. If the Project is not implemented, then MUTCD warrants for signalization would be met by the Future Long-Range Year. If the full MSWLF plus RRP option is implemented, then average vehicle delay would increase significantly to almost 15 minutes during the PM peak hour. MUTCD warrants for signalization would continue to be met.	Under Baseline conditions, would operate at LOS E during the AM peak hour and LOS D during the PM peak hour. MUTCD warrants for signalization would not be met by the Baseline conditions. If the full MSWLF plus RRP option is implemented, then average vehicle delay would increase significantly to almost 4 minutes during the PM peak hour. MUTCD warrants for signalization would continue to be met.

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Table 6: Comparison of Recommended Improvements and Identified Issues for Access Alternatives at Four Kūhiō Highway Intersections

Alternative	Kūhiō Highway Intersection			
	Ma'alo Road (One-Way Stop-Controlled Intersection)	**'Ehiku Street (Signalized Intersection)**	**Laulima Street (Two-Way Stop-Controlled Intersection)**	**Roberts Hawaii Driveway (One-Way Stop-Controlled Intersection)**
Ma'alo Road	• Signalize intersection when warranted. • Install either a right-turn deceleration lane for southbound Kūhiō Highway traffic turning right into Ma'alo Road or a large turn-radius for this movement. The deceleration lane would require widening of the Kūhiō Highway bridge north of the Ma'alo Road intersection.	No change	• Signalize intersection when warranted. • Reconfigure mauka approach to intersection. • Widen Kūhiō Highway at intersection to provide left-turn lanes in both northbound and southbound directions.	No change
"Ehiku Street	No change	• Implement an advance green phase for the northbound Kūhiō Highway leg of the intersection to alleviate some of the impediment to through traffic that increased left-turning traffic would create. • Enlarge curb return radii at the existing 'Ehiku Street intersection to handle semi-trailer truck (WB-40) right turns without significant intrusion into the opposing traffic lanes. • Upgrade existing pedestrian facilities: – Install crosswalks across both approach legs of Kūhiō Highway and across the inactive cane haul road – Install appropriate American Disabilities Act (ADA)-accessible pedestrian ramps on all corners of the intersection – Provide pedestrian signal heads to control pedestrian crossing movements.	• Signalize intersection when warranted. • Reconfigure mauka approach to intersection. • Widen Kūhiō Highway at intersection to provide left-turn lanes in both northbound and southbound directions.	No change
Laulima Street	No change	No change	• Signalize intersection when warranted. • Reconfigure mauka approach to intersection. • Widen Kūhiō Highway at intersection to provide left-turn lanes in both northbound and southbound directions.	No change
Roberts Hawaii Driveway	No change	No change	• Signalize intersection when warranted. • Reconfigure mauka approach to intersection. • Widen Kūhiō Highway at intersection to provide left-turn lanes in both northbound and southbound directions.	• Signalize intersection when warranted • Provide left-turn lane on Kūhiō Highway in Kapa'a direction for turns into Robert's Hawaii Driveway. • Provide right-turn deceleration lane on Kūhiō Highway in Līhu'e direction.
Identified Issues	Ma'alo Road currently serves multiple land uses: farm and ranching land, industrial-type uses, a cemetery, and Wailua Falls (tourism). Although it is paved, the road is relatively narrow, often only 20 ft wide. Roadway shoulders are intermittent and are not stabilized. The roadway itself is an issue because of its current geometry, and intersection issues exist as well: • The Ma'alo Road intersection is located in a trough at the bottom of a sag curve and near the apex of a horizontal curve on Kūhiō Highway. This condition makes it important to shelter turning vehicles at the intersection. The northbound left-turn lane and a southbound right-turn lane would need to be appropriately designed to handle the traffic demand. A large-radius curb return could be substituted for the southbound right turn, especially in the MSWLF-only scenario. If this were not acceptable to reviewing agencies, however, the southbound right-turn would require widening of a bridge on Kūhiō Highway. Mitigating this issue by prohibiting the right-turn into Ma'alo Road would be difficult, given that Ma'alo Road serves as an access to Wailua Falls, a major tourist attraction. A large share of tourists would approach from the north (Kapa'a side) and would be looking to execute this movement. If the existing left-turn lane on Kūhiō Highway needed to be lengthened, then it would begin to interfere with the southbound left-turn lane serving traffic turning onto Laukini Road. • The MSWLF-only scenario would not warrant a traffic signal at this intersection. Therefore, under a MSWLF-only scenario, using Ma'alo as the proposed access would result in large trucks making left turns out of Ma'alo at a location with challenging roadway geometry. This is a safety issue that would require close review by the agency with jurisdiction.	The 'Ehiku Street intersection initially appears a promising choice to accommodate access to the proposed MSWLF/RRP. Closer examination reveals several issues, however: • Widening Kūhiō Highway to provide left-turn lanes at the intersection would be difficult. As a result, the existing shared through-/left-lane configuration on the northbound approach would be retained, creating potential operating difficulties as the left-turning vehicles interfere with the northbound through traffic. • MSWLF and RRP operations would involve large semi-trailer vehicles. A small number of similar vehicles currently use 'Ehiku Street to reach agricultural operations. These have difficulty making the right turn from 'Ehiku Street to southbound Kūhiō Highway without intruding into oncoming traffic lanes. If 'Ehiku Street were used as an access to the MSWLF/RRP, then modifications would need to be made to the curb return radii, which would trigger ADA compliance requirements including handicap ramps, crosswalks, and pedestrian signal heads. Also, a discontinuity present in the sidewalk along the east (Walmart) side of Kūhiō Highway just south of the intersection would require being improved to ADA standards. • Traffic has been observed to queue from Ahukini Road back almost to 'Ehiku Street during the AM peak hour. This may limit the amount of traffic that can efficiently access Kūhiō Highway at this location. • 'Ehiku Street between Kūhiō Highway and Kanakolu Street is a collector roadway serving a residential subdivision. Single-family homes and a church are adjacent to this segment of 'Ehiku Street. Carrying the MSWLF and RRP traffic along this residential street may create safety and nuisance issues.	Laulima Street east of Kūhiō Highway serves a residential subdivision, and Laulima Street west of Kūhiō Highway serves an equipment rental business. If this route is selected as the proposed access route, then the access roadway would abut these land uses. Issues associated with this intersection include the following: • Laulima Street west of Kūhiō Highway is slightly offset from Laulima Street east of Kūhiō Highway, and the intersection would require modification to align the two streets. At the same time, necessary ADA pedestrian improvements such as handicap ramps and crosswalks would require implementation. If signalized, then pedestrian signal heads would be required. • The cane haul road would require pavement reconstruction. • Kūhiō Highway would require widening to provide northbound and southbound left-turn lanes. • If selected as the proposed access route, the intersection would warrant signalization under all scenarios. In fact, the intersection already warrants signalization, and would continue to under all MSWLF/RRP implementation scenarios, even if it is not selected as the proposed access route.	Issues associated with the Roberts Hawaii Driveway intersection include the following: • The roadway that connects between Roberts Hawaii Driveway and Laulima Street would require pavement construction. • Kūhiō Highway would require widening to provide a westbound right-turn lane and an eastbound left-turn lane. If this route is selected as the proposed access route, then the intersection would warrant signalization under the future long-term year MSWLF and RRP scenario.

Table 7: Recommended Signalization Improvements at Five Study Intersections for Project-Access Scenarios in Future Opening and Future Long-Range Years

		Ma'alo Road Scenarios (A1, A2)			'Ehiku Street Scenarios (B1, B2)			Laulima Street Scenario (C3)			Roberts Hawaii Driveway Scenario (D3)		
Kūhiō Hwy Intersection	**Existing Traffic Control**	**Baseline**	**Baseline plus MSWLF**	**Baseline plus MSWLF plus RRP**	**Baseline**	**Baseline plus MSWLF**	**Baseline plus MSWLF plus RRP**	**Baseline**	**Baseline plus MSWLF**	**Baseline plus MSWLF plus RRP**	**Baseline**	**Baseline plus MSWLF**	**Baseline plus MSWLF plus RRP**
Future Opening Year													
Ma'alo Road	One-way stop	No change	No change	**Signalization Required** (LOS F: 381 secs delay)	No change	No change	No change	No change	No change	No change	No change	No change	No change
'Ehiku Street	Signalized	No change	No change	No change	No change	No change	No change	No change	No change	No change	No change	No change	No change
Laulima Street	Two-way stop	**Does Not Meet Signal Warrants** (LOS F: 93 secs delay)	**Does Not Meet Signal Warrants** (LOS F: 96 secs delay)	**Does Not Meet Signal Warrants** (LOS F: 123 secs delay)	**Does Not Meet Signal Warrants** (LOS F: 93 secs delay)	**Does Not Meet Signal Warrants** (LOS F: 96 secs delay)	**Does Not Meet Signal Warrants** (LOS F: 123 secs delay)	**Does Not Meet Signal Warrants** (LOS F: 93 secs delay)	**Does Not Meet Signal Warrants** (LOS F: 105 secs delay)	**Signalization Required** (LOS F: 415 secs delay)	**Does Not Meet Signal Warrants** (LOS F: 93 secs delay)	**Does Not Meet Signal Warrants** (LOS F: 97 secs delay)	**Does Not Meet Signal Warrants** (LOS F: 128 secs delay)
Roberts Hawaii Driveway	One-way stop	No change	No change	No change	No change	No change	No change	No change	No change	No change	No change	No change	**Signalization Required** (LOS F: 78 secs delay)
Kapule Hwy	Signalized	No change	No change	**Optimize Timing** (LOS E: 58 secs delay	No change	No change	**Optimize Timing** (LOS E: 58 secs delay	No change	No change	**Optimize Timing** (LOS E: 58 secs delay	No change	No change	**Optimize Timing** (LOS E: 58 secs delay
Future Long-Range Year													
Ma'alo Road	One-way stop	**Does Not Meet Signal Warrants** (LOS F: 127 secs delay)	**Does Not Meet Signal Warrants** (LOS F: 210 secs delay)	**Signalization Required** (LOS F: 942 secs delay)	**Does Not Meet Signal Warrants** (LOS F: 127 secs delay)	**Does Not Meet Signal Warrants** (LOS F: 134 secs delay)	**Does Not Meet Signal Warrants** (LOS F: 178 secs delay)	**Does Not Meet Signal Warrants** (LOS F: 127 secs delay)	**Does Not Meet Signal Warrants** (LOS F: 135 secs delay)	**Does Not Meet Signal Warrants** (LOS F: 192 secs delay)	**Does Not Meet Signal Warrants** (LOS F: 127 secs delay)	**Does Not Meet Signal Warrants** (LOS F: 135 secs delay)	**Does Not Meet Signal Warrants** (LOS F: 192 secs delay)
'Ehiku Street	Signalized	No change	No change	No change	No change	No change	No change	No change	No change	No change	No change	No change	No change
Laulima Street	Two-way stop	**Signalization Required** (LOS F: 422 secs delay)	**Signalization Required** (LOS F: 442 secs delay)	**Signalization Required** (LOS F: 545 secs delay)	**Signalization Required** (LOS F: 422 secs delay)	**Signalization Required** (LOS F: 442 secs delay)	**Signalization Required** (LOS F: 545 secs delay)	**Signalization Required** (LOS F: 422 secs delay)	**Signalization Required** (LOS F: 487 secs delay)	**Signalization Required** LOS F: 917 secs delay)	**Signalization Required** (LOS F: 422 secs delay)	**Signalization Required** (LOS F: 446 secs delay)	**Signalization Required** (LOS F: 567 secs delay)
Roberts Hawaii Driveway	One-way stop	No change	No change	No change	No change	No change	No change	No change	No change	No change	No change	**Does Not Meet Signal Warrants** (LOS F: 51 secs delay)	**Signalization Required** (LOS F: 252 secs delay)
Kapule Hwy	Signalized	**Optimize Timing** (LOS E: 68 secs delay	**Optimize Timing** (LOS E: 70 secs delay	**Optimize Timing** (LOS F: 85 secs delay	**Optimize Timing** (LOS E: 68 secs delay	**Optimize Timing** (LOS E: 70 secs delay	**Optimize Timing** (LOS F: 85 secs delay	**Optimize Timing** (LOS E: 68 secs delay	**Optimize Timing** (LOS E: 70 secs delay	**Optimize Timing** (LOS F: 85 secs delay	**Optimize Timing** (LOS E: 68 secs delay	**Optimize Timing** (LOS E: 70 secs delay	**Optimize Timing** (LOS F: 85 secs delay

secs seconds

Color coding:

- No change
- Does not meet peak hour MUTCD signal warrants (but projected to exhibit unacceptable LOS) – peak hour signal warrants generally not met because minor roadway volume is less than 100 vehicles per hour.
- Peak hour MUTCD signal warrants met. Signalization recommended or required.
- Signal requires timing optimization to reach acceptable levels.

3.0 INFRASTRUCTURE IMPROVEMENTS ASSESSMENT

3.1 INTRODUCTION AND PURPOSE

This infrastructure improvements assessment provides conceptual analysis of access route alternatives from Kūhiō Highway to the proposed Project. The analysis evaluates the existing conditions, recommends improvements to the access routes, provides permitting, land use or land acquisition requirements and the estimated processing time, and presents planning-level cost estimates. The potential access routes analyzed in this section are as follows (see Figure 6):

- Routes A1 & A2: via Ma‘alo Road (Section 3.3)
- Routes B1 & B2: via ‘Ehiku Street (Section 3.4)
- Route C3: via Laulima Street (Section 3.5)
- Route D3: via Roberts Hawaii Driveway (Section 3.6)

3.2 UTILITY CONNECTIONS

Development of the selected project access route would also include utility corridor improvements, including relocation and connection to existing facilities as well as establishment of new facilities (i.e., along the driveway). Existing infrastructure in the vicinity of each route is presented in the following subsections.

3.2.1 Water

The Līhu‘e Water system in Hanamaulu has two known water storage tanks, a 500,000-gallon concrete tank, and a 1.0-million-gallon (MG) concrete tank, that provide water along Kūhiō Highway and Ma‘alo Road. The 500,000-gallon tank is located along Laulima Street about ¼ mile mauka of Kūhiō Highway. The 1.0-MG concrete tank is located along Kulei Road approximately ½ mile mauka of Kūhiō Highway and provides water for a 12-inch water main along Kūhiō Highway and a 16-inch water main along Ma‘alo Road. Based on this preliminary analysis, a new 12-inch water main with a small booster pump station would be sufficient to meet the assumed domestic average Project daily demand of 2,760 gallons per day (gpd), the required fire flow, and other County of Kauai Department of Water criteria. It is also assumed that the existing water system has enough capacity, storage, and well supply to handle the proposed Project water demand, and would not require upgrades. Upon selection of the proposed route, further analysis will be required to confirm these assumptions, which may include consultation with the County of Kaua‘i Department of Water.

3.2.2 Wastewater

The sewage collection system in the Līhu‘e and Hanamaulu area flow to the Līhu‘e Sewage Treatment Plant located just south of the Līhu‘e Airport, approximately 5 miles from the project site. Based on this preliminary analysis, a new 8-inch sewer main would be adequate to handle the additional proposed average Project daily flow of 2,200 gpd. It is assumed that the existing downstream sewage infrastructure, including sewer mains and the Kapaia Sewer Pump Station, has adequate capacity to handle the additional flows from the Project site and does not require any upgrades. Upon selection of the proposed route, further analysis would be required to confirm the assumptions, which may include consultation with the County of Kaua‘i Department of Public Works.

However, due to the distance between the Project site and the existing sewer line points of connection, a more cost-effective alternative is to install onsite individual wastewater systems comprised of septic tanks and absorption beds. Additional environmental clearances and permitting would be required for this option; however, no problems are anticipated in obtaining the required approvals. This option would cost approximately $220,000 regardless of which access route is

chosen, and is not included in the access route cost estimates presented herein (because it will be accounted for in the design of the facilities, in a separate report).

3.2.3 Electric Power and Telephone Service

Overhead electric power and telephone service is available at Ma'alo Road and along Kūhiō Highway. Along Ma'alo and 'Ehiku Roads, the existing poles would require relocating to accommodate road widening. Service along routes C and D would have to be established along the entire access routes.

3.3 MA'ALO ROAD ACCESS (ROUTES A1 AND A2)

3.3.1 Existing Conditions and Improvements

The Ma'alo Road access routes are shown on Figure 6. The routes start at the Ma'alo Road / Kūhiō Highway intersection and split near the proposed RRP site at the intersection of Driveways 1 and 2:

- Route A1 uses Driveway 1 to provide a direct route to the MSWLF, crossing two corrugated pipe culverts located in offsite wetland areas.
- Route A2 follows Driveway 1 to the intersection where Driveway 2 commences and bypasses the culverts and wetlands.

3.3.1.1 MA'ALO ROAD ROADWAY IMPROVEMENTS

Ma'alo Road is under State jurisdiction. The typical section through this area consists of two paved 10-ft lanes and 3-ft unimproved shoulders (Figure 7). Existing guardrails along the access route were observed during a site visit. The existing road includes a bridge and crosses nine existing culverts before reaching the intersection with Driveways 1 and 2. The Right-Of-Way (ROW) is 60 ft wide. The existing pavement section could not be found from as-built records.

Proposed improvements to Ma'alo Road, which conform to the requirements of the American Association of State Highway and Transportation Officials (AASHTO) and Hawai'i DOT, are:

- Widen roads and pave: 12-ft lanes with 4-ft shoulders; 2 inches asphalt concrete pavement (ACP), 6 inches asphalt concrete base (ACB), 6 inches aggregate subbase
- Reconstruct existing culverts
- Relocate guardrails

3.3.1.2 MA'ALO ROAD UTILITY IMPROVEMENTS

Along routes A1 and A2, the nearest water connection is the 16-inch main along Ma'alo Road, where electricity and telephone service are also available. Recommended utility improvements to Ma'alo Road are:

- Relocate power and telephone poles along Ma'alo Road to accommodate road widening
- Connect water to Driveway 1 and 2
- Relocate 2-inch waterline along Ma'alo Road
- Relocate backflow preventer, fire hydrant, drain inlet, etc.
- Reconstruct existing culverts

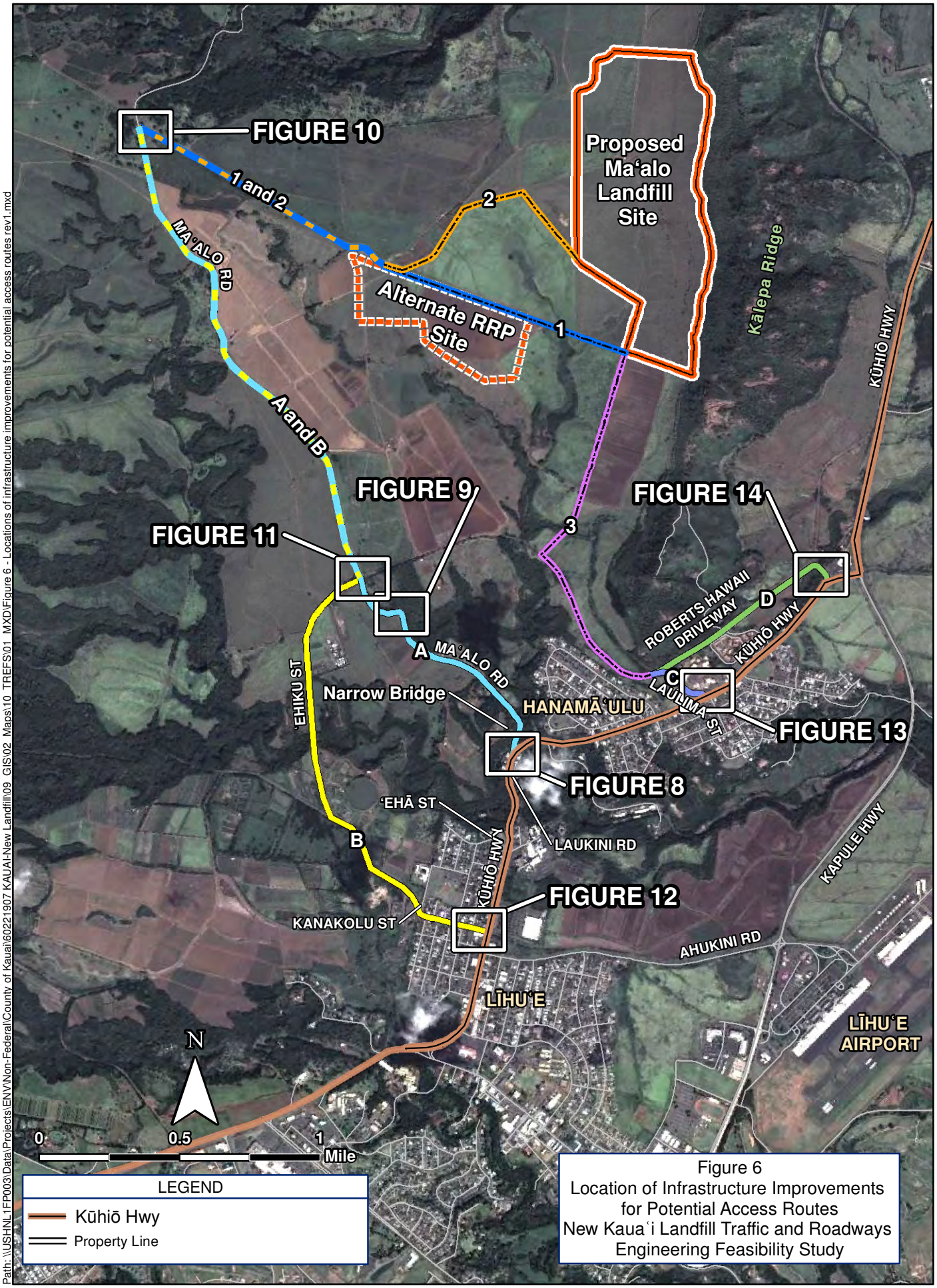
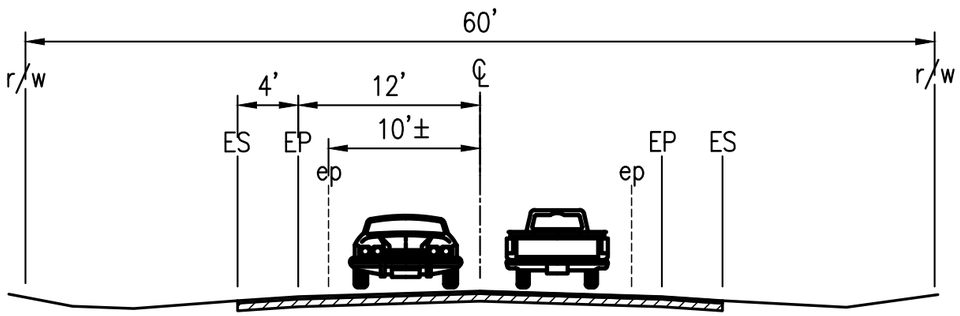
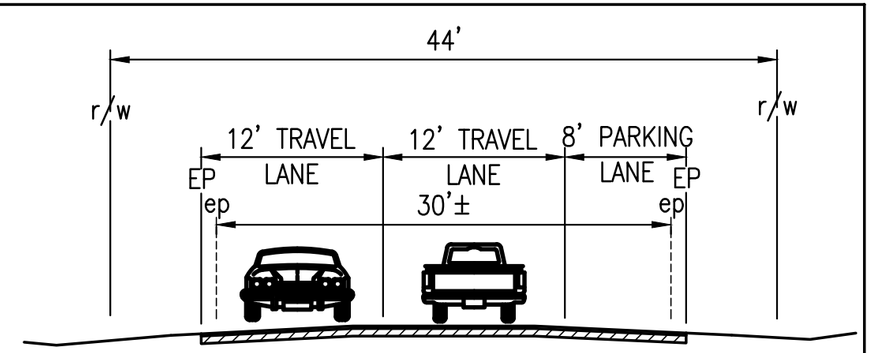


Figure 6
Location of Infrastructure Improvements for Potential Access Routes
New Kaua'i Landfill Traffic and Roadways Engineering Feasibility Study

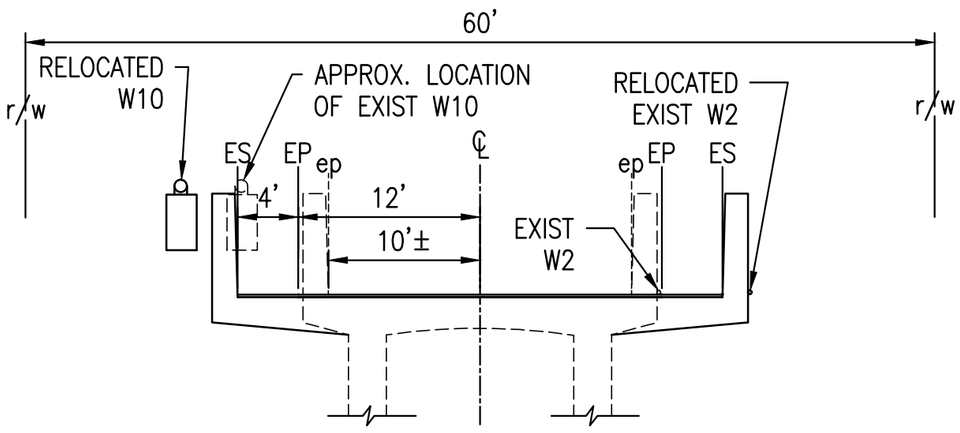
Path: \\USHNL1FP003\Data\Projects\ENV\Non-Federal\County of Kauai\60221907 KAUAI-New Landfill\09_GIS\02_Maps\10_TREFS\01_MXD\Figure 6 - Locations of infrastructure improvements for potential access routes rev1.mxd



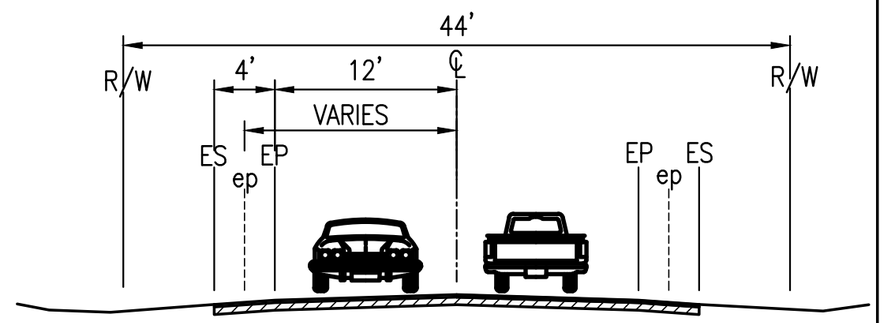
TYPICAL SECTION FOR MAALO ROAD



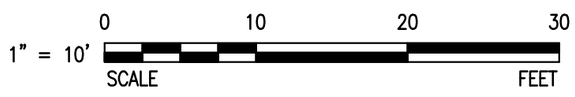
TYPICAL SECTION FOR EHIKU STREET
FROM ELIMA STREET
TO KANAKOLU STREET



TYPICAL SECTION FOR MAALO ROAD BRIDGE



TYPICAL SECTION FOR LAULIMA STREET,
ROBERT'S HAWAII DRIVEWAY ACCESS,
DRIVEWAYS "1", "2" & "3",
AND EHIKU STREET
FROM KANAKOLU STREET TO MAALO ROAD



LIST OF ABBREVIATIONS:

℄	CENTER LINE OF ROADWAY
ep	EXISTING EDGE OF PAVEMENT
ecls	existing center line striping
EP	PROPOSED EDGE OF PAVEMENT
ES	PROPOSED EDGE OF SHOULDER
r/w	EXISTING RIGHT OF WAY
R/W	PROPOSED RIGHT OF WAY

NOTES

SOURCE: HDOT PROJ. NO. ARR-0583(1) 2009, GOOGLE EARTH
DATE: 10-10-2013
DRAWN BY: AT (AECOM)

Figure 7
Typical Sections
New Kaua'i Landfill Traffic and Roadways Engineering Feasibility Study

\\wahet1p003\data\Projects\ENV\Non-Federal\County of Kauai\60221607 KAUAI-New Landfill\07 Deliverables\Task 05 TREFS\02 Prelim Dramsp.dwg 12/17/13 8:04 AM nakaoka

3.3.1.3 MA'ALO ROAD / KŪHIŌ HIGHWAY INTERSECTION

The Ma'alo Road / Kūhiō Highway intersection is a 3-way, unsignalized intersection with a left-turn lane in the northbound direction on Kūhiō Highway. The State DOT ROW is 60 ft wide. The Kapaia Bridge (Kūhiō Highway) is just east of the intersection and has a travelway width of 24 ft. The existing intersection can accommodate truck-turning movements for a WB-40 design vehicle. The existing pavement sections could not be found from as-built records.

Based on initial consultation, the State DOT suggested providing a right-turn lane southbound on Kūhiō Highway to Ma'alo Road, and a median lane for left turns onto Kūhiō Highway northbound. The proposed intersection layout is shown on Figure 8.

Proposed improvements to the Ma'alo Road / Kūhiō Highway intersection are:

- Signalize intersection
- Widen roads and pave: 2 inches ACP, 6 inches ACB, 6 inches aggregate subbase
  - Right-turn from Kūhiō Highway southbound onto Ma'alo Road:
    Increase turning radius to 40 feet to accommodate large vehicles
  - Median lane for left turns onto Kūhiō Highway northbound
    12-ft lane, 14-ft median lane, 60-ft storage length, 100-ft and 80-ft taper lengths
- Install guardrail and end treatment
- Excavate and grade along Kūhiō Highway sloped shoulder
- Construct retaining wall (approximately 13 ft tall) along Kūhiō Highway due to slope excavation
- Relocate utility poles, fire hydrant, backflow preventer, drain inlet, culvert
- Acquire additional ROW (including survey maps)

Upon completion of these improvements, all turning movements at the proposed intersection will accommodate the WB-40 design vehicle.

A roundabout is an alternative that could conceivably be used at the Ma'alo Road / Kūhiō Highway intersection. Benefits of a roundabout include improved safety, reduced speeds, and decreased traffic congestion. Negative aspects of a roundabout include user unfamiliarity with roundabouts and the equal-priority status of all approaches, which can slow through traffic. Land requirements for a roundabout would be an issue of particular concern at this location, as a single-lane roundabout would require an inscribed circle diameter of 105–150 ft to accommodate a WB-40 design vehicle. Lane width for the roundabout is typically 16–20 ft, resulting in an outside diameter of 120–170 ft for a roundabout at this intersection—this would require substantial ROW acquisition. Due primarily to land acquisition issues and the geometry of the area, a roundabout is not recommended and has been eliminated from further consideration. If a single-lane roundabout is desired, then further analysis would be required.

3.3.1.4 EXISTING BRIDGE ON MA'ALO ROAD

The existing bridge on Ma'alo Road just north of the Ma'alo Road / Kūhiō Highway intersection is 20 ft wide with 10-ft lanes and no shoulders. The ROW is 60 ft wide.

The proposed typical section of the bridge is presented on Figure 7.

Proposed improvements to the existing bridge on Ma'alo Road are:

- Widen bridge (32 ft clear width)
  - It is assumed at this stage that there are no issues with widening the bridge; e.g., historical preservation review or requirements.
  - Bridge repaving: 12-ft lanes with 4-ft shoulders; 2 inches ACP, 6 inches ACB, 6 inches aggregate subbase
- Relocate 2-inch waterline strapped to side of bridge
- Relocate 12-inch waterline crossing adjacent to bridge

3.3.1.5 Existing Sharp Curve along Ma'alo Road

A sharp curve exists along Ma'alo Road, as shown on Figure 9. This curve will not accommodate the WB-40 design vehicle. The existing typical section through this area consists of two 10-ft lanes with 3-ft unimproved shoulders. The ROW is 60 ft wide.

This stretch would be excavated as necessary, re-graded, and a reverse curve established. Figure 9 shows the proposed road widening in this area. Proposed improvements to the existing sharp curve along Ma'alo Road are:

- Acquire additional ROW
- Excavate and grade

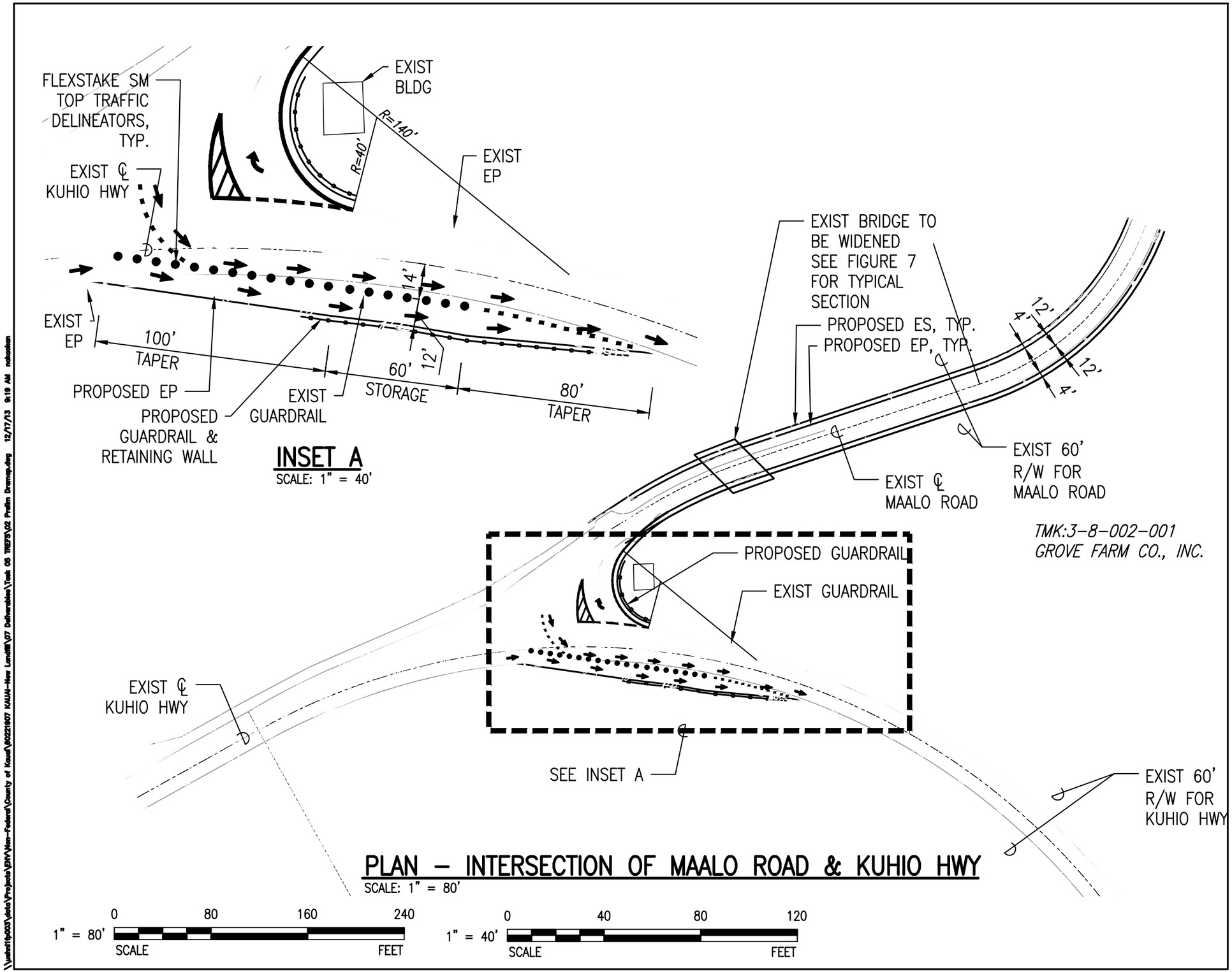
The cost of paving this area is captured under Section 3.3.1.1.

3.3.1.6 Ma'alo Road / Driveways 1 and 2 Intersection

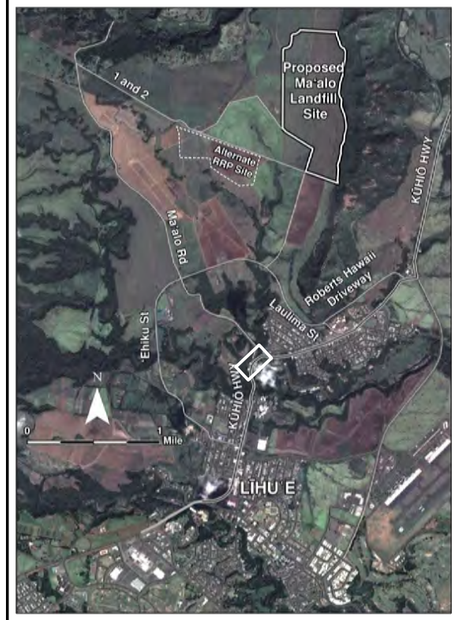
A sharp right turn exists northbound on Ma'alo Road at the intersection with Driveways 1 and 2, as shown on Figure 10. This curve will not accommodate the WB-40 design vehicle. Ma'alo Road currently has 10-ft lanes and 3-ft unpaved shoulders at this intersection. The land adjacent to the intersection is owned by the State of Hawai'i.

The intersection needs to be graded to accommodate the new intersection configuration. Drainage must be considered to accommodate increased surface runoff. Figure 10 shows the proposed road widening and curve alignment in this area. Proposed improvements to the Ma'alo Road / Driveways 1 and 2 intersection are:

- Widen roads and pave: 2 inches ACP, 6 inches ACB, 6 inches aggregate subbase
- Acquire additional ROW (including survey maps)
- Relocate/widen double-swing gate



KEY MAP



NOTES

SOURCE: HDOT PROJ. NO. 56A-01-04M 2005
DATE: 10-10-2013
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Figure 8
Plan of Ma'alo Road / Kuhio Highway Intersection
New Kaua'i Landfill Traffic and Roadways Engineering Feasibility Study

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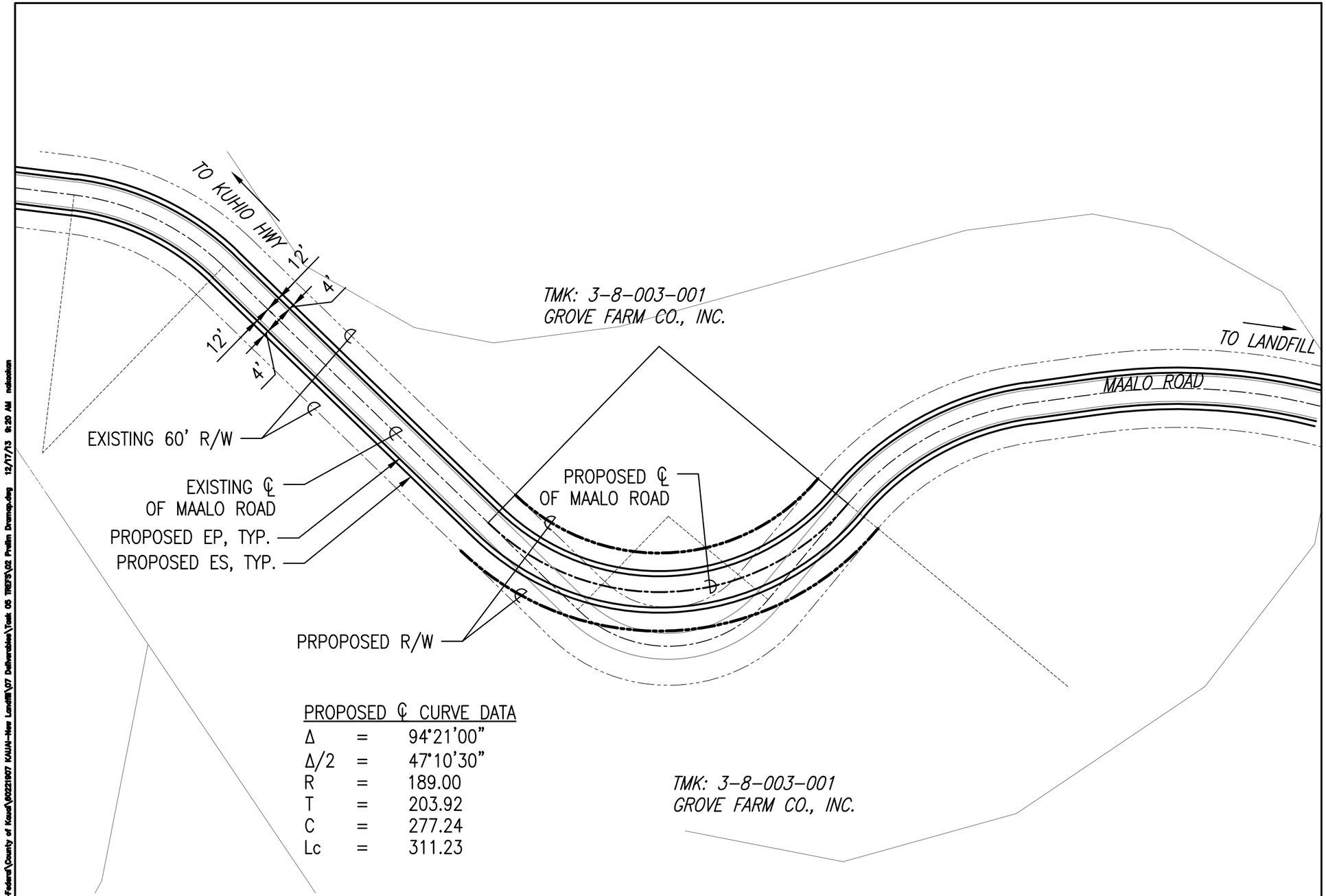


PROPOSED ℄ CURVE DATA

Δ	=	94°21'00"
Δ/2	=	47°10'30"
R	=	189.00
T	=	203.92
C	=	277.24
Lc	=	311.23

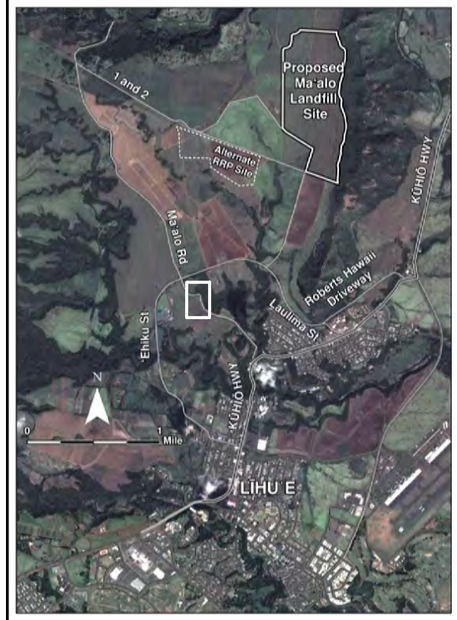
PLAN – MAALO ROAD SHARP CURVE

SCALE: 1" = 80'

0 80 160 240

1" = 80' SCALE FEET

KEY MAP



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SOURCE: HDOT PROJ. NO. ARR-0583(1) 2009
DATE: 10-10-2013
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Figure 9
Plan of Sharp Curve on Ma'alo Road
New Kaua'i Landfill Traffic and Roadways
Engineering Feasibility Study

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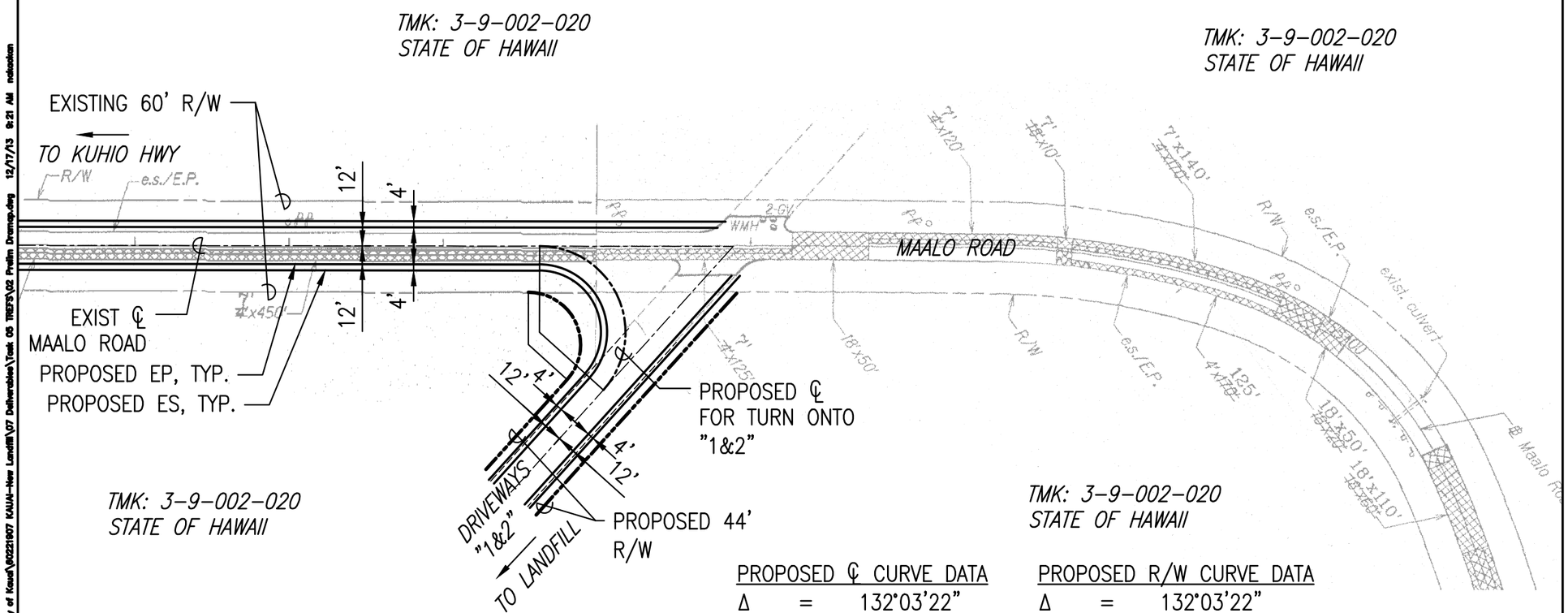

PROPOSED ℄ CURVE DATA		
Δ	=	132°03'22"
Δ/2	=	66°01'41"
R	=	56.00
T	=	125.94
C	=	102.34
Lc	=	129.07

PROPOSED R/W CURVE DATA		
Δ	=	132°03'22"
Δ/2	=	66°01'41"
R	=	34.00
T	=	76.47
C	=	62.13
Lc	=	78.36

1" = 80' 0 80 160 240
SCALE FEET

PLAN – INTERSECTION OF MAALO ROAD & DRIVEWAYS "1&2"

SCALE: 1" = 80'

KEY MAP

NOTES

SOURCE: HDOT PROJ. NO. 583A-01-07M 2007
DATE: 10-10-2013
DRAWN BY: AT (AECOM)

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Figure 10
Plan of Ma'alo Road /
Driveways 1 and 2 Intersection
New Kaua'i Landfill Traffic and Roadways
Engineering Feasibility Study

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3.3.1.7 DRIVEWAYS 1 AND 2

Driveways 1 and 2 connect Ma'alo Road to the Project site. Driveway 1 is a direct route to the MSWLF that crosses two existing culverts. If selected as the proposed Project access route, this route will require widening of the roadway into the wetland and reconstruction of the culverts connecting portions of the wetland areas, which would trigger additional wetland mitigation requirements, i.e., U.S. Army Corps of Engineers (USACE) consultation and Clean Water Act Section 404 Permit. Because specific requirements would need to be discussed with USACE, exact requirements and associated costs cannot be determined at this time. Subject to USACE oversight, mitigation could conceivably consist of erecting barriers to keep cattle out of the wetlands, improving the wetland hydrology, or creating other wetland areas. Because requirements and costs are not currently determinable, a placeholder cost has been assumed. Driveway 2 is an alternate route with greater length; however, this route bypasses the culverts and wetland area.

Proposed improvements to the selected driveway are as follows:

- Provide chain-link fence on both sides of the driveway
- Establish utility corridors to bring water, electricity, and phones to the proposed Project site
- Provide new pavement (including road widening): 2 inches ACP, 6 inches ACB, 6 inches aggregate subbase
- Widen/relocate gate
- For Driveway 1 only: Reconstruct culverts connecting portions of the offsite wetlands, widen the road into the wetlands, and provide wetland consultation, permitting, and mitigation
- Acquire additional ROW (including survey maps)

3.3.2 Permitting, Land Use, and Land Acquisitions

The ROW acquisitions described above are on properties currently zoned as Agricultural and Industrial. The owners of the ROW acquisition areas are Grove Farm Co., Inc. and the State of Hawai'i. Estimated time for rezoning and ROW acquisition is 12 months.

The proposed improvements described above will require a National Pollutant Discharge Elimination System (NPDES) Form C permit from the State of Hawai'i Department of Health (DOH). Estimated time for approval from DOH is 6 months. If Driveway 1 is selected as part of the proposed Project access route, then additional environmental requirements would be triggered, which could require 12 months or more for studies, permitting, and approval.

3.3.3 Planning-Level Cost Estimate

Table 8 and Table 9 provide the detailed cost estimates for the Ma'alo Road access routes. The planning-level cost estimates are:

- A1: $36.7 million
- A2: $35.3 million

Due to the wetlands, the estimate for Driveway 1 is less certain than the estimate for Driveway 2.

Table 8: Access Route A1 (Ma'alo Road, Driveway 1) Detailed Cost Estimate

Item	Description	Qty	Unit	Unit Cost	Costs
Ma'alo Road Roadway Improvements					
	Widen roadways and repave				
	Unclassified Excavation	20,800	CY	$120	$2,496,000
	Asphalt Concrete Pavement (ACP)	5,900	tons	$180	$1,062,000
	Asphalt Concrete Base (ACB)	8,900	CY	$360	$3,204,000
	Aggregate Subbase	8,900	CY	$120	$1,068,000
	Reconstruct existing culverts	10	Ea	$10,000	$100,000
	Relocate guardrails	15,000	LF	$100	$1,500,000
		Subtotal Road Improvements			***$9,430,000***
Ma'alo Road Utility Improvements					
	Power/Telephone Pole Relocation/Installation	50	Ea	$5,000	$250,000
	Construct Water Supply Line to Driveway 1				
	Unclassified Excavation	4,500	CY	$50	$225,000
	Backfill	4,500	CY	$80	$360,000
	12-inch Pipe	10,000	LF	$150	$1,500,000
	Booster Pump Station	1	LS	$750,000	$750,000
	Relocate 2-inch waterline	1,000	LF	$100	$100,000
		Subtotal Utility Improvements			***$3,185,000***
Ma'alo Road / Kūhiō Highway Intersection Improvements					
	Signalization	1	LS	$1,000,000	$1,000,000
	Widen roadways and repave				
	Unclassified Excavation	420	CY	$120	$51,000
	Asphalt Concrete Pavement (ACP)	120	tons	$180	$22,000
	Asphalt Concrete Base (ACB)	180	CY	$360	$65,000
	Aggregate Subbase	180	CY	$120	$22,000
	Install Guard Rail	200	LF	$100	$20,000
	Install End Treatment	1	LS	$50,000	$50,000
	Excavation and Grading	300	CY	$120	$36,000
	Construct Retaining wall	130	LF	$750	$98,000
	Relocate Utility Poles, Fire Hydrant, Backflow Preventer, Drain Inlet, Culvert	1	LS	$50,000	$50,000
	ROW Land Acquisition (Including Survey Maps)	1	LS	$30,000	$30,000
		Subtotal Intersection Improvements			***$1,444,000***
Existing Bridge on Ma'alo Road					
	Bridge widening and repaving (including waterline support)	1	Ea	$5,000,000	$5,000,000
	2-inch Waterline	100	LF	$100	$10,000
	12-inch Waterline	100	LF	$150	$15,000
		Subtotal Existing Bridge Improvements			***$5,025,000***
Existing Sharp Curve along Ma'alo Road					
	ROW Land Acquisition (Including Survey Maps)	1	LS	$30,000	$30,000
	Excavation and Grading	400	CY	$120	$48,000
		Subtotal Sharp Curve Improvements			***$78,000***

Item	Description	Qty	Unit	Unit Cost	Costs
Ma'alo Road / Driveway 1 Intersection Improvements					
	Widen roadways and repave				
	Unclassified Excavation	60	CY	$120	$8,000
	Asphalt Concrete Pavement (ACP)	20	tons	$180	$4,000
	Asphalt Concrete Base (ACB)	30	CY	$360	$11,000
	Aggregate Subbase	30	CY	$120	$4,000
	ROW Land Acquisition (Including Survey Maps)	1	LS	$30,000	$30,000
	Relocate/widen Double-swing gate	1	EA	$1,500	$2,000
		Subtotal Driveway Intersection Improvements			***$59,000***
Driveway 1					
	Chain-link fence	20,800	LF	$50	$1,040,000
	Utility corridors (water, wastewater, electricity, and phones)				
	Power/Telephone Pole Installation	60	Ea	$5,000	$300,000
	Construct Water Supply Line to Project Site				
	Unclassified Excavation	4,700	CY	$50	$235,000
	Backfill	4,700	CY	$80	$376,000
	12-inch Pipe	10,400	LF	$150	$1,560,000
	New pavement & road widening				
	Unclassified Excavation	14,400	CY	$120	$1,728,000
	Asphalt Concrete Pavement (ACP)	4,100	tons	$180	$738,000
	Asphalt Concrete Base (ACB)	6,200	CY	$360	$2,232,000
	Aggregate Subbase	6,200	CY	$120	$744,000
	Relocate/widen Double-swing gate	3	Ea	$1,500	$5,000
	Reconstruct existing culverts	2	Ea	$10,000	$20,000
	Wetlands consultation, permitting, and mitigation	1	Ea	$1,000,000	$1,000,000
	ROW Land Acquisition (Including Survey Maps)	1	LS	$150,000	$150,000
		Subtotal Driveway 1 Improvements			***$10,128,000***
Permitting					***$50,000***
Subtotal - Route A1					$29,399,000
	Contingency (25%)				$7,350,000
Total Cost - Access Route A1					**$36,749,000**

Table 9: Access Route A2 (Ma'alo Road, Driveway 2) Detailed Cost Estimate

Item	Description	Qty	Unit	Unit Cost	Costs
Ma'alo Road Roadway Improvements					
	Widen roadways and repave				
	Unclassified Excavation	20,800	CY	$120	$2,496,000
	Asphalt Concrete Pavement (ACP)	5,900	tons	$180	$1,062,000
	Asphalt Concrete Base (ACB)	8,900	CY	$360	$3,204,000
	Aggregate Subbase	8,900	CY	$120	$1,068,000
	Reconstruct existing culverts	10	Ea	$10,000	$100,000
	Relocate guardrails	15,000	LF	$100	$1,500,000
		Subtotal Road Improvements			***$9,430,000***
Ma'alo Road Utility Improvements					
	Power/Telephone Pole Relocation/Installation	50	Ea	$5,000	$250,000
	Construct Water Supply Line to Driveway 2				
	Unclassified Excavation	4,500	CY	$50	$225,000
	Backfill	4,500	CY	$80	$360,000
	12-inch Pipe	10,000	LF	$150	$1,500,000
	Booster Pump Station	1	LS	$750,000	$750,000
	Relocate 2-inch waterline	1,000	LF	$100	$100,000
		Subtotal Utility Improvements			***$3,185,000***
Ma'alo Road / Kūhiō Highway Intersection Improvements					
	Signalization	1	LS	$1,000,000	$1,000,000
	Widen roadways and repave				
	Unclassified Excavation	420	CY	$120	$51,000
	Asphalt Concrete Pavement (ACP)	120	tons	$180	$22,000
	Asphalt Concrete Base (ACB)	180	CY	$360	$65,000
	Aggregate Subbase	180	CY	$120	$22,000
	Install Guard Rail	200	LF	$100	$20,000
	Install End Treatment	1	LS	$50,000	$50,000
	Excavation and Grading	300	CY	$120	$36,000
	Construct Retaining wall	130	LF	$750	$98,000
	Relocate Utility Poles, Fire Hydrant, Backflow Preventer, Drain Inlet, Culvert	1	LS	$50,000	$50,000
	ROW Land Acquisition (Including Survey Maps)	1	LS	$30,000	$30,000
		Subtotal Intersection Improvements			***$1,444,000***
Existing Bridge on Ma'alo Road					
	Bridge widening and repaving (including waterline support)	1	Ea	$5,000,000	$5,000,000
	2-inch Waterline	100	LF	$100	$10,000
	12-inch Waterline	100	LF	$150	$15,000
		Subtotal Existing Bridge Improvements			***$5,025,000***
Existing Sharp Curve along Ma'alo Road					
	ROW Land Acquisition (Including Survey Maps)	1	LS	$30,000	$30,000
	Excavation and Grading	400	CY	$120	$48,000
		Subtotal Sharp Curve Improvements			***$78,000***

Item	Description	Qty	Unit	Unit Cost	Costs
Ma'alo Road / Driveway 2 Intersection Improvements					
	Widen roadways and repave				
	Unclassified Excavation	60	CY	$120	$8,000
	Asphalt Concrete Pavement (ACP)	20	tons	$180	$4,000
	Asphalt Concrete Base (ACB)	30	CY	$360	$11,000
	Aggregate Subbase	30	CY	$120	$4,000
	ROW Land Acquisition (Including Survey Maps)	1	LS	$30,000	$30,000
	Relocate/widen Double-swing gate	1	EA	$1,500	$2,000
	Subtotal Driveway Intersection Improvements				***$59,000***
Driveway 2					
	Chain-link fence	20,400	LF	$50	$1,020,000
	Utility corridors (water, wastewater, electricity, and phones)				
	Power/Telephone Pole Installation	60	Ea	$5,000	$300,000
	Construct Water Supply Line to Project Site				
	Unclassified Excavation	4,600	CY	$50	$230,000
	Backfill	4,600	CY	$80	$368,000
	12-inch Pipe	10,200	LF	$150	$1,530,000
	New pavement & road widening				
	Unclassified Excavation	14,200	CY	$120	$1,704,000
	Asphalt Concrete Pavement (ACP)	4,100	tons	$180	$738,000
	Asphalt Concrete Base (ACB)	6,100	CY	$360	$2,196,000
	Aggregate Subbase	6,100	CY	$120	$732,000
	Relocate/widen Double-swing gate	3	Ea	$1,500	$5,000
	ROW Land Acquisition (Including Survey Maps)	1	LS	$150,000	$150,000
	Subtotal Driveway 1 Improvements				***$8,973,000***
Permitting					***$50,000***
Subtotal - Route A2					$28,244,000
	Contingency (25%)				$7,061,000
Total Cost - Access Route A2					**$35,305,000**

3.4 'EHIKU STREET ACCESS (B1, B2)

3.4.1 Existing Conditions and Improvements

The 'Ehiku Street access is shown on Figure 6 as Routes B1 and B2. Both access routes start at the 'Ehiku Street / Kūhiō Highway intersection. 'Ehiku Street intersects with Ma'alo Road, at which point the route follows the Ma'alo Road access, including Driveways 1 and 2.

3.4.1.1 'EHIKU STREET ROADWAY IMPROVEMENTS

'Ehiku Street is under County jurisdiction from Kūhiō Highway to Kanakolu Street and is owned by Grove Farm Co., Inc. from Kanakolu Street to Ma'alo Road, with gates on each end. The existing road is paved from Kūhiō Highway to Ma'alo Road. From Kūhiō Highway to Kanakolu Street, the road has two 10-ft lanes and a 10-ft shoulder/parking area on the north side of the street. A typical section of this segment is presented in Figure 7. From Kanakolu Street to Ma'alo Road, the existing roadway is a 30-ft-wide paved road; no defined lane widths or shoulder widths are present. The ROW is 44 ft wide. The existing pavement sections could not be found from as-built records.

Proposed improvements to 'Ehiku Street, which would conform to AASHTO and Hawai'i DOT requirements, are:

- Widen roads and pave: 12-ft lanes with 4-ft shoulders; 2 inches ACP, 6 inches ACB, 6 inches aggregate subbase
- Acquire additional ROW along private portion of 'Ehiku Street

3.4.1.2 MA'ALO ROAD ROADWAY IMPROVEMENTS

Ma'alo Road is under State jurisdiction. The typical section through this area consists of two paved 10-ft lanes and 3-ft unimproved shoulders. Existing guardrails along the access route were observed during a site visit. The existing road consists of seven existing culverts before reaching the intersection with Driveways 1 and 2. The ROW is 60 ft wide. The existing pavement section could not be found from as-built records.

Proposed improvements to Ma'alo Road, which conform to AASHTO and Hawai'i DOT requirements, are:

- Widen roads and pave: 12-ft lanes with 4-ft shoulders; 2 inches ACP, 6 inches ACB, 6 inches aggregate subbase
- Reconstruct existing culverts
- Relocate guardrails

3.4.1.3 'EHIKU STREET / MA'ALO ROAD UTILITY IMPROVEMENTS

Along routes B1 and B2, the nearest water connection is the 16-inch main along Ma'alo Road, where electricity and telephone service are also available. Based on conceptual analysis, this 8-inch main is sufficient to handle the additional flow. If the 8-inch main cannot handle the additional flow, then an alternative is to connect to the 12-inch main at the intersection of 'Ehiku Street and Kūhiō Highway. Although wastewater connection is available at the most upstream manhole along 'Ehiku Street, it is recommended that cesspools be installed at the facility instead.

In addition to the normal utility requirements for all of the access routes, a large earthen "culvert" exists at a waterway that passes under 'Ehiku Street, south of the Ma'alo intersection. The channel bottom is approximately 50–75 ft below the road. The property owner has been monitoring the erosion of the culvert opening over the years as it approaches the road. Soft clay material was observed along the culvert walls during a site visit, and erosion is evident by the material that has fallen into the channel bottom. The structural integrity of the earthen culvert is unknown, and likely problematic. An extensive geotechnical analysis would be required. It is likely that this access route would require significant design and reconstruction of a new culvert, and possible work in a waterway, which is reflected in the cost estimate presented below.

Recommended utility improvements to 'Ehiku Street and Ma'alo Road are:

- Relocate power and telephone poles to accommodate road widening
- Connect water to Driveway 1 and 2
- Reconstruct waterway/culvert under 'Ehiku Road (Including investigation, design, permitting)

3.4.1.4 MA'ALO ROAD / 'EHIKU STREET INTERSECTION

The Ma'alo Road / 'Ehiku Street intersection is a 4-way, unsignalized intersection. The State DOT ROW is 60 ft wide. The existing intersection cannot accommodate the WB-40 truck-turning movements, thus requiring widening of the intersection. The existing pavement sections could not be found from as-built records.

The proposed intersection layout is shown on Figure 11. Proposed improvements to the ‘Ehiku Street/Ma‘alo Road intersection are:

- Acquire additional ROW
- Widen roads and pave: 12-ft lanes with 4-ft shoulders; 2 inches ACP, 6 inches ACB, 6 inches aggregate subbase

Costs for these improvements are captured within the estimates for Ma‘alo Road and ‘Ehiku Street. Upon implementation of the proposed improvements, all turning movements at the proposed intersection would accommodate the WB-40 design vehicle.

3.4.1.5 ‘Ehiku Street / Kūhiō Highway Intersection

The ‘Ehiku Street / Kūhiō Highway intersection is a 4-way signalized intersection. The State DOT ROW is 60 ft wide. The existing ‘Ehiku Street / Kūhiō Highway intersection has two lanes in the northbound (Kapa‘a-bound) direction: a through lane and a left/through lane. No exclusive left-turn phase operates at the signal for northbound traffic turning left into ‘Ehiku Street. The existing intersection cannot accommodate the WB-40 truck-turning movements. The existing pavement sections could not be found from as-built records.

The proposed intersection layout is shown on Figure 12. Proposed improvements to the ‘Ehiku Street/Ma‘alo Road intersection are:

- Widen roads and pave: 2 inches ACP, 6 inches ACB, 6 inches aggregate subbase
  - Right-turn from Kūhiō Highway southbound onto ‘Ehiku Street:
    Increase turning radius to 60 feet to accommodate the large trucks
- Construct American Disabilities Act (ADA)-accessible pedestrian ramps with signal heads on all corners of the intersection
- Relocate electrical/traffic cabinet, master arm, traffic signal and pull boxes
- Acquire additional ROW land (including survey maps)

Upon implementation of the proposed improvements, all turning movements at the proposed intersection would accommodate the WB-40 design vehicle.

3.4.1.6 Ma‘alo Road / Driveways 1 and 2 Intersection

A sharp right turn exists northbound on Ma‘alo Road at the intersection with Driveways 1 and 2, as described above in Section 3.3.1.6.

Proposed improvements to the Ma‘alo Road / Driveways 1 and 2 intersection are:

- Widen roads and pave: 2 inches ACP, 6 inches ACB, 6 inches aggregate subbase
- Acquire additional ROW land (including survey maps)
- Relocate/widen double-swing gate

3.4.1.7 Driveways 1 and 2

Driveways 1 and 2 connect Ma‘alo Road to the Project site. Driveway 1 is a direct route to the MSWLF that crosses two existing culverts in the vicinity of offsite wetlands. If selected as the proposed Project access route, this route will require wetland mitigation measures, as described

above in Section 3.3.1.7. Driveway 2 is an alternate route with greater length; however, this route bypasses the culverts and wetland area.

Proposed improvements to the selected driveway are:

- Provide chain-link fence on both sides of the driveway
- Establish utility corridors to bring water, electricity, and phones to the proposed Project site
- Provide new pavement (including road widening): 2 inches ACP, 6 inches ACB, 6 inches aggregate subbase
- Widen and relocate gate
- For Driveway 1 only: Reconstruct culverts connecting portions of the offsite wetlands, widen the road into the wetlands, and provide wetland consultation, permitting, and mitigation
- Acquire additional ROW land (including survey maps)

3.4.2 Permitting, Land Use, and Land Acquisitions

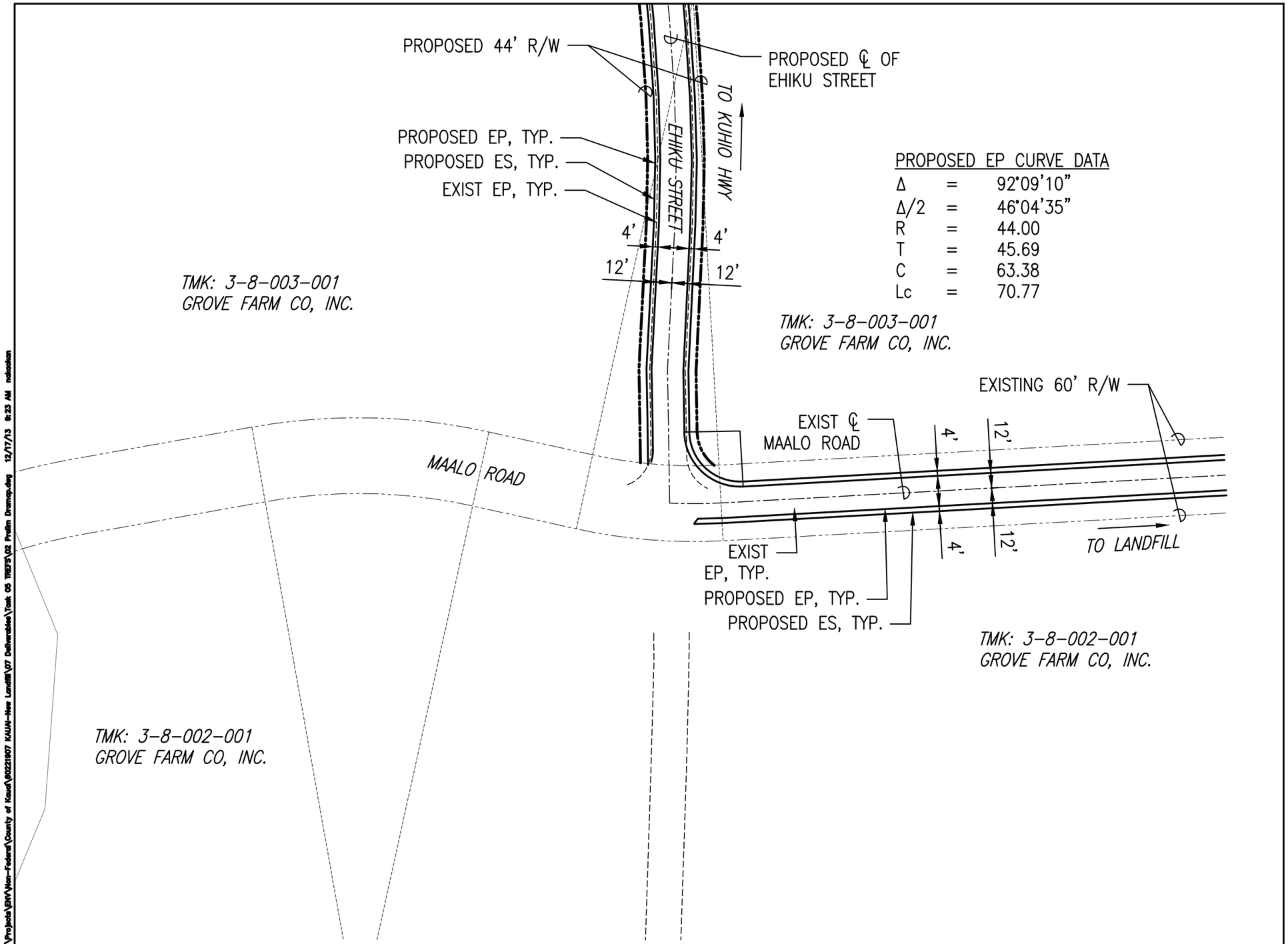
'Ehiku Street is zoned Agricultural. The ROW acquisitions described above are on properties currently zoned as Agricultural. The property owner of the ROW acquisition area is Grove Farm Co., Inc. Estimated time for rezoning and ROW acquisition is 12 months.

The proposed improvements described above would require an NPDES Form C permit from DOH. Estimated time for approval from DOH is 6 months. If Driveway 1 is selected as the proposed Project access route, then additional environmental requirements may be triggered, which could result in 12 months or more required for studies, permitting, and approval.

3.4.3 Planning-Level Cost Estimate

Table 10 and Table 11 provide detailed cost estimates for the 'Ehiku Street access routes. The planning-level cost estimates are:

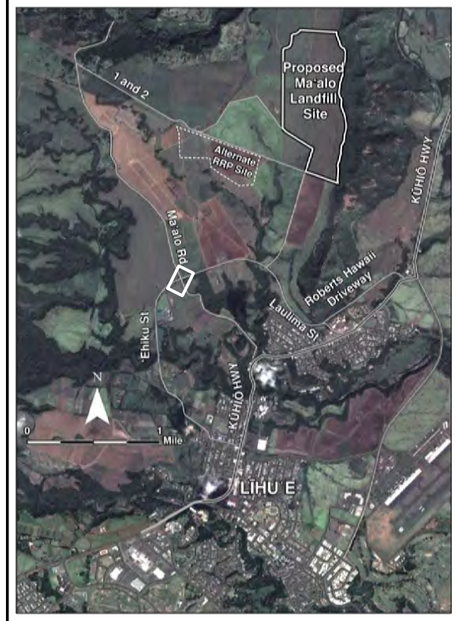
- B1: $43.3 million
- B2: $41.8 million



PLAN – INTERSECTION OF MAALO ROAD & EHIKU STREET

SCALE: 1" = 80'

KEY MAP



NOTES

SOURCE: HDOT PROJ. NO. ARR-0583(1) 2009
DATE: 10-10-2013
DRAWN BY: AT (AECOM)

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Figure 11
Plan of Ma'alo Road / 'Ehiku Street Intersection
New Kaua'i Landfill Traffic and Roadways Engineering Feasibility Study

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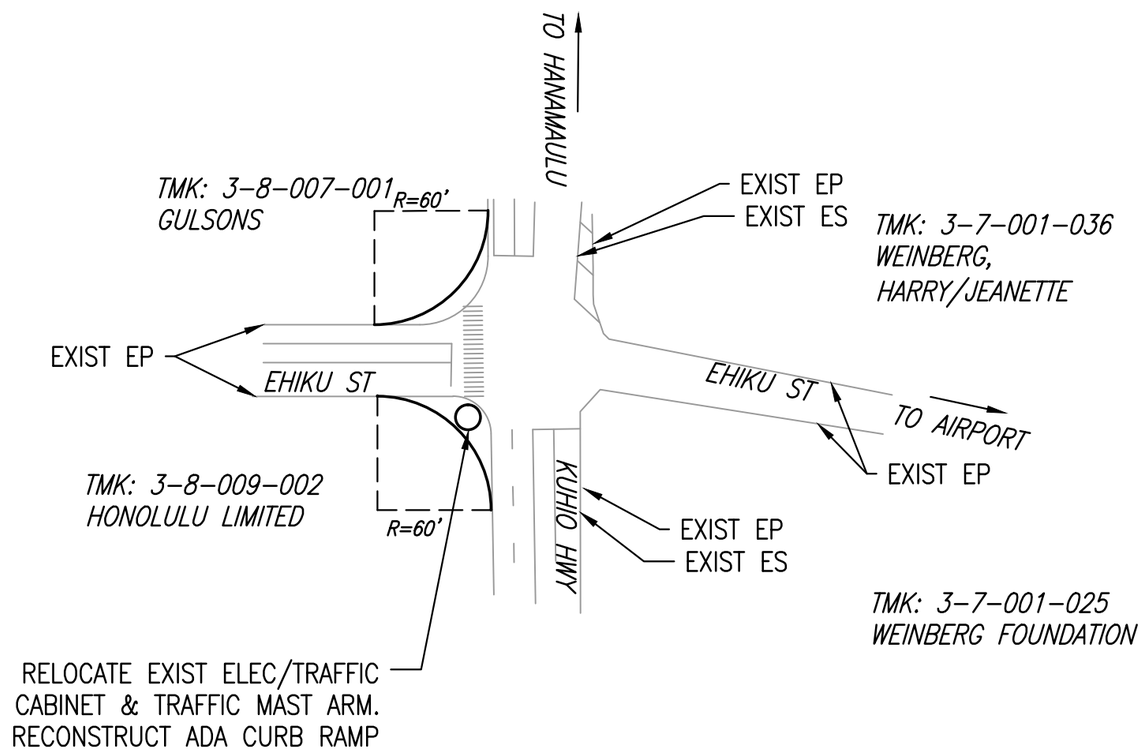


0 80 160 240

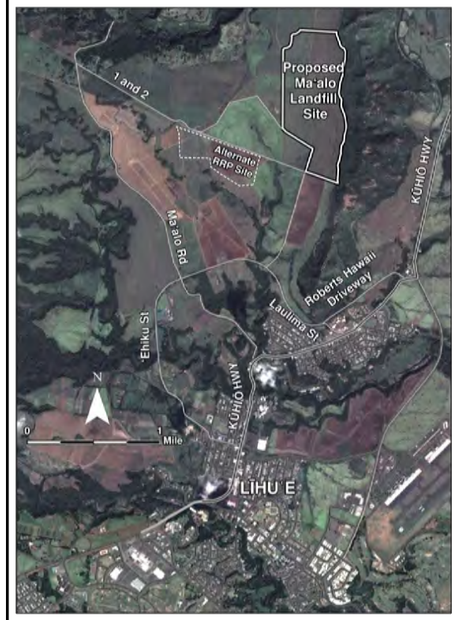
1" = 80'

SCALE FEET

PLAN – INTERSECTION OF KUHIO HWY & EHIKU STREET

SCALE: 1" = 80'

KEY MAP



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SOURCE: GOOGLE EARTH
DATE: 12-17-2013
DRAWN BY: AT (AECOM)

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Figure 12
Plan of Ehiku Street /
Kuhio Highway Intersection
New Kaua'i Landfill Traffic and Roadways
Engineering Feasibility Study

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Table 10: Access Route B1 ('Ehiku Street, Driveway 1) Detailed Cost Estimate

Item	Description		Qty	Unit	Unit Cost	Costs
'Ehiku Street Roadway Improvements						
	ROW Land Acquisition (Private portion of 'Ehiku Street, including Survey Maps)		1	LS	$150,000	$150,000
	Widen roadways and repave					
		Unclassified Excavation	12,500	CY	$120	$1,500,000
		Asphalt Concrete Pavement (ACP)	3,600	tons	$180	$648,000
		Asphalt Concrete Base (ACB)	5,400	CY	$360	$1,944,000
		Aggregate Subbase	5,400	CY	$120	$648,000
					Subtotal Road Improvements	***$4,890,000***
Ma'alo Road Roadway Improvements						
	Widen roadways and repave					
		Unclassified Excavation	13,700	CY	$120	$1,644,000
		Asphalt Concrete Pavement (ACP)	3,900	tons	$180	$702,000
		Asphalt Concrete Base (ACB)	5,900	CY	$360	$2,124,000
		Aggregate Subbase	5,900	CY	$120	$708,000
	Reconstruct existing culverts		7	EA	$10,000	$70,000
	Relocate guardrails		9,900	LF	$100	$990,000
					Subtotal Road Improvements	***$6,238,000***
Utility Improvements						
	Power/Telephone Pole Relocation/Installation		40	Ea	$5,000	$200,000
	Construct Water Supply Line to Driveway 1					
		Unclassified Excavation	4,400	CY	$50	$220,000
		Backfill	4,400	CY	$80	$352,000
		12-inch Pipe	9,740	LF	$150	$1,461,000
		Booster Pump Station	1	LS	$750,000	$750,000
					Subtotal Utility Improvements	***$2,983,000***
Reconstruct Waterway/Culvert Under 'Ehiku Road						
	Investigate, Design, Permit, and Repair Waterway/"Culvert"		1	EA	$10,000,000	$10,000,000
					Subtotal Waterway/Culvert Repair	***$10,000,000***
'Ehiku Street / Kūhiō Highway Intersection Improvements						
	Widen roadways and repave					
		Unclassified Excavation	200	CY	$120	$24,000
		Asphalt Concrete Pavement (ACP)	100	tons	$180	$18,000
		Asphalt Concrete Base (ACB)	100	CY	$360	$36,000
		Aggregate Subbase	100	CY	$120	$12,000
	Construct ADA-accessible pedestrian ramps with signal		4	EA	$10,000	$40,000
	Relocate Cabinet, Mast Arm, Traffic Signal & Pull Boxes		1	LS	$120,000	$120,000
	ROW Land Acquisition (Including Survey Maps)		1	LS	$30,000	$30,000
					Subtotal Intersection Improvements	***$280,000***

Item	Description	Qty	Unit	Unit Cost	Costs
Ma'alo Road / Driveway 1 Intersection Improvements					
	Widen roadways and repave				
	Unclassified Excavation	60	CY	$120	$8,000
	Asphalt Concrete Pavement (ACP)	20	tons	$180	$4,000
	Asphalt Concrete Base (ACB)	30	CY	$360	$11,000
	Aggregate Subbase	30	CY	$120	$4,000
	ROW Land Acquisition (Including Survey Maps)	1	LS	$30,000	$30,000
	Relocate/widen Double-swing gate	1	EA	$1,500	$2,000
	Subtotal Driveway Intersection Improvements				***$59,000***
Driveway 1					
	Chain-link fence	20,800	LF	$50	$1,040,000
	Utility corridors (water, wastewater, electricity, and phones)				
	Power/Telephone Pole Installation	60	Ea	$5,000	$300,000
	Construct Water Supply Line to Project Site				
	Unclassified Excavation	4,700	CY	$50	$235,000
	Backfill	4,700	CY	$80	$376,000
	12-inch Pipe	10,400	LF	$150	$1,560,000
	New pavement & road widening				
	Unclassified Excavation	14,400	CY	$120	$1,728,000
	Asphalt Concrete Pavement (ACP)	4,100	tons	$180	$738,000
	Asphalt Concrete Base (ACB)	6,200	CY	$360	$2,232,000
	Aggregate Subbase	6,200	CY	$120	$744,000
	Relocate/widen Double-swing gate	3	Ea	$1,500	$5,000
	Reconstruct existing culverts	2	Ea	$10,000	$20,000
	Wetlands consultation, permitting, and mitigation	1	Ea	$1,000,000	$1,000,000
	ROW Land Acquisition (Including Survey Maps)	1	LS	$150,000	$150,000
	Subtotal Driveway 1 Improvements				***$10,128,000***
Permitting					***$50,000***
Subtotal - Route B1					$34,628,000
	Contingency (25%)				$8,657,000
Total Cost - Access Route B1					**$43,285,000**

Table 11: Access Route B2 ('Ehiku Street, Driveway 2) Detailed Cost Estimate

Item	Description		Qty	Unit	Unit Cost	Costs
'Ehiku Street Roadway Improvements						
	ROW Land Acquisition (Private portion of 'Ehiku Street, including Survey Maps)		1	LS	$150,000	$150,000
	Widen roadways and repave					
		Unclassified Excavation	12,500	CY	$120	$1,500,000
		Asphalt Concrete Pavement (ACP)	3,600	tons	$180	$648,000
		Asphalt Concrete Base (ACB)	5,400	CY	$360	$1,944,000
		Aggregate Subbase	5,400	CY	$120	$648,000
					Subtotal Road Improvements	***$4,890,000***
Ma'alo Road Roadway Improvements						
	Widen roadways and repave					
		Unclassified Excavation	13,700	CY	$120	$1,644,000
		Asphalt Concrete Pavement (ACP)	3,900	tons	$180	$702,000
		Asphalt Concrete Base (ACB)	5,900	CY	$360	$2,124,000
		Aggregate Subbase	5,900	CY	$120	$708,000
	Reconstruct existing culverts		7	EA	$10,000	$70,000
	Relocate guardrails		9,900	LF	$100	$990,000
					Subtotal Road Improvements	***$6,238,000***
Utility Improvements						
	Power/Telephone Pole Relocation/Installation		40	Ea	$5,000	$200,000
	Construct Water Supply Line to Driveway 1					
		Unclassified Excavation	4,400	CY	$50	$220,000
		Backfill	4,400	CY	$80	$352,000
		12-inch Pipe	9,740	LF	$150	$1,461,000
		Booster Pump Station	1	LS	$750,000	$750,000
					Subtotal Utility Improvements	***$2,983,000***
Repair Waterway/Culvert Under 'Ehiku Road						
	Investigate, Design, Permit, and Repair Waterway/"Culvert"		1	EA	$10,000,000	$10,000,000
					Subtotal Waterway/Culvert Repair	***$10,000,000***
'Ehiku Street / Kūhiō Highway Intersection Improvements						
	Widen roadways and repave					
		Unclassified Excavation	200	CY	$120	$24,000
		Asphalt Concrete Pavement (ACP)	100	tons	$180	$18,000
		Asphalt Concrete Base (ACB)	100	CY	$360	$36,000
		Aggregate Subbase	100	CY	$120	$12,000
	Construct ADA-accessible pedestrian ramps with signal		4	EA	$10,000	$40,000
	Relocate Cabinet, Mast Arm, Traffic Signal & Pull Boxes		1	LS	$120,000	$120,000
	ROW Land Acquisition (Including Survey Maps)		1	LS	$30,000	$30,000
					Subtotal Intersection Improvements	***$280,000***

Item	Description	Qty	Unit	Unit Cost	Costs
Ma'alo Road / Driveway 2 Intersection Improvements					
	Widen roadways and repave				
	Unclassified Excavation	60	CY	$120	$8,000
	Asphalt Concrete Pavement (ACP)	20	tons	$180	$4,000
	Asphalt Concrete Base (ACB)	30	CY	$360	$11,000
	Aggregate Subbase	30	CY	$120	$4,000
	ROW Land Acquisition (Including Survey Maps)	1	LS	$30,000	$30,000
	Relocate/widen Double-swing gate	1	EA	$1,500	$2,000
	Subtotal Driveway Intersection Improvements				***$59,000***
Driveway 2					
	Chain-link fence	20,400	LF	$50	$1,020,000
	Utility corridors (water, wastewater, electricity, and phones)				
	Power/Telephone Pole Installation	60	Ea	$5,000	$300,000
	Construct Water Supply Line to Project Site				
	Unclassified Excavation	4,600	CY	$50	$230,000
	Backfill	4,600	CY	$80	$368,000
	12-inch Pipe	10,200	LF	$150	$1,530,000
	New pavement & road widening				
	Unclassified Excavation	14,200	CY	$120	$1,704,000
	Asphalt Concrete Pavement (ACP)	4,100	tons	$180	$738,000
	Asphalt Concrete Base (ACB)	6,100	CY	$360	$2,196,000
	Aggregate Subbase	6,100	CY	$120	$732,000
	Relocate/widen Double-swing gate	3	Ea	$1,500	$5,000
	ROW Land Acquisition (Including Survey Maps)	1	LS	$150,000	$150,000
	Subtotal Driveway 1 Improvements				***$8,973,000***
Permitting					***$50,000***
Subtotal - Route B2					$33,473,000
	Contingency (25%)				$8,368,250
Total Cost - Access Route B2					**$41,841,250**

3.5 LAULIMA STREET ACCESS (C3)

3.5.1 Existing Conditions and Improvements

The Laulima Street access is shown on Figure 1 as Route C3. The access route starts at the Laulima Street / Kūhiō Highway intersection and ends at the Project site. If the alternate RRP site is implemented, then a portion of either Driveway 1 (approximately 1,913 linear feet) or Driveway 2 (approximately 4,865 linear feet) will be used to connect the Landfill site to the RRP site.

3.5.1.1 LAULIMA STREET ROADWAY IMPROVEMENTS

Laulima Street makai of Kūhiō Highway is under County jurisdiction. Laulima Street mauka of Kūhiō Highway is owned by Grove Farm Co, Inc. Laulima Street mauka of Kūhiō Highway extends a short distance past the commercial buildings near the highway to the existing gate, beyond which is a gravel road, designated as Driveway 3 (Figure 6). Laulima Street is a 30-ft-wide paved road, and no defined lane widths or shoulder widths are present. The existing pavement section could not be found from as-built records. A typical section is presented on Figure 7.

Proposed improvements to Laulima Street, which must conform to County of Kaua'i requirements, are:

- Acquire additional ROW
- Widen roads and pave: 12-ft lanes with 4-ft shoulders; 2 inches ACP, 6 inches ACB, 6 inches aggregate subbase

3.5.1.2 Utility Improvements

The nearest water connection is the 12-inch main along Kūhiō Highway at the intersection of Laulima Street. Although an existing 8-inch sewer main runs west along Kūhiō Highway, it is recommended that cesspools be installed at the facility instead. Electricity and telephone service is also available at the intersection of Laulima Street and Kūhiō Highway. Additionally, a 12-inch waterline may require relocating to satisfy the minimum cover requirements. Recommended utility improvements to the Laulima Street access route are:

- Construct power and telephone poles along the access route
- Connect water to Driveway 3

3.5.1.3 Laulima Street / Kūhiō Highway Intersection

The existing Laulima Street / Kūhiō Highway intersection is a 3-way, unsignalized intersection (Laulima Street mauka of Kūhiō Highway is not currently a public roadway). Laulima Street mauka of Kūhiō Highway is currently a private driveway that provides access to businesses. The Kūhiō Highway State DOT ROW is 60 ft wide. The existing intersection cannot accommodate the WB-40 truck-turning movements. The existing pavement sections could not be found from as-built records.

Based on discussions with the State DOT regarding this access route to the Project site, coordination may be required with the future Līhu'e bypass project. The State DOT suggests including a left-turn lane in the northbound direction on Kūhiō Highway.

The proposed intersection layout is shown on Figure 13. Access to businesses will be maintained. Proposed improvements to the Laulima Street / Kūhiō Highway intersection are:

- Signalize the intersection
- Widen roads and pave: 2 inches ACP, 6 inches ACB, 6 inches aggregate subbase
  - Left-turn lane in both directions on Kūhiō Highway: 11-ft lane, 100-ft storage length, 100-ft taper length
  - 4-way intersection: Reconfigure median islands
- Excavation and Grading along Laulima Street sloped shoulder
- Construct retaining wall (approximately 8 ft tall) along Laulima Street due to slope excavation
- Construct ADA-accessible pedestrian ramps on all corners of the intersection
- Relocate utility poles, culvert
- Acquire additional ROW land (including survey maps)

Upon implementation of the proposed improvements, all turning movements at the proposed intersection would accommodate the WB-40 design vehicle.

3.5.1.4 Driveway 3

Driveway 3 connects Laulima Street to the proposed Project site.

Proposed improvements to the driveway are:

- Provide chain-link fence on both sides of the driveway
- Establish utility corridors to bring water, electricity, and phones to the proposed Project site
- Provide new pavement (including road widening): 2 inches ACP, 6 inches ACB, 6 inches aggregate subbase
- Acquire additional ROW land (including survey maps)

3.5.1.5 DRIVEWAY 1 OR 2

If the alternate RRP site is implemented, then one of the following two alternatives will be used to connect the Landfill site to the RRP site:

- Approximately 1,913 linear feet of Driveway 1
- Approximately 4,965 linear feet of Driveway 2

Driveway 1 is a direct route to the RRP site that crosses two existing culverts in the vicinity of offsite wetlands. If selected as the proposed Project access route, this route will require wetland mitigation measures, as described above in Section 3.3.1.7. Driveway 2 is an alternate, longer route that bypasses the culverts and wetland area, but may have more impact on use of the parcel.

Proposed improvements to the selected driveway are:

- Provide chain-link fence on both sides of the driveway
- Establish utility corridors to bring water, electricity, and phones to the proposed Project site
- Provide new pavement (including road widening): 2 inches ACP, 6 inches ACB, 6 inches aggregate subbase
- Widen and relocate gate
- For Driveway 1 only: Reconstruct culverts connecting portions of the offsite wetlands, widen the road into the wetlands, and provide wetlands consultation, permitting, and mitigation.
- Acquire additional ROW land (including survey maps)

3.5.2 Permitting, Land Use, and Land Acquisitions

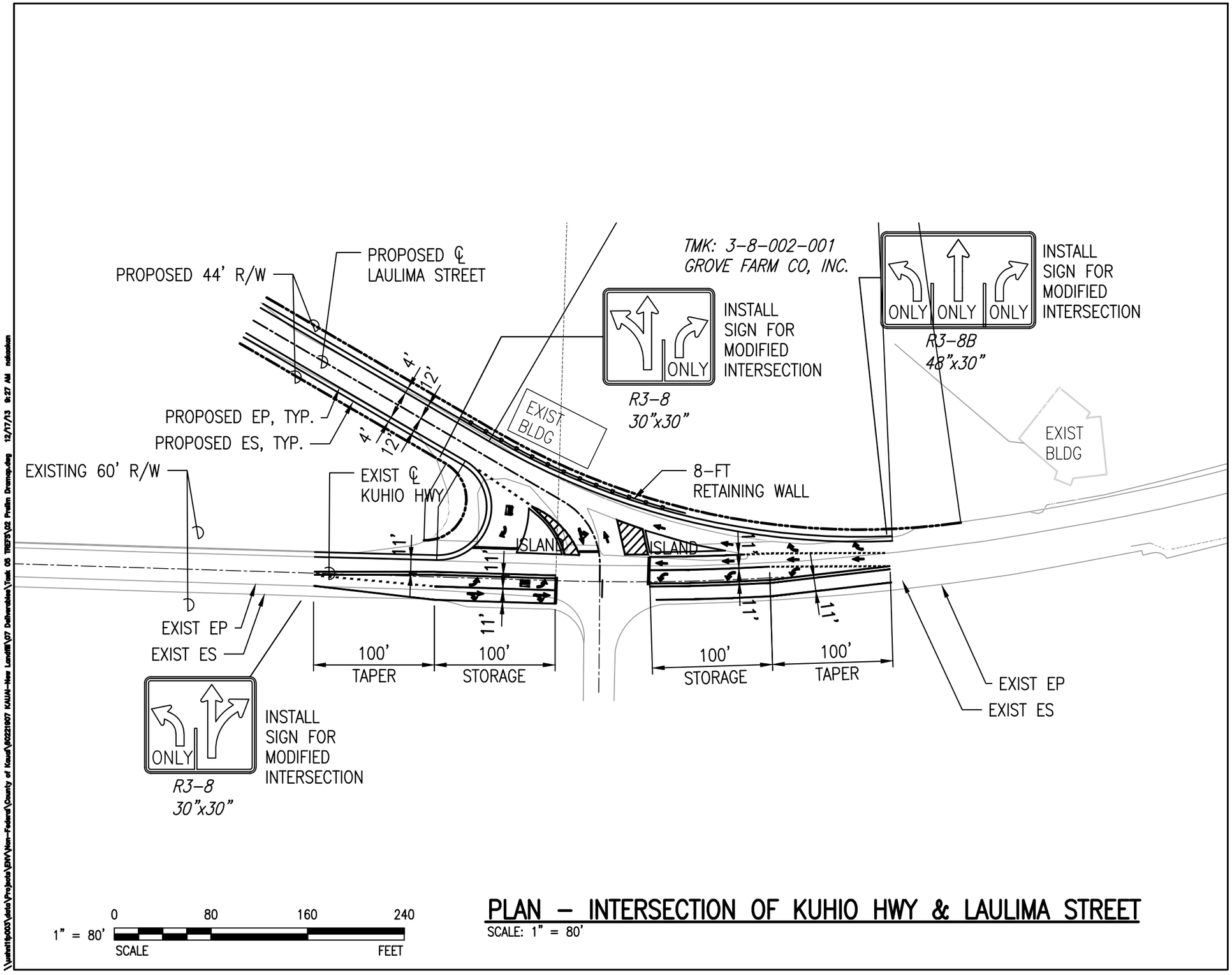
Laulima Street mauka of the highway is zoned as Mixed Agricultural/Industrial. The ROW acquisitions described above are on properties currently zoned as Mixed Agricultural/Industrial. The property owners of the ROW acquisition areas are Grove Farm Co., Inc. and the State of Hawai'i. Estimated time for rezoning and ROW acquisition is 12 months.

The proposed improvements described above will require an NPDES Form C permit from DOH. Estimated time for approval from DOH is 6 months.

3.5.3 Planning-Level Cost Estimate

Table 12 provides detailed cost estimates for the Laulima Street access route. The planning-level cost estimate is:

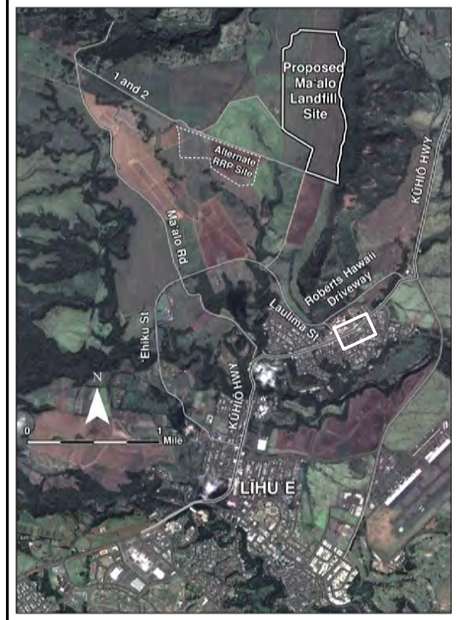
- C3: $12.5 million



PLAN – INTERSECTION OF KUHIO HWY & LAULIMA STREET

SCALE: 1" = 80'

KEY MAP



NOTES

SOURCE: HDOT PROJ. NO. 56A-01-04M 2005
DATE: 10-10-2013
DRAWN BY: AT (AECOM)

Figure 13
Plan of Laulima Street / Kuhio Highway Intersection
New Kaua'i Landfill Traffic and Roadways Engineering Feasibility Study

Table 12: Access Route C3 (Laulima Street) Cost Estimate Breakdown

Item	Description	Qty	Unit	Unit Cost	Costs
Laulima Street Roadway Improvements					
	ROW acquisition	1	LS	$50,000	$50,000
	Widen roadways and repave				
	Unclassified Excavation	1,800	CY	$120	$216,000
	Asphalt Concrete Pavement (ACP)	600	tons	$180	$108,000
	Asphalt Concrete Base (ACB)	800	CY	$360	$288,000
	Aggregate Subbase	800	CY	$120	$96,000
				Subtotal Road Improvements	***$758,000***
Utility Improvements					
	Power/Telephone Pole Relocation/Installation	12	Ea	$5,000	$60,000
	Construct Water Supply Line to Driveway 3				
	Unclassified Excavation	600	CY	$50	$30,000
	Backfill	600	CY	$80	$48,000
	12-inch Pipe	1,261	LF	$150	$190,000
	Booster Pump Station	1	LS	$750,000	$750,000
				Subtotal Utility Improvements	***$1,078,000***
Laulima Street / Kūhiō Highway Intersection Improvements					
	Signalization	1	LS	$1,000,000	$1,000,000
	Widen roadways and repave				
	Unclassified Excavation	900	CY	$120	$108,000
	Asphalt Concrete Pavement (ACP)	300	tons	$180	$54,000
	Asphalt Concrete Base (ACB)	400	CY	$360	$144,000
	Aggregate Subbase	400	CY	$120	$48,000
	Construct Retaining wall	200	LF	$750	$150,000
	Construct ADA-accessible pedestrian ramps	4	EA	$10,000	$40,000
	Relocate Utility Poles, Culvert	1	LS	$50,000	$50,000
	ROW Land Acquisition (Including Survey Maps)	1	LS	$30,000	$30,000
				Subtotal Intersection Improvements	***$1,624,000***
Driveway 3					
	Chain-link fence	15,000	LF	$50	$750,000
	Utility corridors (water, wastewater, electricity, and phones)				
	Power/Telephone Pole Installation	40	Ea	$5,000	$200,000
	Construct Water Supply Line to Project Site				
	Unclassified Excavation	3,400	CY	$50	$170,000
	Backfill	3,400	CY	$80	$272,000
	12-inch Pipe	7,500	LF	$150	$1,125,000
	New pavement & road widening				
	Unclassified Excavation	10,400	CY	$120	$1,248,000
	Asphalt Concrete Pavement (ACP)	3,000	tons	$180	$540,000
	Asphalt Concrete Base (ACB)	4,500	CY	$360	$1,620,000
	Aggregate Subbase	4,500	CY	$120	$540,000
	Gate Relocation	3	EA	$1,500	$5,000
	ROW Land Acquisition (Including Survey Maps)	1	LS	$125,000	$125,000
				Subtotal Driveway 1 Improvements	***$6,470,000***

Item	Description	Qty	Unit	Unit Cost	Costs
Permitting					***$50,000***
Subtotal - Route C3					$9,980,000
	Contingency (25%)				$2,495,000
Total Cost - Access Route C3					**$12,475,000**

This cost estimate includes the cost to signalize the Laulima Street / Kūhiō Highway intersection. Signalization of this intersection is recommended for this alternative when warranted. Signalization would also be desirable regardless of which access route is selected, but may not be warranted for the other routes.

3.6 ROBERTS HAWAII DRIVEWAY ACCESS (D3)

3.6.1 Existing Conditions and Improvements

The Roberts Hawaii Driveway access is shown on Figure 6 as Route D3. The access route starts at the Roberts Hawaii Driveway intersection with Kūhiō Highway and intersects with Laulima Street, at which point the route follows the Laulima Street access to the landfill. If the alternate RRP site is implemented, then a portion of either Driveway 1 (approximately 1,913 linear feet) or Driveway 2 (approximately 4,865 linear feet) will be used to connect the Landfill site to the RRP site.

The Roberts Hawaii Driveway access is owned by Visionary LLC and Grove Farm Co., Inc. The existing driveway is an 18-ft wide paved road; there are no defined lane widths or shoulder widths. The existing pavement section could not be found from as-built records.

The proposed improvements to the Roberts Hawaii Driveway access, which must conform to County of Kaua'i requirements, are:

- Acquire additional ROW
- Widen roads and pave: 12-ft lanes with 4-ft shoulders; 2 inches ACP, 6 inches ACB, 6 inches aggregate subbase
- Stabilize shoulders and provide erosion control
- Provide drainage improvements (shoulder swales, culverts, drainage outfalls)

3.6.1.1 UTILITY IMPROVEMENTS

The nearest water connection is the 12-inch main along Kūhiō Highway at the intersection of Laulima Street. Although an existing 8-inch sewer main runs west along Kūhiō Highway, it is recommended that cesspools be installed at the facility instead. Electricity and telephone service is also available at the intersection of Laulima Street and Kūhiō Highway. Additionally, a 12-inch waterline may require relocating to satisfy the minimum cover requirements. Recommended utility improvements to the Roberts Hawaii Driveway access route are as follows:

- Construct power and telephone poles along Laulima Street to Driveway 3
- Connect water along Laulima Street to Driveway 3

3.6.1.2 ROBERTS HAWAII DRIVEWAY / KŪHIŌ HIGHWAY INTERSECTION

The Roberts Hawaii Driveway / Kūhiō Highway intersection is a 3-way, unsignalized intersection. The State DOT ROW is 60 ft wide. The existing intersection can accommodate WB-40 truck-turning movements. The existing pavement sections could not be found from as-built records.

Based on discussions with DOT regarding this access route to the landfill, coordination is required with the Līhu'e bypass project. A left-turn lane in the northbound direction on Kūhiō Highway is required.

The proposed intersection layout is shown on Figure 14. Access to Roberts Hawaii will be maintained. Proposed improvements to the Roberts Hawaii Driveway / Kūhiō Highway intersection are:

- Signalize the Intersection
- Widen roads and pave: 2 inches ACP, 6 inches ACB, 6 inches aggregate subbase
  - Left-turn lane in northbound direction on Kūhiō Highway:
    11-ft lane, 200-ft storage length, 100-ft taper length
  - Right-turn lane in southbound direction on Kūhiō Highway:
    11-ft lane, 200-ft storage length, 100-ft taper length
- Construct ADA-accessible pedestrian ramps on two corners of the intersection
- Acquire additional ROW land (including survey maps)

Upon implementation of the proposed improvements, all turning movements at the proposed intersection would accommodate the WB-40 design vehicle.

3.6.1.3 DRIVEWAY 3

Driveway 3 connects Laulima Street to the proposed Project site.

Proposed improvements to the driveway are:

- Stabilize shoulders and provide erosion control
- Provide chain-link fence on both sides of the driveway
- Establish utility corridors to bring water, electricity, and phones to the proposed Project site
- Provide new pavement (including road widening): 2 inches ACP, 6 inches ACB, 6 inches aggregate subbase
- Acquire additional ROW land (including survey maps)

3.6.1.4 DRIVEWAY 1 OR 2

If the alternate RRP site is implemented, then one of the following two alternatives will be used to connect the Landfill site to the RRP site:

- Approximately 1,913 linear feet of Driveway 1
- Approximately 4,965 linear feet of Driveway 2

Driveway 1 is a direct route to the RRP site that crosses two existing culverts in the vicinity of offsite wetlands. If selected as the proposed Project access route, this route will require wetland mitigation measures, as described above in Section 3.3.1.7. Driveway 2 is an alternate, longer route that bypasses the culverts and wetland area, but may have more impact on use of the parcel.

Proposed improvements to the selected driveway are:

- Provide chain-link fence on both sides of the driveway

- Establish utility corridors to bring water, electricity, and phones to the proposed Project site
- Provide new pavement (including road widening): 2 inches ACP, 6 inches ACB, 6 inches aggregate subbase
- Widen and relocate gate
- For Driveway 1 only: Reconstruct culverts connecting portions of the offsite wetlands, widen the road into the wetlands, and provide wetlands consultation, permitting, and mitigation
- Acquire additional ROW land (including survey maps)

3.6.2 Permitting, Land Use, and Land Acquisitions

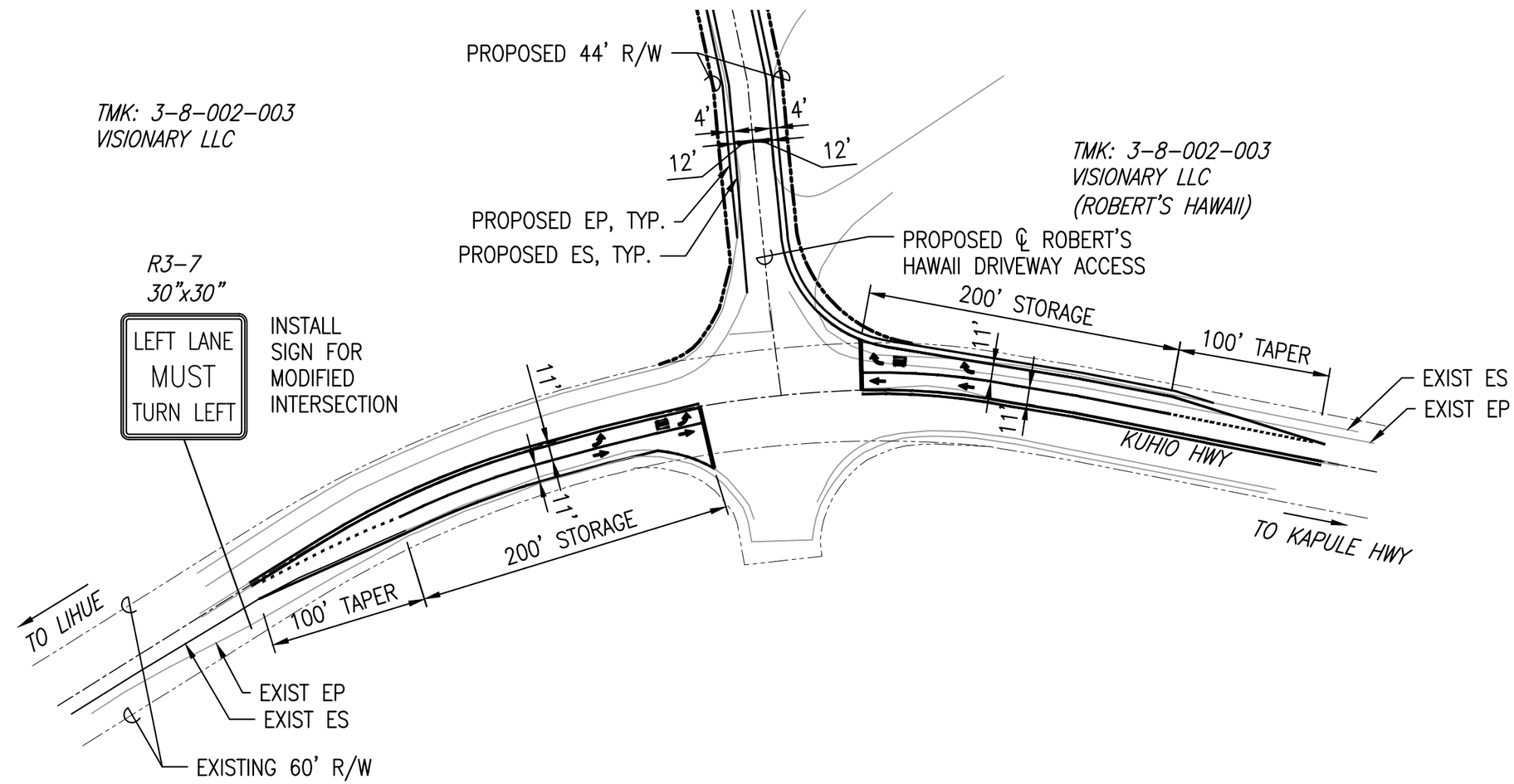
The Roberts Hawaii Driveway access is zoned as Residential and Industrial. The ROW acquisitions described above are on properties currently zoned as Residential and Industrial. The property owners of the ROW acquisition areas are Visionary LLC and Grove Farm Co., Inc. Estimated time for rezoning and ROW acquisition is 12 months.

The proposed improvements described above will require an NPDES Form C permit from the State DOH. Estimated time for approval from DOH is 6 months.

3.6.3 Planning-Level Cost Estimate

Table 13 provides detailed cost estimates for the Roberts Hawaii Driveway access route. The planning-level cost estimate is:

- D3: $14.3 million

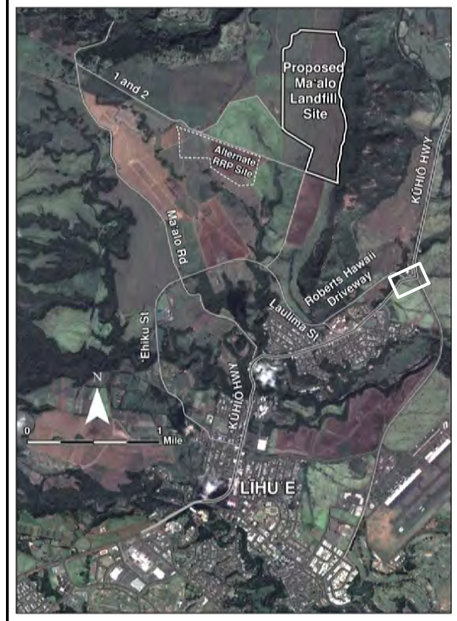


PLAN – INTERSECTION OF KUHIO HWY & ROBERT'S HAWAII DRIVEWAY ACCESS

SCALE: 1" = 80'

1" = 80' 0 80 160 240 SCALE FEET

KEY MAP



NOTES

SOURCE: GOOGLE EARTH
DATE: 10-10-2013
DRAWN BY: AT (AECOM)

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Figure 14
Plan of Roberts Hawaii Driveway / Kuhio Highway Intersection
New Kaua'i Landfill Traffic and Roadways Engineering Feasibility Study

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Table 13: Access Route D3 (Roberts Hawaii Driveway) Detailed Cost Estimate

Item	Description	Qty	Unit	Unit Cost	Costs
Roberts Hawaii Driveway Roadway Improvements					
	ROW acquisition	1	LS	$100,000	$100,000
	Widen roadways and repave				
	Unclassified Excavation	5,700	CY	$120	$684,000
	Asphalt Concrete Pavement (ACP)	1,700	tons	$180	$306,000
	Asphalt Concrete Base (ACB)	2,500	CY	$360	$900,000
	Aggregate Subbase	2,500	CY	$120	$300,000
	Shoulder Stabilization, Erosion Control	1	LS	$50,000	$50,000
	Drainage Improvements	1	LS	$100,000	$100,000
				Subtotal Road Improvements	***$2,440,000***
Utility Improvements					
	Power/Telephone Pole Relocation/Installation	12	Ea	$5,000	$60,000
	Construct Water Supply Line to Driveway 3				
	Unclassified Excavation	600	CY	$50	$30,000
	Backfill	600	CY	$80	$48,000
	12-inch Pipe	1,261	LF	$150	$190,000
	Booster Pump Station	1	LS	$750,000	$750,000
				Subtotal Utility Improvements	***$1,078,000***
Roberts Hawaii Driveway / Kūhiō Highway Intersection Improvements					
	Signalization	1	LS	$1,000,000	$1,000,000
	Widen roadways and repave				
	Unclassified Excavation	900	CY	$120	$108,000
	Asphalt Concrete Pavement (ACP)	300	tons	$180	$54,000
	Asphalt Concrete Base (ACB)	400	CY	$360	$144,000
	Aggregate Subbase	400	CY	$120	$48,000
	Construct ADA-accessible pedestrian ramps	2	EA	$10,000	$20,000
	ROW Land Acquisition (Including Survey Maps)	1	LS	$30,000	$30,000
				Subtotal Intersection Improvements	***$1,404,000***
Driveway 3					
	Chain-link fence	15,000	LF	$50	$750,000
	Utility corridors (water, wastewater, electricity, and phones)				
	Power/Telephone Pole Installation	40	Ea	$5,000	$200,000
	Construct Water Supply Line to Project Site				
	Unclassified Excavation	3,400	CY	$50	$170,000
	Backfill	3,400	CY	$80	$272,000
	12-inch Pipe	7,500	LF	$150	$1,125,000
	New pavement & road widening				
	Unclassified Excavation	10,400	CY	$120	$1,248,000
	Asphalt Concrete Pavement (ACP)	3,000	tons	$180	$540,000
	Asphalt Concrete Base (ACB)	4,500	CY	$360	$1,620,000
	Aggregate Subbase	4,500	CY	$120	$540,000
	Gate Relocation	3	EA	$1,500	$5,000
	ROW Land Acquisition (Including Survey Maps)	1	LS	$125,000	$125,000
				Subtotal Driveway 1 Improvements	***$6,470,000***

Item	Description	Qty	Unit	Unit Cost	Costs
Permitting					***$50,000***
Subtotal - Route C3					$11,442,000
	Contingency (25%)				$2,860,500
Total Cost - Access Route C3					**$14,302,500**

3.7 ALTERNATE RRP SITE ACCESS ROUTE

If the alternate RRP site is implemented, then additional costs may be required to connect the MSWLF and RRP sites via a portion of Driveway 1 or 2. Those additional costs are shown in Table 14 (Driveway 1) and Table 15 (Driveway 2).

Table 14: Detailed Cost Estimate for Portion of Driveway 1 Connecting Proposed Project to Alternate RRP Site

Item	Description	Qty	Unit	Unit Cost	Costs
Driveway 1					
	Chain-link fence	10,120	LF	$50	$506,000
	Utility corridors (water, wastewater, electricity, and phones)				
	Power/Telephone Pole Installation	10	Ea	$5,000	$50,000
	Construct Water Supply Line to Project Site				
	Unclassified Excavation	2,300	CY	$50	$115,000
	Backfill	2,300	CY	$80	$184,000
	12-inch Pipe	5,060	LF	$150	$759,000
	New pavement & road widening				
	Unclassified Excavation	7,000	CY	$120	$840,000
	Asphalt Concrete Pavement (ACP)	2,000	tons	$180	$360,000
	Asphalt Concrete Base (ACB)	3,000	CY	$360	$1,080,000
	Aggregate Subbase	3,000	CY	$120	$360,000
	Relocate/widen Double-swing gate	1	Ea	$1,500	$1,500
	Reconstruct existing culverts	2	Ea	$10,000	$20,000
	Wetlands consultation, permitting, and mitigation	1	Ea	$1,000,000	$1,000,000
	ROW Land Acquisition (Including Survey Maps)	1	LS	$75,000	$75,000
		Subtotal Driveway 1 Improvements			***$5,350,500***
Permitting					***$50,000***
Subtotal - Portion of Driveway 1					$5,401,000
	Contingency (25%)				$1,351,000
Total Cost - Portion of Driveway 1					**$6,752,000**

Note: This cost applies only if the alternate RRP site is implemented and the portion of Driveway 1 is selected as the connecting route.

Table 15: Detailed Cost Estimate for Portion of Driveway 2 Connecting Proposed Project to Alternate RRP Site

Item	Description	Qty	Unit	Unit Cost	Costs
Driveway 2					
	Chain-link fence	9,720	LF	$50	$486,000
	Utility corridors (water, wastewater, electricity, and phones)				
	Power/Telephone Pole Installation	30	Ea	$5,000	$150,000
	Construct Water Supply Line to Project Site				
	Unclassified Excavation	2,200	CY	$50	$110,000
	Backfill	2,200	CY	$80	$176,000
	12-inch Pipe	4,860	LF	$150	$729,000
	New pavement & road widening				
	Unclassified Excavation	6,800	CY	$120	$816,000
	Asphalt Concrete Pavement (ACP)	2,000	tons	$180	$360,000
	Asphalt Concrete Base (ACB)	2,900	CY	$360	$1,044,000
	Aggregate Subbase	2,900	CY	$120	$348,000
	Relocate/widen Double-swing gate	1	Ea	$1,500	$1,500
	ROW Land Acquisition (Including Survey Maps)	1	LS	$75,000	$75,000
		Subtotal Driveway 1 Improvements			***$4,295,500***
Permitting					***$50,000***
Subtotal - Portion of Driveway 2					$4,346,000
	Contingency (25%)				$1,087,000
Total Cost - Portion of Driveway 2					**$5,433,000**

Note: This cost applies only if the alternate RRP site is implemented and the portion of Driveway 2 is selected as the connecting route.

3.8 INFRASTRUCTURE IMPROVEMENTS SUMMARY AND CONCLUSION

The significant infrastructure improvements recommended for the six access routes are summarized in Section 5.0. The planning-level cost estimate summary for the six access routes is presented in Table 16, sorted by total cost.

Table 16: Summary of the Planning-Level Cost Estimates for the Six Access Routes

Access Route	Estimated Cost ($ million)	
	Base Cost Estimate	**With 25% Contingency**
C3: Laulima Road and Driveway 3	10.0 [a]	12.5 [a]
D3: Roberts Hawaii Driveway and Driveway 3	11.4	14.3
A2: Ma'alo Road and Driveway 2	28.2	35.3
A1: Ma'alo Road and Driveway 1	29.4	36.7
B2: 'Ehiku Street and Driveway 2	33.5	41.8
B1: 'Ehiku Street and Driveway 1	34.6	43.3

Note: Cost estimates for Routes A, B, and D do not include recommended signalization at Laulima.
[a] If the alternate RRP site is implemented, then additional cost for developing a portion of Driveway 1 or 2 to connect to it the Project site would be:
Driveway 1: Base Cost $5.4 million, with 25% Contingency $6.8 million
Driveway 2: Base Cost $4.3 million, with 25% Contingency $5.4 million

Based on the planning-level cost estimates, the Laulima Street access has the lowest expected cost, followed by the Roberts Driveway Access. The Laulima Street access also has the shortest and most

direct route between Kūhiō Highway and the Project (1.7 miles), resulting in less pavement and utility improvement costs (and future fuel consumption for waste transport) compared to the other routes.

The Laulima Street access route (C3) is the shortest and most direct, implementable, feasible, and cost-effective Project access alternative. The Roberts Hawaii Driveway access route (D3) is the second best route, according to the infrastructure improvements assessment criteria. Both routes are, however, located on private land.

4.0 PRELIMINARY SOCIAL IMPACTS ASSESSMENT

4.1 INTRODUCTION AND PURPOSE

The social impacts of the access route alternatives are being analyzed to assist the County of Kaua‘i with its decision making and for input to the EIS. The assessment of the potential for traffic-related social impacts includes potential public safety, traffic, and nuisance concerns, as well as right-of-way and landowner-related issues associated with each access road and driveway alternative.

The preliminary social impacts assessment (SIA) presented in this section is intended to prompt conversations and help solicit feedback from the public. Community members, stakeholders, and other residents of the County of Kaua‘i will be asked to provide comments and concerns, after which this SIA will be updated.

The material presented in this section was developed from several sources, including:

- Comments relating to access road issues were extracted from personal interviews that were previously conducted for the overall Project EIS.
- Initial interviews with landowners and transportation specialists were conducted for this preliminary access road SIA.
- Traffic engineering reports and characteristics of existing roadways in the area were examined.
- A general review of the route maps and social characteristics of nearby communities was conducted.

Several potential concerns were noted during the study. Some people were concerned with the traffic impacts of the alternative access roads, including delays and safety. Some also expressed concern with costs or perceived costs of the alternatives. An added concern was the land use impact of the roadways among property owners in the area, with the potential problems of noise, dust, and odors that might affect nearby homes and businesses. Most respondents interviewed had both positive and negative reactions to the alternative roadways, and these have been grouped appropriately. The findings of this preliminary SIA are presented below for each of the potential access routes.

4.2 ROUTE A: MA‘ALO ROAD

4.2.1 Description

Route A begins at the intersection of Ma‘alo Road and Kūhiō Highway and proceeds mauka along Ma‘alo Road to the proposed Driveway 1 (Figure 1). The intersection currently has no signals and experiences some delays during peak traffic periods. Some interviewees suggested that it is a relatively dangerous intersection that may require significant widening and lane additions to ensure public safety. Interviewees also noted that the road is relatively narrow with no shoulder areas, several sharp turns, and a narrow bridge along the way. Interviewees were generally more familiar with Ma‘alo Road as the potential Project access route than the other potential access routes.

4.2.2 Advantages

One of the major advantages cited for this access route alternative is that the road already exists. To some, that made it easier to accept. Others felt (whether true or not) that, as an existing roadway, Ma‘alo Road would be the least expensive route to develop.

Other potential advantages of this route include:

- Ma‘alo Road does not pass through any residential areas.
- Some people felt the view plane could easily be preserved by planting trees on the side of the landfill facing Ma‘alo Road.
- Roadway improvements along Ma‘alo Road may benefit everyone who currently uses the road.
- Other infrastructure improvements could benefit property owners along Ma‘alo Road.

4.2.3 Disadvantages

The major disadvantages of Route A were traffic concerns stemming from the intersection at Kūhiō Highway and the cost of improvements to Ma‘alo Road. Some interviewees were concerned that the acute angle at which the two roads meet, limited visibility on the curve on Kūhiō Highway, and other factors would require major improvements. Those improvements might be expensive and time-consuming.

In addition, people who have considered the potential cost of improvements to Ma‘alo Road are concerned that this may be one of the more expensive alternatives to implement. Some suggested that Ma‘alo Road improvements might require land acquisition for ROW.

Other potential disadvantages of this route include:

- Regardless of improvements, trucks passing through this intersection would increase traffic congestion.
- Signalization would be required.
- Concern that this route would raise dust that might affect commercial operations along Ma‘alo Road.
- Truck traffic along Ma‘alo Road might negatively affect safety or the visitor experience of those on tour buses to Wailua Falls.

4.3 ROUTE B: ‘EHIKU STREET

4.3.1 Description

Route B begins at the intersection of Kūhiō Highway and ‘Ehiku Street and proceeds along ‘Ehiku Street to the intersection with Ma‘alo Road (Figure 1). The section of Ma‘alo Road between the intersection with ‘Ehiku Street and Driveway 1 is common to both Routes A and B.

The intersection of ‘Ehiku Street and Kūhiō Highway is presently unsignalized and not thought to be a particularly congested intersection. Fewer people are as familiar with the roadway alignment as a potential route for the proposed Project as are familiar with Ma‘alo Road. Route B shares a segment with Route A.

4.3.2 Advantages

The major advantage of Route B over other alternatives is traffic related. Some interviewees felt that traffic issues associated with the ‘Ehiku Street / Kūhiō Highway intersection were not as problematic as those with the Ma‘alo Road / Kūhiō Highway intersection, and that fewer resources and time would be required for the ‘Ehiku Street intersection. Some interviewees also felt that it avoids the cost of improvements along the first section of the Ma‘alo Road alternative.

Other potential advantages of this route include:

- Roadway improvements along Route B may benefit everyone who currently uses the road.
- Other infrastructure improvements would benefit property owners along ‘Ehiku Street and Ma‘alo Road.
- This route could have positive impacts on tourist traffic patterns. The route along ‘Ehiku Street to its intersection with Ma‘alo Road is scenic, and tour operators might begin using ‘Ehiku Street rather than Ma‘alo Road. This could be beneficial to tourism and could also distribute traffic between the two roads, potentially easing overall traffic impacts.

4.3.3 Disadvantages

The primary disadvantage of Route 2 is the fact that it runs through the Isenberg neighborhood in North Līhu‘e. Some Isenberg residents have already expressed opposition to the proposed Ma‘alo landfill site, and the prospect of trucks running through their neighborhood along ‘Ehiku Street is prominent among their concerns.

Other potential disadvantages of this route include:

- Trucks using the ‘Ehiku Street / Kūhiō Highway intersection could increase traffic congestion and delays at a previously problem-free area.
- If additional lanes were needed, then, property acquisition may be required.
- Problems may still exist with the safety and visitor experience along upper Ma‘alo Road.
- Some suggested that this route may be more expensive than improving the existing Ma‘alo Road.

4.4 DRIVEWAY ALTERNATIVES 1 AND 2

4.4.1 Description

Driveways 1 and 2 are alternatives for Routes A and B that connect Ma‘alo Road with the Project site (Figure 1). Driveway 1 passes through an offsite wetlands area, and therefore would require consultation with USACE and wetland mitigation measures. Driveway 2 bypasses the wetlands and is therefore somewhat longer and circuitous, but may have a greater impact on the existing parcel. Interviewees were asked to compare the relative merits of Driveway 1 and Driveway 2.

4.4.2 Advantages of Driveway 1 – Disadvantages of Driveway 2

- Some interviewees felt that Driveway 1 is straight and less expensive to construct, and that Driveway 2 would be more expensive.
- Driveway 1 is shorter. Driveway 2 may involve an unacceptable addition to drive times.
- Driveway 1, which runs along the border of existing properties, is less intrusive to agricultural operations in the area. Driveway 2 appears to break up the land use pattern to a greater extent.

4.4.3 Disadvantages of Driveway 1 – Advantages of Driveway 2

- Driveway 1 traverses the potential wetlands areas. Driveway 2 avoids the potential wetlands area, and may require a potentially lengthy and difficult permitting process with USACE. Driveway 2 would avoid those issues.
- Driveway 1 may be less popular with members of the community who are sensitive to potential wetlands issues. Driveway 2 would avoid controversy with wetlands supporters.

4.5 ROUTE C: LAULIMA STREET

4.5.1 Description

Route C begins at the intersection of Laulima Street and Kūhiō Highway and continues mauka through the Hanamā'ulu commercial area to the connection where Driveway 3 leads to the Project site (Figure 1). The intersection is not signalized and does not have a stop sign. It is currently a busy intersection. On the mauka side of Kūhiō Highway, Laulima Street provides access to the commercial area. On the makai side, it is a major outlet for the Hanamā'ulu community. While nearly everyone knows the intersection, the exact route to the Project site was less familiar to some interviewees.

4.5.2 Advantages

Route C is the shortest, most direct route from the highway to the Project site. People felt other routes were more complicated and harder to understand.

Other potential advantages of this route include:

- Some preferred this route because it does not pass through any residential area.
- It avoids some of the disadvantages of Routes A and B, especially problems with tourists using the Ma'alo Road.
- Much of the route would not be visible from any direction.
- Improvements to the Laulima Street / Kūhiō Highway intersection would benefit residents and businesses in Hanamā'ulu.
- Some felt there was sufficient land along the mauka side of Kūhiō Highway to widen the road and add turn lanes. They thought that made Laulima Street a better choice than either Ma'alo Road or 'Ehiku Street.

4.5.3 Disadvantages

The primary perceived problem identified for Route C was its impact on traffic at the Laulima Street / Kūhiō Highway intersection. Peak hour traffic is already difficult in the area and most felt that adding more trucks making turns would cause a major problem.

Other potential disadvantages of this route include:

- Signalization would be required.
- Concern that this route would raise dust that might affect commercial operations in the commercial area.
- Some felt that bringing the truck traffic to the center of Hanamā'ulu Town would cause a problem that would persist even with the best improvements to the intersection.
- The part of Laulima Street that runs parallel to Laukona Street is adjacent to several single-family homes, and could present nuisance, noise, and safety concerns.
- Some felt that the combined cost of the intersection and improvements to Laulima Road could be substantial.

4.6 ROUTE D: ROBERTS HAWAII DRIVEWAY

4.6.1 Description

Route D begins at the Roberts Hawai'i Driveway / Kūhiō Highway intersection, which is approximately 500 feet mauka of the intersection of Kūhiō Highway and Kapule Highway. Route D proceeds west and joins Laulima Street, from where it follows the same route as Route C (Figure 1). The current intersection has no signal and was not considered a heavily used intersection.

4.6.2 Advantages

Some interviewees felt that the primary advantage of Route D is that it may avoid adding traffic to the Laulima intersection.

Other potential advantages of this route include:

- Like Route C, it avoids some of the disadvantages of Routes A and B.
- The Driveway runs north of the commercial area, avoiding any access issues for businesses located there.
- Improvements to the Route D might benefit residents and businesses in Hanamā'ulu.

4.6.3 Disadvantages

Some interviewees stated that peak-hour traffic at the intersection of Kūhiō Highway and Kapule Highway regularly backs up traffic beyond the Roberts Hawaii Driveway. Therefore, they felt that Route D may potentially impact traffic on Kūhiō Highway.

Other potential disadvantages of this route include:

- The Roberts Hawaii Driveway runs along the back side of Kalepa Village, which could result in dust, noise, odor, or other nuisance concerns among residents there.
- Some of the disadvantages of Route C would similarly affect Route D, e.g., the potential impact on residents of Laukona Street.
- Some expressed concerns with cost, noting that Route D would likely be more expensive than Route C.

4.7 DRIVEWAY 3

4.7.1 Description

Driveway 3 connects both Routes C and D to the proposed Project site.

4.7.2 Advantages

- Driveway 3 is relatively short, straight, and simple.
- Driveway 3 may be the least expensive driveway.
- Driveway 3 may be less intrusive than Driveway 1, resulting in a lower potential impact to agricultural operations in the area.

4.7.3 Disadvantages

- Driveway 3 splits a portion of the landowner's (Grove Farm Company's) property.

- If the alternate RRP site is implemented (rather than the combined MSWLF/RRP option), then Driveway 3 would require a connection between the proposed MSWLF and RRP sites. This would raise the issues noted in Section 4.4 regarding crossing or circumventing the offsite wetlands.

4.8 OTHER ISSUES

The preliminary SIA identified several ancillary issues that arise in discussions of access route alternatives. These issues affect all access route alternatives. They include:

- Two entrances: Some interviewees felt that the access road design should offer two entrances to the landfill site. They cite advantages such as reduction of traffic at the site and reduction of traffic along roadways leading to the site and at major intersections.
- Completing the loop: Some interviewees noted that Routes A and B approach the landfill from the west, and Routes C and D approach from the east. By joining the two, the loop would be completed.
- Relationship to the Bypass Road: Completing the loop produces a route that is similar to a portion of some proposals for a Hanamā'ulu Bypass Road. Although those interviewed were informed that the Hanamā'ulu Bypass and the proposed New Kaua'i Landfill and RRP were separate projects, many still felt that the issues were the same and should be treated together.

5.0 OVERALL SITE COMPARISON

This Draft TREFS analyzed traffic impacts and required improvements and related costs, and preliminarily evaluated potential social impacts of four potential access routes from Kūhiō Highway (the principal thoroughfare in the area) to the proposed Project (MSWLF and RRP at Ma'alo). All access scenarios present traffic issues that require addressing via physical and operational improvements at their respective Kūhiō Highway intersection. All access scenarios involve significant paving and utility work, including bringing water, electricity, and phone lines to the Project site. Table 17 summarizes key features of each potential access scenario and the projected impacts and costs as presented in the preceding sections.

Public outreach will be conducted to solicit feedback from the community prior to the County choosing a proposed access route, which will be further analyzed in the Project EIS.

Table 17: Overall Comparison of Project Access Routes

Assessment		Ma'alo Road (Routes A1, A2)		'Ehiku Street (Routes B1, B2)		Laulima Street (Route C3)	Roberts Hawaii Driveway (Route D3)	Overall Conclusion
Current Description	Route Length	4.8 miles (A1) ; 4.7 miles (A2)		5.6 miles (B1); 5.7 miles (B2)		1.7 miles	2.2 miles	Not applicable
	Intersection Type	Stop-sign-controlled T-intersection		Signalized		Stop-sign-controlled four-legged intersection	Stop-sign-controlled T-intersection	
	Intersection LOS	C (weekday AM peak) D (weekday PM peak)		A (weekday AM, PM peak)		E (weekday AM peak) F (weekday PM peak)	D (weekday AM peak) C (weekday PM peak)	
	Key Features	Ma'alo Road is narrow with one narrow bridge near the highway intersection, no shoulders, sharp turns; main route for tourist traffic to Wailua Falls		Route transits residential area (Isenberg neighborhood, from intersection to Kanakolu St)		Intersection is major outlet for Hanamā'ulu community; route briefly parallels a residential area (Laukona St)	Most of the initial "D" segment is a gravel road. Intersection is currently not heavily used, but can be impacted by vehicle queuing for nearby signalized Kapule Hwy intersection	
Traffic (Section 2.0)		Significant impacts to Kūhiō Hwy intersection operations Recommended intersection improvements: • Signalize intersection when warranted • Modify Kuhio Hwy intersection to accommodate southbound traffic turning right into Ma'alo Rd		Minor impacts to Kūhiō Hwy intersection operations; significant impacts to residential segment (between Kūhiō Hwy and Kanakolu St) Recommended intersection improvements: • Modify existing signal operation • Enlarge 'Ehiku St right-turn curb return radii • Upgrade pedestrian facilities		Signalization of intersection will be needed regardless of which Project access route is used Recommended intersection improvements: • Signalize intersection • Reconfigure Laulima St mauka approach • Widen highway for northbound and southbound left-turn lanes	Signalization required to accommodate vehicle queuing from the nearby signalized Kapule Hwy / Kūhiō Hwy intersection Recommended intersection improvements: • Signalize intersection when warranted • Provide left-turn lane for Kapa'a-direction Kūhiō Hwy traffic • Provide right-turn deceleration lane for Līhu'e-direction Kūhiō Hwy traffic	Laulima Street (Route C3) is the most implementable, feasible, and cost-effective alternative
Infrastructure Improvement Requirements (Section 3.0)	*Improvements:*	*Cost for Route A1:*	*Cost for Route A2:*	*Cost for Route B1:*	*Cost for Route B2:*	*Cost for Route C3:*	*Cost for Route D3:*	Laulima Street (Route C3) has the least cost and is the shortest and most direct route
	Roadway	$9,430,000	$9,430,000	'Ehiku: $4,890,000 Ma'alo: $6,238,000	'Ehiku: $4,890,000 Ma'alo: $6,238,000	$758,000	$2,440,000	
	Driveway	$10,128,000 [a]	$8,973,000	$10,128,000 [a]	$8,973,000	$6,470,000	$6,470,000	
	Utility	$3,185,000	$3,185,000	$2,983,000	$2,983,000	$1,078,000	$1,078,000	
	Hwy intersection [c]	$1,444,000	$1,444,000	$280,000	$280,000	$1,624,000 [b]	$1,404,000	
	Permitting	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	
	Other	Ma'alo Road / Driveway 1 intersection: $59,000	Ma'alo Road / Driveway 2 intersection: $59,000	Ma'alo Road / Driveway 1 intersection: $59,000	Ma'alo Road / Driveway 2 intersection: $59,000			
		Existing bridge: $5,025,000	Existing bridge: $5,025,000	Reconstruct waterway/ culvert: $10,000,000	Reconstruct waterway/ culvert: $10,000,000			
		Existing sharp curve: $78,000	Existing sharp curve: $78,000					
	Total Cost [e]	*$36,749,000*	*$35,305,000*	*$43,285,000*	*$41,841,250*	*$12,475,000* [e]	*$14,302,500* [e]	
Social Impacts (Section 4.0)	Advantages:	• Route avoids residential areas • Roadway and infrastructure improvements would benefit all road users and property owners along the route		• Required intersection and roadway improvements perceived as less than for Ma'alo route • Roadway and infrastructure improvements would benefit all road users and property owners along the route • Positive economic impacts to neighborhood from potential increased Wailua Falls tourist traffic		• Shortest, most-direct route to Project site • Avoids potential impacts to tourist traffic on Ma'alo Rd • Intersection signalization and improvements would benefit all users	• Relatively short and direct route to Project site • Avoids potential impacts to tourist traffic on Ma'alo Rd • Avoids impacts to commercial area businesses • Roadway and infrastructure improvements would benefit all road users and property owners along the route	Pending further consultation
	Disadvantages:	• Increased intersection traffic and cost for intersection improvements • Increased truck traffic on Ma'alo Rd • Increased dust for commercial operations along route • Potential aesthetic impacts to Wailua Falls tourist traffic		• Potential safety and nuisance impacts along Isenberg residential segment of route (between Kūhiō Hwy and Kanakolu St) • Increased traffic at previously problem-free highway intersection		• Increased traffic and requisite signalization at already-busy intersection • Increased dust in the commercial area • Impacts from truck traffic transiting through center of Hanamā'ulu town, near single-family homes at Laukona St	• Increased dust, noise, odor, other nuisances to Kalepa Village residents • Potential impacts to Laukona St residents	

[a] Includes $1,000,000 for wetlands mitigation.
[b] Includes $1,000,000 for signalization of intersection, which is recommended in the long-term future regardless of Project implementation or selected Proposed Project access route.
[c] The cost estimates for Access Routes A, B, and D do not include signalization of the Laulima / Kūhiō Hwy intersection, which is recommended under all scenarios.
[d] Total cost includes 25% contingency.
[e] If the alternate RRP site is implemented, then additional cost for developing a portion of Driveway 1 or 2 to connect to it the Project site would be $6.8 million (Driveway 1) or $5.4 million (Driveway 2) (includes 25% Contingency).

6.0 REFERENCES

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Attachment A
LOS Calculations

Appendix A
Intersection Volumes

Ehiku Access Option - AM Peak Hour Summary

Year	Scenario	Intersection	Northbound			Southbound			Eastbound			Westbound		
			Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Existing		Ehiku St & Kuhio Hwy	58	537	0	0	979	17	9	0	87	0	0	0
		Ma'alo Rd & Kuhio Hwy	17	365	0	0	833	13	8	0	9	0	0	0
		Laulima St & Kuhio Hwy	4	322	37	13	787	12	3	0	3	56	0	43
		Roberts Driveway & Kuhio Hwy	0	0	0	8	0	1	1	439	0	119	811	12
		Kapule Highway & Kuhio Hwy	33	311	0	0	884	909	278	0	288	0	0	0
Future Opening Year	Base	Ehiku St & Kuhio Hwy	62	576	0	0	1050	18	10	0	93	0	0	0
		Ma'alo Rd & Kuhio Hwy	18	391	0	0	893	14	9	0	10	0	0	0
		Laulima St & Kuhio Hwy	4	345	40	14	844	13	3	0	3	60	0	46
		Roberts Driveway & Kuhio Hwy	0	0	0	9	0	1	1	471	0	128	870	13
		Kapule Highway & Kuhio Hwy	35	333	0	0	948	975	298	0	309	0	0	0
	Landfill Project Trips	Ehiku St & Kuhio Hwy	8	0	0	0	0	7	7	0	8	0	0	0
		Ma'alo Rd & Kuhio Hwy	0	7	0	0	7	0	0	0	0	0	0	0
		Laulima St & Kuhio Hwy	0	7	0	0	7	0	0	0	0	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	0	0	0	0	7	0	0	7	0
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	7	7	0	0	0	0	0
	Base + Landfill	Ehiku St & Kuhio Hwy	70	576	0	0	1050	25	16	0	102	0	0	0
		Ma'alo Rd & Kuhio Hwy	18	398	0	0	900	14	9	0	10	0	0	0
		Laulima St & Kuhio Hwy	4	352	40	14	851	13	3	0	3	60	0	46
		Roberts Driveway & Kuhio Hwy	0	0	0	9	0	1	1	477	0	128	876	13
		Kapule Highway & Kuhio Hwy	35	333	0	0	948	981	305	0	309	0	0	0
	Landfill & RRP Project Trips	Ehiku St & Kuhio Hwy	80	0	0	0	0	65	18	0	23	0	0	0
		Ma'alo Rd & Kuhio Hwy	0	18	0	0	65	0	0	0	0	0	0	0
		Laulima St & Kuhio Hwy	0	18	0	0	65	0	0	0	0	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	0	0	0	0	18	0	0	65	0
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	65	18	0	0	0	0	0
	Base + Landfill + RRP	Ehiku St & Kuhio Hwy	142	576	0	0	1050	83	28	0	116	0	0	0
		Ma'alo Rd & Kuhio Hwy	18	410	0	0	958	14	9	0	10	0	0	0
		Laulima St & Kuhio Hwy	4	364	40	14	909	13	3	0	3	60	0	46
		Roberts Driveway & Kuhio Hwy	0	0	0	9	0	1	1	489	0	128	935	13
		Kapule Highway & Kuhio Hwy	35	333	0	0	948	1040	317	0	309	0	0	0
Future Long-Range Year	Base	Ehiku St & Kuhio Hwy	76	703	0	0	1281	22	12	0	114	0	0	0
		Ma'alo Rd & Kuhio Hwy	22	477	0	0	1090	17	10	0	12	0	0	0
		Laulima St & Kuhio Hwy	5	421	48	17	1030	16	4	0	4	73	0	56
		Roberts Driveway & Kuhio Hwy	0	0	0	10	0	1	1	574	0	156	1061	16
		Kapule Highway & Kuhio Hwy	43	407	0	0	1156	1189	364	0	377	0	0	0
	Landfill Project Trips	Ehiku St & Kuhio Hwy	10	0	0	0	0	9	8	0	10	0	0	0
		Ma'alo Rd & Kuhio Hwy	0	8	0	0	9	0	0	0	0	0	0	0
		Laulima St & Kuhio Hwy	0	8	0	0	9	0	0	0	0	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	0	0	0	0	8	0	0	9	0
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	9	8	0	0	0	0	0
	Base + Landfill	Ehiku St & Kuhio Hwy	86	703	0	0	1281	31	20	0	124	0	0	0
		Ma'alo Rd & Kuhio Hwy	22	486	0	0	1098	17	10	0	12	0	0	0
		Laulima St & Kuhio Hwy	5	429	48	17	1038	16	4	0	4	73	0	56
		Roberts Driveway & Kuhio Hwy	0	0	0	10	0	1	1	582	0	156	1070	16
		Kapule Highway & Kuhio Hwy	43	407	0	0	1156	1198	372	0	377	0	0	0
	Landfill & RRP Project Trips	Ehiku St & Kuhio Hwy	82	0	0	0	0	67	20	0	24	0	0	0
		Ma'alo Rd & Kuhio Hwy	0	20	0	0	67	0	0	0	0	0	0	0
		Laulima St & Kuhio Hwy	0	20	0	0	67	0	0	0	0	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	0	0	0	0	20	0	0	67	0
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	67	20	0	0	0	0	0
	Base + Landfill + RRP	Ehiku St & Kuhio Hwy	158	703	0	0	1281	89	32	0	138	0	0	0
		Ma'alo Rd & Kuhio Hwy	22	497	0	0	1157	17	10	0	12	0	0	0
		Laulima St & Kuhio Hwy	5	441	48	17	1097	16	4	0	4	73	0	56
		Roberts Driveway & Kuhio Hwy	0	0	0	10	0	1	1	594	0	156	1128	16
		Kapule Highway & Kuhio Hwy	43	407	0	0	1156	1256	383	0	377	0	0	0

Ehiku Access Option - PM Peak Hour Summary

Year	Scenario	Intersection	Northbound			Southbound			Eastbound			Westbound		
			Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Existing		Ehiku St & Kuhio Hwy	102	923	0	0	871	13	17	0	59	0	0	0
		Ma'alo Rd & Kuhio Hwy	29	834	0	0	610	24	28	0	32	0	0	0
		Laulima St & Kuhio Hwy	4	776	82	15	594	4	7	1	6	34	2	27
		Roberts Driveway & Kuhio Hwy	0	0	0	7	0	11	2	596	0	0	643	9
		Kapule Highway & Kuhio Hwy	101	1024	0	0	461	551	540	0	63	0	0	0
Future Opening Year	Base	Ehiku St & Kuhio Hwy	109	990	0	0	934	14	18	0	63	0	0	0
		Ma'alo Rd & Kuhio Hwy	31	894	0	0	654	26	30	0	34	0	0	0
		Laulima St & Kuhio Hwy	4	832	88	16	637	4	8	1	6	36	2	29
		Roberts Driveway & Kuhio Hwy	0	0	0	8	0	12	2	639	0	0	689	10
		Kapule Highway & Kuhio Hwy	108	1098	0	0	494	591	579	0	68	0	0	0
	Landfill Project Trips	Ehiku St & Kuhio Hwy	7	0	0	0	0	5	7	0	8	0	0	0
		Ma'alo Rd & Kuhio Hwy	0	7	0	0	5	0	0	0	0	0	0	0
		Laulima St & Kuhio Hwy	0	7	0	0	5	0	0	0	0	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	0	0	0	0	7	0	0	5	0
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	5	7	0	0	0	0	0
	Base + Landfill	Ehiku St & Kuhio Hwy	116	990	0	0	934	19	25	0	72	0	0	0
		Ma'alo Rd & Kuhio Hwy	31	901	0	0	659	26	30	0	34	0	0	0
		Laulima St & Kuhio Hwy	4	839	88	16	642	4	8	1	6	36	2	29
		Roberts Driveway & Kuhio Hwy	0	0	0	8	0	12	2	646	0	0	695	10
		Kapule Highway & Kuhio Hwy	108	1098	0	0	494	596	586	0	68	0	0	0
	Landfill & RRP Project Trips	Ehiku St & Kuhio Hwy	19	0	0	0	0	15	65	0	80	0	0	0
		Ma'alo Rd & Kuhio Hwy	0	65	0	0	15	0	0	0	0	0	0	0
		Laulima St & Kuhio Hwy	0	65	0	0	15	0	0	0	0	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	0	0	0	0	65	0	0	15	0
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	15	65	0	0	0	0	0
	Base + Landfill + RRP	Ehiku St & Kuhio Hwy	128	990	0	0	934	29	83	0	143	0	0	0
		Ma'alo Rd & Kuhio Hwy	31	959	0	0	669	26	30	0	34	0	0	0
		Laulima St & Kuhio Hwy	4	897	88	16	652	4	8	1	6	36	2	29
		Roberts Driveway & Kuhio Hwy	0	0	0	8	0	12	2	704	0	0	705	10
		Kapule Highway & Kuhio Hwy	108	1098	0	0	494	606	644	0	68	0	0	0
Future Long-Range Year	Base	Ehiku St & Kuhio Hwy	133	1207	0	0	1139	17	22	0	77	0	0	0
		Ma'alo Rd & Kuhio Hwy	38	1091	0	0	798	31	37	0	42	0	0	0
		Laulima St & Kuhio Hwy	5	1015	107	20	777	5	9	1	8	44	3	35
		Roberts Driveway & Kuhio Hwy	0	0	0	9	0	14	3	780	0	0	841	12
		Kapule Highway & Kuhio Hwy	132	1340	0	0	603	721	706	0	82	0	0	0
	Landfill Project Trips	Ehiku St & Kuhio Hwy	8	0	0	0	0	7	8	0	10	0	0	0
		Ma'alo Rd & Kuhio Hwy	0	8	0	0	7	0	0	0	0	0	0	0
		Laulima St & Kuhio Hwy	0	8	0	0	7	0	0	0	0	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	0	0	0	0	8	0	0	7	0
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	7	8	0	0	0	0	0
	Base + Landfill	Ehiku St & Kuhio Hwy	142	1207	0	0	1139	24	30	0	87	0	0	0
		Ma'alo Rd & Kuhio Hwy	38	1099	0	0	805	31	37	0	42	0	0	0
		Laulima St & Kuhio Hwy	5	1023	107	20	784	5	9	1	8	44	3	35
		Roberts Driveway & Kuhio Hwy	0	0	0	9	0	14	3	788	0	0	848	12
		Kapule Highway & Kuhio Hwy	132	1340	0	0	603	728	715	0	82	0	0	0
	Landfill & RRP Project Trips	Ehiku St & Kuhio Hwy	20	0	0	0	0	17	67	0	81	0	0	0
		Ma'alo Rd & Kuhio Hwy	0	67	0	0	17	0	0	0	0	0	0	0
		Laulima St & Kuhio Hwy	0	67	0	0	17	0	0	0	0	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	0	0	0	0	67	0	0	17	0
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	17	67	0	0	0	0	0
	Base + Landfill + RRP	Ehiku St & Kuhio Hwy	154	1207	0	0	1139	34	89	0	159	0	0	0
		Ma'alo Rd & Kuhio Hwy	38	1158	0	0	815	31	37	0	42	0	0	0
		Laulima St & Kuhio Hwy	5	1082	107	20	794	5	9	1	8	44	3	35
		Roberts Driveway & Kuhio Hwy	0	0	0	9	0	14	3	846	0	0	858	12
		Kapule Highway & Kuhio Hwy	132	1340	0	0	603	737	773	0	82	0	0	0

Ma'alo Access Option - AM Peak Hour Summary

Year	Scenario	Intersection	Northbound			Southbound			Eastbound			Westbound		
			Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Existing		Ehiku St & Kuhio Hwy	58	537	0	0	979	17	9	0	87	0	0	0
		Ma'alo Rd & Kuhio Hwy	17	365	0	0	833	13	8	0	9	0	0	0
		Laulima St & Kuhio Hwy	4	322	37	13	787	12	3	0	3	56	0	43
		Roberts Driveway & Kuhio Hwy	0	0	0	8	0	1	1	439	0	119	811	12
		Kapule Highway & Kuhio Hwy	33	311	0	0	884	909	278	0	288	0	0	0
Future Opening Year	Base	Ehiku St & Kuhio Hwy	62	576	0	0	1050	18	10	0	93	0	0	0
		Ma'alo Rd & Kuhio Hwy	18	391	0	0	893	14	9	0	10	0	0	0
		Laulima St & Kuhio Hwy	4	345	40	14	844	13	3	0	3	60	0	46
		Roberts Driveway & Kuhio Hwy	0	0	0	9	0	1	1	471	0	128	870	13
		Kapule Highway & Kuhio Hwy	35	333	0	0	948	975	298	0	309	0	0	0
	Landfill Project Trips	Ehiku St & Kuhio Hwy	0	8	0	0	8	0	0	0	0	0	0	0
		Ma'alo Rd & Kuhio Hwy	8	0	0	0	0	7	7	0	8	0	0	0
		Laulima St & Kuhio Hwy	0	7	0	0	7	0	0	0	0	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	0	0	0	0	7	0	0	7	0
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	7	7	0	0	0	0	0
	Base + Landfill	Ehiku St & Kuhio Hwy	62	584	0	0	1058	18	10	0	93	0	0	0
		Ma'alo Rd & Kuhio Hwy	26	391	0	0	893	21	15	0	18	0	0	0
		Laulima St & Kuhio Hwy	4	352	40	14	851	13	3	0	3	60	0	46
		Roberts Driveway & Kuhio Hwy	0	0	0	9	0	1	1	477	0	128	876	13
		Kapule Highway & Kuhio Hwy	35	333	0	0	948	981	305	0	309	0	0	0
	Landfill & RRP Project Trips	Ehiku St & Kuhio Hwy	0	80	0	0	23	0	0	0	0	0	0	0
		Ma'alo Rd & Kuhio Hwy	80	0	0	0	0	65	18	0	23	0	0	0
		Laulima St & Kuhio Hwy	0	18	0	0	65	0	0	0	0	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	0	0	0	0	18	0	0	65	0
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	65	18	0	0	0	0	0
	Base + Landfill + RRP	Ehiku St & Kuhio Hwy	62	655	0	0	1072	18	10	0	93	0	0	0
		Ma'alo Rd & Kuhio Hwy	98	391	0	0	893	79	27	0	32	0	0	0
		Laulima St & Kuhio Hwy	4	364	40	14	909	13	3	0	3	60	0	46
		Roberts Driveway & Kuhio Hwy	0	0	0	9	0	1	1	489	0	128	935	13
		Kapule Highway & Kuhio Hwy	35	333	0	0	948	1040	317	0	309	0	0	0
Future Long-Range Year	Base	Ehiku St & Kuhio Hwy	76	703	0	0	1281	22	12	0	114	0	0	0
		Ma'alo Rd & Kuhio Hwy	22	477	0	0	1090	17	10	0	12	0	0	0
		Laulima St & Kuhio Hwy	5	421	48	17	1030	16	4	0	4	73	0	56
		Roberts Driveway & Kuhio Hwy	0	0	0	10	0	1	1	574	0	156	1061	16
		Kapule Highway & Kuhio Hwy	43	407	0	0	1156	1189	364	0	377	0	0	0
	Landfill Project Trips	Ehiku St & Kuhio Hwy	0	10	0	0	10	0	0	0	0	0	0	0
		Ma'alo Rd & Kuhio Hwy	10	0	0	0	0	9	8	0	10	0	0	0
		Laulima St & Kuhio Hwy	0	8	0	0	9	0	0	0	0	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	0	0	0	0	8	0	0	9	0
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	9	8	0	0	0	0	0
	Base + Landfill	Ehiku St & Kuhio Hwy	76	713	0	0	1291	22	12	0	114	0	0	0
		Ma'alo Rd & Kuhio Hwy	33	477	0	0	1090	26	19	0	22	0	0	0
		Laulima St & Kuhio Hwy	5	429	48	17	1038	16	4	0	4	73	0	56
		Roberts Driveway & Kuhio Hwy	0	0	0	10	0	1	1	582	0	156	1070	16
		Kapule Highway & Kuhio Hwy	43	407	0	0	1156	1198	372	0	377	0	0	0
	Landfill & RRP Project Trips	Ehiku St & Kuhio Hwy	0	82	0	0	24	0	0	0	0	0	0	0
		Ma'alo Rd & Kuhio Hwy	82	0	0	0	0	67	20	0	24	0	0	0
		Laulima St & Kuhio Hwy	0	20	0	0	67	0	0	0	0	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	0	0	0	0	20	0	0	67	0
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	67	20	0	0	0	0	0
	Base + Landfill + RRP	Ehiku St & Kuhio Hwy	76	784	0	0	1305	22	12	0	114	0	0	0
		Ma'alo Rd & Kuhio Hwy	104	477	0	0	1090	84	30	0	36	0	0	0
		Laulima St & Kuhio Hwy	5	441	48	17	1097	16	4	0	4	73	0	56
		Roberts Driveway & Kuhio Hwy	0	0	0	10	0	1	1	594	0	156	1128	16
		Kapule Highway & Kuhio Hwy	43	407	0	0	1156	1256	383	0	377	0	0	0

Ma'alo Access Option - PM Peak Hour Summary

Year	Scenario	Intersection	Northbound			Southbound			Eastbound			Westbound		
			Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Existing		Ehiku St & Kuhio Hwy	102	923	0	0	871	13	17	0	59	0	0	0
		Ma'alo Rd & Kuhio Hwy	29	834	0	0	610	24	28	0	32	0	0	0
		Laulima St & Kuhio Hwy	4	776	82	15	594	4	7	1	6	34	2	27
		Roberts Driveway & Kuhio Hwy	0	0	0	7	0	11	2	596	0	0	643	9
		Kapule Highway & Kuhio Hwy	101	1024	0	0	461	551	540	0	63	0	0	0
Future Opening Year	Base	Ehiku St & Kuhio Hwy	109	990	0	0	934	14	18	0	63	0	0	0
		Ma'alo Rd & Kuhio Hwy	31	894	0	0	654	26	30	0	34	0	0	0
		Laulima St & Kuhio Hwy	4	832	88	16	637	4	8	1	6	36	2	29
		Roberts Driveway & Kuhio Hwy	0	0	0	8	0	12	2	639	0	0	689	10
		Kapule Highway & Kuhio Hwy	108	1098	0	0	494	591	579	0	68	0	0	0
	Landfill Project Trips	Ehiku St & Kuhio Hwy	0	7	0	0	8	0	0	0	0	0	0	0
		Ma'alo Rd & Kuhio Hwy	7	0	0	0	0	5	7	0	8	0	0	0
		Laulima St & Kuhio Hwy	0	7	0	0	5	0	0	0	0	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	0	0	0	0	7	0	0	5	0
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	5	7	0	0	0	0	0
	Base + Landfill	Ehiku St & Kuhio Hwy	109	996	0	0	942	14	18	0	63	0	0	0
		Ma'alo Rd & Kuhio Hwy	38	894	0	0	654	31	37	0	43	0	0	0
		Laulima St & Kuhio Hwy	4	839	88	16	642	4	8	1	6	36	2	29
		Roberts Driveway & Kuhio Hwy	0	0	0	8	0	12	2	646	0	0	695	10
		Kapule Highway & Kuhio Hwy	108	1098	0	0	494	596	586	0	68	0	0	0
	Landfill & RRP Project Trips	Ehiku St & Kuhio Hwy	0	19	0	0	80	0	0	0	0	0	0	0
		Ma'alo Rd & Kuhio Hwy	19	0	0	0	0	15	65	0	80	0	0	0
		Laulima St & Kuhio Hwy	0	65	0	0	15	0	0	0	0	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	0	0	0	0	65	0	0	15	0
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	15	65	0	0	0	0	0
	Base + Landfill + RRP	Ehiku St & Kuhio Hwy	109	1008	0	0	1014	14	18	0	63	0	0	0
		Ma'alo Rd & Kuhio Hwy	50	894	0	0	654	41	95	0	114	0	0	0
		Laulima St & Kuhio Hwy	4	897	88	16	652	4	8	1	6	36	2	29
		Roberts Driveway & Kuhio Hwy	0	0	0	8	0	12	2	704	0	0	705	10
		Kapule Highway & Kuhio Hwy	108	1098	0	0	494	606	644	0	68	0	0	0
Future Long-Range Year	Base	Ehiku St & Kuhio Hwy	133	1207	0	0	1139	17	22	0	77	0	0	0
		Ma'alo Rd & Kuhio Hwy	38	1091	0	0	798	31	37	0	42	0	0	0
		Laulima St & Kuhio Hwy	5	1015	107	20	777	5	9	1	8	44	3	35
		Roberts Driveway & Kuhio Hwy	0	0	0	9	0	14	3	780	0	0	841	12
		Kapule Highway & Kuhio Hwy	132	1340	0	0	603	721	706	0	82	0	0	0
	Landfill Project Trips	Ehiku St & Kuhio Hwy	0	8	0	0	10	0	0	0	0	0	0	0
		Ma'alo Rd & Kuhio Hwy	8	0	0	0	0	7	8	0	10	0	0	0
		Laulima St & Kuhio Hwy	0	8	0	0	7	0	0	0	0	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	0	0	0	0	8	0	0	7	0
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	7	8	0	0	0	0	0
	Base + Landfill	Ehiku St & Kuhio Hwy	133	1216	0	0	1149	17	22	0	77	0	0	0
		Ma'alo Rd & Kuhio Hwy	46	1091	0	0	798	38	45	0	52	0	0	0
		Laulima St & Kuhio Hwy	5	1023	107	20	784	5	9	1	8	44	3	35
		Roberts Driveway & Kuhio Hwy	0	0	0	9	0	14	3	788	0	0	848	12
		Kapule Highway & Kuhio Hwy	132	1340	0	0	603	728	715	0	82	0	0	0
	Landfill & RRP Project Trips	Ehiku St & Kuhio Hwy	0	20	0	0	81	0	0	0	0	0	0	0
		Ma'alo Rd & Kuhio Hwy	20	0	0	0	0	17	67	0	81	0	0	0
		Laulima St & Kuhio Hwy	0	67	0	0	17	0	0	0	0	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	0	0	0	0	67	0	0	17	0
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	17	67	0	0	0	0	0
	Base + Landfill + RRP	Ehiku St & Kuhio Hwy	133	1228	0	0	1221	17	22	0	77	0	0	0
		Ma'alo Rd & Kuhio Hwy	58	1091	0	0	798	48	103	0	123	0	0	0
		Laulima St & Kuhio Hwy	5	1082	107	20	794	5	9	1	8	44	3	35
		Roberts Driveway & Kuhio Hwy	0	0	0	9	0	14	3	846	0	0	858	12
		Kapule Highway & Kuhio Hwy	132	1340	0	0	603	737	773	0	82	0	0	0

Laulima Access Option - AM Peak Hour Summary

Year	Scenario	Intersection	Northbound			Southbound			Eastbound			Westbound		
			Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Existing		Ehiku St & Kuhio Hwy	58	537	0	0	979	17	9	0	87	0	0	0
		Ma'alo Rd & Kuhio Hwy	17	365	0	0	833	13	8	0	9	0	0	0
		Laulima St & Kuhio Hwy	4	322	37	13	787	12	3	0	3	56	0	43
		Roberts Driveway & Kuhio Hwy	0	0	0	8	0	1	1	439	0	119	811	12
		Kapule Highway & Kuhio Hwy	33	311	0	0	884	909	278	0	288	0	0	0
Future Opening Year	Base	Ehiku St & Kuhio Hwy	62	576	0	0	1050	18	10	0	93	0	0	0
		Ma'alo Rd & Kuhio Hwy	18	391	0	0	893	14	9	0	10	0	0	0
		Laulima St & Kuhio Hwy	4	345	40	14	844	13	3	0	3	60	0	46
		Roberts Driveway & Kuhio Hwy	0	0	0	9	0	1	1	471	0	128	870	13
		Kapule Highway & Kuhio Hwy	35	333	0	0	948	975	298	0	309	0	0	0
	Landfill Project Trips	Ehiku St & Kuhio Hwy	0	8	0	0	8	0	0	0	0	0	0	0
		Ma'alo Rd & Kuhio Hwy	0	8	0	0	8	0	0	0	0	0	0	0
		Laulima St & Kuhio Hwy	8	0	0	0	0	7	7	0	8	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	0	0	0	0	7	0	0	7	0
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	7	7	0	0	0	0	0
	Base + Landfill	Ehiku St & Kuhio Hwy	62	584	0	0	1058	18	10	0	93	0	0	0
		Ma'alo Rd & Kuhio Hwy	18	400	0	0	901	14	9	0	10	0	0	0
		Laulima St & Kuhio Hwy	13	345	40	14	844	20	10	0	11	60	0	46
		Roberts Driveway & Kuhio Hwy	0	0	0	9	0	1	1	477	0	128	876	13
		Kapule Highway & Kuhio Hwy	35	333	0	0	948	981	305	0	309	0	0	0
	Landfill & RRP Project Trips	Ehiku St & Kuhio Hwy	0	80	0	0	23	0	0	0	0	0	0	0
		Ma'alo Rd & Kuhio Hwy	0	80	0	0	23	0	0	0	0	0	0	0
		Laulima St & Kuhio Hwy	80	0	0	0	0	65	18	0	23	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	0	0	0	0	18	0	0	65	0
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	65	18	0	0	0	0	0
	Base + Landfill + RRP	Ehiku St & Kuhio Hwy	62	655	0	0	1072	18	10	0	93	0	0	0
		Ma'alo Rd & Kuhio Hwy	18	471	0	0	916	14	9	0	10	0	0	0
		Laulima St & Kuhio Hwy	84	345	40	14	844	78	22	0	26	60	0	46
		Roberts Driveway & Kuhio Hwy	0	0	0	9	0	1	1	489	0	128	935	13
		Kapule Highway & Kuhio Hwy	35	333	0	0	948	1040	317	0	309	0	0	0
Future Long-Range Year	Base	Ehiku St & Kuhio Hwy	76	703	0	0	1281	22	12	0	114	0	0	0
		Ma'alo Rd & Kuhio Hwy	22	477	0	0	1090	17	10	0	12	0	0	0
		Laulima St & Kuhio Hwy	5	421	48	17	1030	16	4	0	4	73	0	56
		Roberts Driveway & Kuhio Hwy	0	0	0	10	0	1	1	574	0	156	1061	16
		Kapule Highway & Kuhio Hwy	43	407	0	0	1156	1189	364	0	377	0	0	0
	Landfill Project Trips	Ehiku St & Kuhio Hwy	0	10	0	0	10	0	0	0	0	0	0	0
		Ma'alo Rd & Kuhio Hwy	0	10	0	0	10	0	0	0	0	0	0	0
		Laulima St & Kuhio Hwy	10	0	0	0	0	9	8	0	10	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	0	0	0	0	8	0	0	9	0
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	9	8	0	0	0	0	0
	Base + Landfill	Ehiku St & Kuhio Hwy	76	713	0	0	1291	22	12	0	114	0	0	0
		Ma'alo Rd & Kuhio Hwy	22	488	0	0	1100	17	10	0	12	0	0	0
		Laulima St & Kuhio Hwy	16	421	48	17	1030	24	12	0	14	73	0	56
		Roberts Driveway & Kuhio Hwy	0	0	0	10	0	1	1	582	0	156	1070	16
		Kapule Highway & Kuhio Hwy	43	407	0	0	1156	1198	372	0	377	0	0	0
	Landfill & RRP Project Trips	Ehiku St & Kuhio Hwy	0	82	0	0	24	0	0	0	0	0	0	0
		Ma'alo Rd & Kuhio Hwy	0	82	0	0	24	0	0	0	0	0	0	0
		Laulima St & Kuhio Hwy	82	0	0	0	0	67	20	0	24	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	0	0	0	0	20	0	0	67	0
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	67	20	0	0	0	0	0
	Base + Landfill + RRP	Ehiku St & Kuhio Hwy	76	784	0	0	1305	22	12	0	114	0	0	0
		Ma'alo Rd & Kuhio Hwy	22	559	0	0	1114	17	10	0	12	0	0	0
		Laulima St & Kuhio Hwy	87	421	48	17	1030	83	24	0	28	73	0	56
		Roberts Driveway & Kuhio Hwy	0	0	0	10	0	1	1	594	0	156	1128	16
		Kapule Highway & Kuhio Hwy	43	407	0	0	1156	1256	383	0	377	0	0	0

Laulima Access Option - PM Peak Hour Summary

Year	Scenario	Intersection	Northbound			Southbound			Eastbound			Westbound		
			Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Existing		Ehiku St & Kuhio Hwy	102	923	0	0	871	13	17	0	59	0	0	0
		Ma'alo Rd & Kuhio Hwy	29	834	0	0	610	24	28	0	32	0	0	0
		Laulima St & Kuhio Hwy	4	776	82	15	594	4	7	1	6	34	2	27
		Roberts Driveway & Kuhio Hwy	0	0	0	7	0	11	2	596	0	0	643	9
		Kapule Highway & Kuhio Hwy	101	1024	0	0	461	551	540	0	63	0	0	0
Future Opening Year	Base	Ehiku St & Kuhio Hwy	109	990	0	0	934	14	18	0	63	0	0	0
		Ma'alo Rd & Kuhio Hwy	31	894	0	0	654	26	30	0	34	0	0	0
		Laulima St & Kuhio Hwy	4	832	88	16	637	4	8	1	6	36	2	29
		Roberts Driveway & Kuhio Hwy	0	0	0	8	0	12	2	639	0	0	689	10
		Kapule Highway & Kuhio Hwy	108	1098	0	0	494	591	579	0	68	0	0	0
	Landfill Project Trips	Ehiku St & Kuhio Hwy	0	7	0	0	8	0	0	0	0	0	0	0
		Ma'alo Rd & Kuhio Hwy	0	7	0	0	8	0	0	0	0	0	0	0
		Laulima St & Kuhio Hwy	7	0	0	0	0	5	7	0	8	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	0	0	0	0	7	0	0	5	0
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	5	7	0	0	0	0	0
	Base + Landfill	Ehiku St & Kuhio Hwy	109	996	0	0	942	14	18	0	63	0	0	0
		Ma'alo Rd & Kuhio Hwy	31	901	0	0	662	26	30	0	34	0	0	0
		Laulima St & Kuhio Hwy	11	832	88	16	637	10	14	1	15	36	2	29
		Roberts Driveway & Kuhio Hwy	0	0	0	8	0	12	2	646	0	0	695	10
		Kapule Highway & Kuhio Hwy	108	1098	0	0	494	596	586	0	68	0	0	0
	Landfill & RRP Project Trips	Ehiku St & Kuhio Hwy	0	19	0	0	80	0	0	0	0	0	0	0
		Ma'alo Rd & Kuhio Hwy	0	19	0	0	80	0	0	0	0	0	0	0
		Laulima St & Kuhio Hwy	19	0	0	0	0	15	65	0	80	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	0	0	0	0	65	0	0	15	0
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	15	65	0	0	0	0	0
	Base + Landfill + RRP	Ehiku St & Kuhio Hwy	109	1008	0	0	1014	14	18	0	63	0	0	0
		Ma'alo Rd & Kuhio Hwy	31	913	0	0	734	26	30	0	34	0	0	0
		Laulima St & Kuhio Hwy	23	832	88	16	637	20	73	1	86	36	2	29
		Roberts Driveway & Kuhio Hwy	0	0	0	8	0	12	2	704	0	0	705	10
		Kapule Highway & Kuhio Hwy	108	1098	0	0	494	606	644	0	68	0	0	0
Future Long-Range Year	Base	Ehiku St & Kuhio Hwy	133	1207	0	0	1139	17	22	0	77	0	0	0
		Ma'alo Rd & Kuhio Hwy	38	1091	0	0	798	31	37	0	42	0	0	0
		Laulima St & Kuhio Hwy	5	1015	107	20	777	5	9	1	8	44	3	35
		Roberts Driveway & Kuhio Hwy	0	0	0	9	0	14	3	780	0	0	841	12
		Kapule Highway & Kuhio Hwy	132	1340	0	0	603	721	706	0	82	0	0	0
	Landfill Project Trips	Ehiku St & Kuhio Hwy	0	8	0	0	10	0	0	0	0	0	0	0
		Ma'alo Rd & Kuhio Hwy	0	8	0	0	10	0	0	0	0	0	0	0
		Laulima St & Kuhio Hwy	8	0	0	0	0	7	8	0	10	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	0	0	0	0	8	0	0	7	0
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	7	8	0	0	0	0	0
	Base + Landfill	Ehiku St & Kuhio Hwy	133	1216	0	0	1149	17	22	0	77	0	0	0
		Ma'alo Rd & Kuhio Hwy	38	1099	0	0	808	31	37	0	42	0	0	0
		Laulima St & Kuhio Hwy	13	1015	107	20	777	12	17	1	18	44	3	35
		Roberts Driveway & Kuhio Hwy	0	0	0	9	0	14	3	788	0	0	848	12
		Kapule Highway & Kuhio Hwy	132	1340	0	0	603	728	715	0	82	0	0	0
	Landfill & RRP Project Trips	Ehiku St & Kuhio Hwy	0	20	0	0	81	0	0	0	0	0	0	0
		Ma'alo Rd & Kuhio Hwy	0	20	0	0	81	0	0	0	0	0	0	0
		Laulima St & Kuhio Hwy	20	0	0	0	0	17	67	0	81	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	0	0	0	0	67	0	0	17	0
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	17	67	0	0	0	0	0
	Base + Landfill + RRP	Ehiku St & Kuhio Hwy	133	1228	0	0	1221	17	22	0	77	0	0	0
		Ma'alo Rd & Kuhio Hwy	38	1111	0	0	879	31	37	0	42	0	0	0
		Laulima St & Kuhio Hwy	26	1015	107	20	777	22	76	1	89	44	3	35
		Roberts Driveway & Kuhio Hwy	0	0	0	9	0	14	3	846	0	0	858	12
		Kapule Highway & Kuhio Hwy	132	1340	0	0	603	737	773	0	82	0	0	0

Roberts Driveway Access Option - AM Peak Hour Summary

Year	Scenario	Intersection	Northbound			Southbound			Eastbound			Westbound		
			Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Existing		Ehiku St & Kuhio Hwy	58	537	0	0	979	17	9	0	87	0	0	0
		Ma'alo Rd & Kuhio Hwy	17	365	0	0	833	13	8	0	9	0	0	0
		Laulima St & Kuhio Hwy	4	322	37	13	787	12	3	0	3	56	0	43
		Roberts Driveway & Kuhio Hwy	0	0	0	8	0	1	1	439	0	119	811	12
		Kapule Highway & Kuhio Hwy	33	311	0	0	884	909	278	0	288	0	0	0
Future Opening Year	Base	Ehiku St & Kuhio Hwy	62	576	0	0	1050	18	10	0	93	0	0	0
		Ma'alo Rd & Kuhio Hwy	18	391	0	0	893	14	9	0	10	0	0	0
		Laulima St & Kuhio Hwy	4	345	40	14	844	13	3	0	3	60	0	46
		Roberts Driveway & Kuhio Hwy	0	0	0	9	0	1	1	471	0	128	870	13
		Kapule Highway & Kuhio Hwy	35	333	0	0	948	975	298	0	309	0	0	0
	Landfill Project Trips	Ehiku St & Kuhio Hwy	0	8	0	0	8	0	0	0	0	0	0	0
		Ma'alo Rd & Kuhio Hwy	0	8	0	0	8	0	0	0	0	0	0	0
		Laulima St & Kuhio Hwy	0	8	0	0	8	0	0	0	0	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	7	0	8	8	0	0	0	0	7
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	7	7	0	0	0	0	0
	Base + Landfill	Ehiku St & Kuhio Hwy	62	584	0	0	1058	18	10	0	93	0	0	0
		Ma'alo Rd & Kuhio Hwy	18	400	0	0	901	14	9	0	10	0	0	0
		Laulima St & Kuhio Hwy	4	353	40	14	852	13	3	0	3	60	0	46
		Roberts Driveway & Kuhio Hwy	0	0	0	15	0	9	9	471	0	128	870	20
		Kapule Highway & Kuhio Hwy	35	333	0	0	948	981	305	0	309	0	0	0
	Landfill & RRP Project Trips	Ehiku St & Kuhio Hwy	0	80	0	0	23	0	0	0	0	0	0	0
		Ma'alo Rd & Kuhio Hwy	0	80	0	0	23	0	0	0	0	0	0	0
		Laulima St & Kuhio Hwy	0	80	0	0	23	0	0	0	0	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	18	0	23	80	0	0	0	0	65
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	65	18	0	0	0	0	0
	Base + Landfill + RRP	Ehiku St & Kuhio Hwy	62	655	0	0	1072	18	10	0	93	0	0	0
		Ma'alo Rd & Kuhio Hwy	18	471	0	0	916	14	9	0	10	0	0	0
		Laulima St & Kuhio Hwy	4	425	40	14	866	13	3	0	3	60	0	46
		Roberts Driveway & Kuhio Hwy	0	0	0	27	0	24	81	471	0	128	870	78
		Kapule Highway & Kuhio Hwy	35	333	0	0	948	1040	317	0	309	0	0	0
Future Long-Range Year	Base	Ehiku St & Kuhio Hwy	76	703	0	0	1281	22	12	0	114	0	0	0
		Ma'alo Rd & Kuhio Hwy	22	477	0	0	1090	17	10	0	12	0	0	0
		Laulima St & Kuhio Hwy	5	421	48	17	1030	16	4	0	4	73	0	56
		Roberts Driveway & Kuhio Hwy	0	0	0	10	0	1	1	574	0	156	1061	16
		Kapule Highway & Kuhio Hwy	43	407	0	0	1156	1189	364	0	377	0	0	0
	Landfill Project Trips	Ehiku St & Kuhio Hwy	0	10	0	0	10	0	0	0	0	0	0	0
		Ma'alo Rd & Kuhio Hwy	0	10	0	0	10	0	0	0	0	0	0	0
		Laulima St & Kuhio Hwy	0	10	0	0	10	0	0	0	0	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	8	0	10	10	0	0	0	0	9
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	9	8	0	0	0	0	0
	Base + Landfill	Ehiku St & Kuhio Hwy	76	713	0	0	1291	22	12	0	114	0	0	0
		Ma'alo Rd & Kuhio Hwy	22	488	0	0	1100	17	10	0	12	0	0	0
		Laulima St & Kuhio Hwy	5	432	48	17	1039	16	4	0	4	73	0	56
		Roberts Driveway & Kuhio Hwy	0	0	0	19	0	11	12	574	0	156	1061	24
		Kapule Highway & Kuhio Hwy	43	407	0	0	1156	1198	372	0	377	0	0	0
	Landfill & RRP Project Trips	Ehiku St & Kuhio Hwy	0	82	0	0	24	0	0	0	0	0	0	0
		Ma'alo Rd & Kuhio Hwy	0	82	0	0	24	0	0	0	0	0	0	0
		Laulima St & Kuhio Hwy	0	82	0	0	24	0	0	0	0	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	20	0	24	82	0	0	0	0	67
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	67	20	0	0	0	0	0
	Base + Landfill + RRP	Ehiku St & Kuhio Hwy	76	784	0	0	1305	22	12	0	114	0	0	0
		Ma'alo Rd & Kuhio Hwy	22	559	0	0	1114	17	10	0	12	0	0	0
		Laulima St & Kuhio Hwy	5	503	48	17	1054	16	4	0	4	73	0	56
		Roberts Driveway & Kuhio Hwy	0	0	0	30	0	26	83	574	0	156	1061	83
		Kapule Highway & Kuhio Hwy	43	407	0	0	1156	1256	383	0	377	0	0	0

Roberts Driveway Access Option - PM Peak Hour Summary

Year	Scenario	Intersection	Northbound			Southbound			Eastbound			Westbound		
			Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Existing		Ehiku St & Kuhio Hwy	102	923	0	0	871	13	17	0	59	0	0	0
		Ma'alo Rd & Kuhio Hwy	29	834	0	0	610	24	28	0	32	0	0	0
		Laulima St & Kuhio Hwy	4	776	82	15	594	4	7	1	6	34	2	27
		Roberts Driveway & Kuhio Hwy	0	0	0	7	0	11	2	596	0	0	643	9
		Kapule Highway & Kuhio Hwy	101	1024	0	0	461	551	540	0	63	0	0	0
Future Opening Year	Base	Ehiku St & Kuhio Hwy	109	990	0	0	934	14	18	0	63	0	0	0
		Ma'alo Rd & Kuhio Hwy	31	894	0	0	654	26	30	0	34	0	0	0
		Laulima St & Kuhio Hwy	4	832	88	16	637	4	8	1	6	36	2	29
		Roberts Driveway & Kuhio Hwy	0	0	0	8	0	12	2	639	0	0	689	10
		Kapule Highway & Kuhio Hwy	108	1098	0	0	494	591	579	0	68	0	0	0
	Landfill Project Trips	Ehiku St & Kuhio Hwy	0	7	0	0	8	0	0	0	0	0	0	0
		Ma'alo Rd & Kuhio Hwy	0	7	0	0	8	0	0	0	0	0	0	0
		Laulima St & Kuhio Hwy	0	7	0	0	8	0	0	0	0	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	7	0	8	7	0	0	0	0	5
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	5	7	0	0	0	0	0
	Base + Landfill	Ehiku St & Kuhio Hwy	109	996	0	0	942	14	18	0	63	0	0	0
		Ma'alo Rd & Kuhio Hwy	31	901	0	0	662	26	30	0	34	0	0	0
		Laulima St & Kuhio Hwy	4	839	88	16	645	4	8	1	6	36	2	29
		Roberts Driveway & Kuhio Hwy	0	0	0	14	0	20	9	639	0	0	689	15
		Kapule Highway & Kuhio Hwy	108	1098	0	0	494	596	586	0	68	0	0	0
	Landfill & RRP Project Trips	Ehiku St & Kuhio Hwy	0	19	0	0	80	0	0	0	0	0	0	0
		Ma'alo Rd & Kuhio Hwy	0	19	0	0	80	0	0	0	0	0	0	0
		Laulima St & Kuhio Hwy	0	19	0	0	80	0	0	0	0	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	65	0	80	19	0	0	0	0	15
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	15	65	0	0	0	0	0
	Base + Landfill + RRP	Ehiku St & Kuhio Hwy	109	1008	0	0	1014	14	18	0	63	0	0	0
		Ma'alo Rd & Kuhio Hwy	31	913	0	0	734	26	30	0	34	0	0	0
		Laulima St & Kuhio Hwy	4	851	88	16	717	4	8	1	6	36	2	29
		Roberts Driveway & Kuhio Hwy	0	0	0	73	0	92	21	639	0	0	689	25
		Kapule Highway & Kuhio Hwy	108	1098	0	0	494	606	644	0	68	0	0	0
Future Long-Range Year	Base	Ehiku St & Kuhio Hwy	133	1207	0	0	1139	17	22	0	77	0	0	0
		Ma'alo Rd & Kuhio Hwy	38	1091	0	0	798	31	37	0	42	0	0	0
		Laulima St & Kuhio Hwy	5	1015	107	20	777	5	9	1	8	44	3	35
		Roberts Driveway & Kuhio Hwy	0	0	0	9	0	14	3	780	0	0	841	12
		Kapule Highway & Kuhio Hwy	132	1340	0	0	603	721	706	0	82	0	0	0
	Landfill Project Trips	Ehiku St & Kuhio Hwy	0	8	0	0	10	0	0	0	0	0	0	0
		Ma'alo Rd & Kuhio Hwy	0	8	0	0	10	0	0	0	0	0	0	0
		Laulima St & Kuhio Hwy	0	8	0	0	10	0	0	0	0	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	8	0	10	8	0	0	0	0	7
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	7	8	0	0	0	0	0
	Base + Landfill	Ehiku St & Kuhio Hwy	133	1216	0	0	1149	17	22	0	77	0	0	0
		Ma'alo Rd & Kuhio Hwy	38	1099	0	0	808	31	37	0	42	0	0	0
		Laulima St & Kuhio Hwy	5	1023	107	20	787	5	9	1	8	44	3	35
		Roberts Driveway & Kuhio Hwy	0	0	0	17	0	24	11	780	0	0	841	19
		Kapule Highway & Kuhio Hwy	132	1340	0	0	603	728	715	0	82	0	0	0
	Landfill & RRP Project Trips	Ehiku St & Kuhio Hwy	0	20	0	0	81	0	0	0	0	0	0	0
		Ma'alo Rd & Kuhio Hwy	0	20	0	0	81	0	0	0	0	0	0	0
		Laulima St & Kuhio Hwy	0	20	0	0	81	0	0	0	0	0	0	0
		Roberts Driveway & Kuhio Hwy	0	0	0	67	0	81	20	0	0	0	0	17
		Kapule Highway & Kuhio Hwy	0	0	0	0	0	17	67	0	0	0	0	0
	Base + Landfill + RRP	Ehiku St & Kuhio Hwy	133	1228	0	0	1221	17	22	0	77	0	0	0
		Ma'alo Rd & Kuhio Hwy	38	1111	0	0	879	31	37	0	42	0	0	0
		Laulima St & Kuhio Hwy	5	1036	107	20	858	5	9	1	8	44	3	35
		Roberts Driveway & Kuhio Hwy	0	0	0	76	0	96	23	780	0	0	841	28
		Kapule Highway & Kuhio Hwy	132	1340	0	0	603	737	773	0	82	0	0	0

Appendix B
Intersection Level of Service Calculations

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Level Of Service Computation Report

Existing Conditions

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HCM Signalized Intersection Capacity Analysis
1: Kuhio Highway & Ehiku Street

11/7/2013

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	9	87	58	537	979	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3522	3530	
Flt Permitted	0.95	1.00		0.76	1.00	
Satd. Flow (perm)	1770	1583		2685	3530	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	10	95	63	584	1064	18
RTOR Reduction (vph)	0	89	0	0	0	0
Lane Group Flow (vph)	10	6	0	647	1082	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	5.9	5.9		86.1	86.1	
Effective Green, g (s)	5.9	5.9		86.1	86.1	
Actuated g/C Ratio	0.06	0.06		0.86	0.86	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	104	93		2311	3039	
v/s Ratio Prot	c0.01				c0.31	
v/s Ratio Perm		0.00		0.24		
v/c Ratio	0.10	0.06		0.28	0.36	
Uniform Delay, d1	44.5	44.4		1.3	1.4	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.3		0.3	0.3	
Delay (s)	44.9	44.7		1.6	1.7	
Level of Service	D	D		A	A	
Approach Delay (s)	44.7			1.6	1.7	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	57.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	8	9	17	365	833	13
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	10	18	397	905	14
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1346	912	905			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1346	912	905			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	95	97	98			
cM capacity (veh/h)	163	332	751			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	18	18	397	920
Volume Left	9	18	0	0
Volume Right	10	0	0	14
cSH	346	751	1700	1700
Volume to Capacity	0.05	0.02	0.23	0.54
Queue Length 95th (ft)	4	2	0	0
Control Delay (s)	21.9	9.9	0.0	0.0
Lane LOS	C	A		
Approach Delay (s)	21.9	0.4		0.0
Approach LOS	C			

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	54.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	3	0	3	56	0	43	4	332	37	13	787	12
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	0	3	61	0	47	4	361	40	14	855	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1327	1300	862	1283	1286	381	868			401		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1327	1300	862	1283	1286	381	868			401		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	97	100	99	56	100	93	99			99		
cM capacity (veh/h)	121	158	355	139	161	666	776			1158		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	7	108	405	883
Volume Left	3	61	4	14
Volume Right	3	47	40	13
cSH	181	211	776	1158
Volume to Capacity	0.04	0.51	0.01	0.01
Queue Length 95th (ft)	3	65	0	1
Control Delay (s)	25.6	38.5	0.2	0.3
Lane LOS	D	E	A	A
Approach Delay (s)	25.6	38.5	0.2	0.3
Approach LOS	D	E		

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	64.3%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Volume (veh/h)	1	439	119	811	12	8	1
Sign Control		Free		Free		Stop	
Grade		0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	477	0	882	13	9	1
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None		None			
Median storage veh)							
Upstream signal (ft)				593			
pX, platoon unblocked			0.00				
vC, conflicting volume	895		0			1367	888
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	895		0			1367	888
tC, single (s)	4.1		0.0			6.4	6.2
tC, 2 stage (s)							
tF (s)	2.2		0.0			3.5	3.3
p0 queue free %	100		0			95	100
cM capacity (veh/h)	758		0			162	343

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	478	895	10
Volume Left	1	0	9
Volume Right	0	13	1
cSH	758	1700	172
Volume to Capacity	0.00	0.53	0.06
Queue Length 95th (ft)	0	0	4
Control Delay (s)	0.0	0.0	27.2
Lane LOS	A		D
Approach Delay (s)	0.0	0.0	27.2
Approach LOS			D

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	86.5%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	278	288	33	311	884	909
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.12	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	215	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	302	313	36	338	961	988
RTOR Reduction (vph)	0	199	0	0	0	364
Lane Group Flow (vph)	302	114	36	338	961	624
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	22.2	22.2	72.9	95.1	65.1	65.1
Effective Green, g (s)	22.2	22.2	72.9	95.1	65.1	65.1
Actuated g/C Ratio	0.22	0.22	0.71	0.92	0.63	0.63
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	381	340	209	1863	1176	999
v/s Ratio Prot	c0.17		0.01	c0.13	c0.52	
v/s Ratio Perm		0.07	0.12	0.05		0.39
v/c Ratio	0.79	0.34	0.17	0.18	0.82	0.62
Uniform Delay, d1	38.3	34.2	14.3	0.4	14.5	11.6
Progression Factor	1.00	0.99	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.7	0.6	0.4	0.0	6.4	2.9
Delay (s)	48.9	34.4	14.7	0.4	20.8	14.5
Level of Service	D	C	B	A	C	B
Approach Delay (s)	41.5			1.8	17.6	
Approach LOS	D			A	B	

Intersection Summary			
HCM 2000 Control Delay	20.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	103.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
1: Kuhio Highway & Ehiku Street

11/7/2013

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	17	59	102	923	871	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3522	3531	
Flt Permitted	0.95	1.00		0.73	1.00	
Satd. Flow (perm)	1770	1583		2577	3531	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	18	64	111	1003	947	14
RTOR Reduction (vph)	0	60	0	0	0	0
Lane Group Flow (vph)	18	4	0	1114	961	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	5.7	5.7		86.3	86.3	
Effective Green, g (s)	5.7	5.7		86.3	86.3	
Actuated g/C Ratio	0.06	0.06		0.86	0.86	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	100	90		2223	3047	
v/s Ratio Prot	c0.01				0.27	
v/s Ratio Perm		0.00		c0.43		
v/c Ratio	0.18	0.04		0.50	0.32	
Uniform Delay, d1	44.9	44.6		1.7	1.3	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	0.2		0.8	0.3	
Delay (s)	45.8	44.8		2.5	1.6	
Level of Service	D	D		A	A	
Approach Delay (s)	45.0			2.5	1.6	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	3.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	66.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	28	32	29	834	610	24
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	30	35	32	907	663	26
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1646	676	663			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1646	676	663			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	71	92	97			
cM capacity (veh/h)	106	453	926			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	65	32	907	689
Volume Left	30	32	0	0
Volume Right	35	0	0	26
cSH	226	926	1700	1700
Volume to Capacity	0.29	0.03	0.53	0.41
Queue Length 95th (ft)	29	3	0	0
Control Delay (s)	31.7	9.0	0.0	0.0
Lane LOS	D	A		
Approach Delay (s)	31.7	0.3		0.0
Approach LOS	D			

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	53.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	7	1	6	34	2	27	4	776	82	15	594	4
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	1	7	37	2	29	4	843	89	16	646	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1608	1622	648	1584	1579	888	650			933		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1608	1622	648	1584	1579	888	650			933		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	90	99	99	56	98	91	100			98		
cM capacity (veh/h)	74	100	470	84	106	343	936			734		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	15	68	937	666
Volume Left	8	37	4	16
Volume Right	7	29	89	4
cSH	120	125	936	734
Volume to Capacity	0.13	0.55	0.00	0.02
Queue Length 95th (ft)	11	66	0	2
Control Delay (s)	39.3	63.8	0.1	0.6
Lane LOS	E	F	A	A
Approach Delay (s)	39.3	63.8	0.1	0.6
Approach LOS	E	F		

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	59.0%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	2	596	643	9	7	11
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	648	699	10	8	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			593			
pX, platoon unblocked						
vC, conflicting volume	709				1356	704
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	709				1356	704
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				95	97
cM capacity (veh/h)	890				164	437

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	650	709	20
Volume Left	2	0	8
Volume Right	0	10	12
cSH	890	1700	265
Volume to Capacity	0.00	0.42	0.07
Queue Length 95th (ft)	0	0	6
Control Delay (s)	0.1	0.0	19.6
Lane LOS	A		C
Approach Delay (s)	0.1	0.0	19.6
Approach LOS			C

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	44.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	540	63	101	1024	461	551
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.33	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	614	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	587	68	110	1113	501	599
RTOR Reduction (vph)	0	42	0	0	0	278
Lane Group Flow (vph)	587	26	110	1113	501	321
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	31.0	31.0	71.0	102.0	58.9	58.9
Effective Green, g (s)	31.0	31.0	71.0	102.0	58.9	58.9
Actuated g/C Ratio	0.28	0.28	0.65	0.93	0.54	0.54
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	498	446	481	1863	997	847
v/s Ratio Prot	c0.33		0.02	c0.39	0.27	
v/s Ratio Perm		0.02	0.13	0.21		0.20
v/c Ratio	1.18	0.06	0.23	0.60	0.50	0.38
Uniform Delay, d1	39.5	28.8	9.4	0.7	16.2	14.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	99.7	0.1	0.2	0.5	1.8	1.3
Delay (s)	139.2	28.9	9.6	1.2	18.0	16.2
Level of Service	F	C	A	A	B	B
Approach Delay (s)	127.7			1.9	17.0	
Approach LOS	F			A	B	

Intersection Summary			
HCM 2000 Control Delay	35.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	90.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

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Level Of Service Computation Report

Future Opening Year

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HCM Signalized Intersection Capacity Analysis
1: Kuhio Highway & Ehiku Street

1/9/2014

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	10	93	62	576	1050	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3522	3530	
Flt Permitted	0.95	1.00		0.74	1.00	
Satd. Flow (perm)	1770	1583		2624	3530	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	101	67	626	1141	20
RTOR Reduction (vph)	0	95	0	0	1	0
Lane Group Flow (vph)	11	6	0	693	1160	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	5.9	5.9		86.1	86.1	
Effective Green, g (s)	5.9	5.9		86.1	86.1	
Actuated g/C Ratio	0.06	0.06		0.86	0.86	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	104	93		2259	3039	
v/s Ratio Prot	c0.01				c0.33	
v/s Ratio Perm		0.00		0.26		
v/c Ratio	0.11	0.06		0.31	0.38	
Uniform Delay, d1	44.6	44.4		1.3	1.4	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.3		0.4	0.4	
Delay (s)	45.0	44.7		1.7	1.8	
Level of Service	D	D		A	A	
Approach Delay (s)	44.8			1.7	1.8	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	60.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	9	10	18	391	893	14
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	11	20	425	971	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1442	978	971			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1442	978	971			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	96	97			
cM capacity (veh/h)	142	304	710			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	21	20	425	986
Volume Left	10	20	0	0
Volume Right	11	0	0	15
cSH	299	710	1700	1700
Volume to Capacity	0.07	0.03	0.25	0.58
Queue Length 95th (ft)	6	2	0	0
Control Delay (s)	24.4	10.2	0.0	0.0
Lane LOS	C	B		
Approach Delay (s)	24.4	0.4		0.0
Approach LOS	C			

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	57.8%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	3	0	3	60	0	46	4	345	40	14	844	13
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	0	3	65	0	50	4	375	43	15	917	14
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1410	1382	924	1364	1367	397	932			418		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1410	1382	924	1364	1367	397	932			418		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	97	100	99	46	100	92	99			99		
cM capacity (veh/h)	105	141	326	122	144	653	735			1141		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	7	115	423	947
Volume Left	3	65	4	15
Volume Right	3	50	43	14
cSH	159	188	735	1141
Volume to Capacity	0.04	0.61	0.01	0.01
Queue Length 95th (ft)	3	86	0	1
Control Delay (s)	28.5	50.3	0.2	0.4
Lane LOS	D	F	A	A
Approach Delay (s)	28.5	50.3	0.2	0.4
Approach LOS	D	F		

Intersection Summary			
Average Delay	4.3		
Intersection Capacity Utilization	68.6%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Volume (veh/h)	1	471	128	870	13	9	1
Sign Control		Free		Free		Stop	
Grade		0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	512	0	946	14	10	1
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None		None			
Median storage veh)							
Upstream signal (ft)				608			
pX, platoon unblocked			0.00				
vC, conflicting volume	960		0			1467	953
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	960		0			1467	953
tC, single (s)	4.1		0.0			6.4	6.2
tC, 2 stage (s)							
tF (s)	2.2		0.0			3.5	3.3
p0 queue free %	100		0			93	100
cM capacity (veh/h)	717		0			141	314

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	513	960	11
Volume Left	1	0	10
Volume Right	0	14	1
cSH	717	1700	149
Volume to Capacity	0.00	0.56	0.07
Queue Length 95th (ft)	0	0	6
Control Delay (s)	0.0	0.0	31.1
Lane LOS	A		D
Approach Delay (s)	0.0	0.0	31.1
Approach LOS			D

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	91.8%	ICU Level of Service	F
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	298	309	35	333	948	975
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.07	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	129	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	324	336	38	362	1030	1060
RTOR Reduction (vph)	0	187	0	0	0	380
Lane Group Flow (vph)	324	149	38	362	1030	680
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	23.5	23.5	72.9	96.4	65.0	65.0
Effective Green, g (s)	23.5	23.5	72.9	96.4	65.0	65.0
Actuated g/C Ratio	0.23	0.23	0.70	0.92	0.62	0.62
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	398	356	151	1863	1159	985
v/s Ratio Prot	c0.18		0.01	c0.14	c0.55	
v/s Ratio Perm		0.09	0.17	0.06		0.43
v/c Ratio	0.81	0.42	0.25	0.19	0.89	0.69
Uniform Delay, d1	38.4	34.6	19.2	0.4	16.6	13.0
Progression Factor	1.00	0.98	1.00	1.00	1.00	1.00
Incremental Delay, d2	12.0	0.8	0.9	0.1	10.3	4.0
Delay (s)	50.2	34.8	20.0	0.4	26.9	17.0
Level of Service	D	C	C	A	C	B
Approach Delay (s)	42.3			2.3	21.9	
Approach LOS	D			A	C	

Intersection Summary			
HCM 2000 Control Delay	23.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	104.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
1: Kuhio Highway & Ehiku Street

1/9/2014

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	18	63	109	990	934	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3522	3531	
Flt Permitted	0.95	1.00		0.71	1.00	
Satd. Flow (perm)	1770	1583		2512	3531	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	20	68	118	1076	1015	15
RTOR Reduction (vph)	0	64	0	0	0	0
Lane Group Flow (vph)	20	4	0	1194	1030	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	5.8	5.8		86.2	86.2	
Effective Green, g (s)	5.8	5.8		86.2	86.2	
Actuated g/C Ratio	0.06	0.06		0.86	0.86	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	102	91		2165	3043	
v/s Ratio Prot	c0.01				0.29	
v/s Ratio Perm		0.00		c0.48		
v/c Ratio	0.20	0.04		0.55	0.34	
Uniform Delay, d1	44.9	44.5		1.8	1.3	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	0.2		1.0	0.3	
Delay (s)	45.8	44.7		2.8	1.6	
Level of Service	D	D		A	A	
Approach Delay (s)	44.9			2.8	1.6	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	3.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	30	34	31	894	654	26
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	37	34	972	711	28
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1764	725	711			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1764	725	711			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	63	91	96			
cM capacity (veh/h)	89	425	889			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	70	34	972	739
Volume Left	33	34	0	0
Volume Right	37	0	0	28
cSH	190	889	1700	1700
Volume to Capacity	0.37	0.04	0.57	0.43
Queue Length 95th (ft)	39	3	0	0
Control Delay (s)	39.1	9.2	0.0	0.0
Lane LOS	E	A		
Approach Delay (s)	39.1	0.3		0.0
Approach LOS	E			

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	57.1%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	8	1	6	36	2	29	4	832	88	16	637	4
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	1	7	39	2	32	4	904	96	17	692	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1723	1738	695	1697	1692	952	697			1000		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1723	1738	695	1697	1692	952	697			1000		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	86	99	99	44	98	90	100			97		
cM capacity (veh/h)	61	85	442	70	90	315	899			692		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	16	73	1004	714
Volume Left	9	39	4	17
Volume Right	7	32	96	4
cSH	95	106	899	692
Volume to Capacity	0.17	0.69	0.00	0.03
Queue Length 95th (ft)	15	89	0	2
Control Delay (s)	50.5	92.6	0.1	0.7
Lane LOS	F	F	A	A
Approach Delay (s)	50.5	92.6	0.1	0.7
Approach LOS	F	F		

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	62.5%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	2	639	689	10	8	12
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	695	749	11	9	13
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			608			
pX, platoon unblocked						
vC, conflicting volume	760				1453	754
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	760				1453	754
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				94	97
cM capacity (veh/h)	852				143	409

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	697	760	22
Volume Left	2	0	9
Volume Right	0	11	13
cSH	852	1700	235
Volume to Capacity	0.00	0.45	0.09
Queue Length 95th (ft)	0	0	8
Control Delay (s)	0.1	0.0	21.9
Lane LOS	A		C
Approach Delay (s)	0.1	0.0	21.9
Approach LOS			C

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	46.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	579	68	108	1098	494	591
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.30	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	565	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	629	74	117	1193	537	642
RTOR Reduction (vph)	0	42	0	0	0	299
Lane Group Flow (vph)	629	32	117	1193	537	343
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	31.0	31.0	71.0	102.0	58.8	58.8
Effective Green, g (s)	31.0	31.0	71.0	102.0	58.8	58.8
Actuated g/C Ratio	0.28	0.28	0.65	0.93	0.53	0.53
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	498	446	454	1863	995	846
v/s Ratio Prot	c0.36		0.02	c0.41	0.29	
v/s Ratio Perm		0.02	0.15	0.23		0.22
v/c Ratio	1.26	0.07	0.26	0.64	0.54	0.41
Uniform Delay, d1	39.5	28.9	9.9	0.7	16.7	15.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	133.7	0.1	0.3	0.8	2.1	1.4
Delay (s)	173.2	29.0	10.2	1.5	18.8	16.7
Level of Service	F	C	B	A	B	B
Approach Delay (s)	158.1			2.3	17.7	
Approach LOS	F			A	B	

Intersection Summary			
HCM 2000 Control Delay	42.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	96.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

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Level Of Service Computation Report

Future Opening Year plus Landfill (Ehiku Access)

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Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	16	102	70	576	1050	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		0.99	1.00	
Satd. Flow (prot)	1770	1583		3520	3527	
Flt Permitted	0.95	1.00		0.72	1.00	
Satd. Flow (perm)	1770	1583		2534	3527	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	17	111	76	626	1141	27
RTOR Reduction (vph)	0	103	0	0	1	0
Lane Group Flow (vph)	17	8	0	702	1167	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	7.2	7.2		84.8	84.8	
Effective Green, g (s)	7.2	7.2		84.8	84.8	
Actuated g/C Ratio	0.07	0.07		0.85	0.85	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	127	113		2148	2990	
v/s Ratio Prot	c0.01				c0.33	
v/s Ratio Perm		0.01		0.28		
v/c Ratio	0.13	0.07		0.33	0.39	
Uniform Delay, d1	43.5	43.3		1.6	1.7	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	0.3		0.4	0.4	
Delay (s)	44.0	43.5		2.0	2.1	
Level of Service	D	D		A	A	
Approach Delay (s)	43.6			2.0	2.1	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	9	10	18	398	900	14
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	11	20	433	978	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1458	986	978			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1458	986	978			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	96	97			
cM capacity (veh/h)	139	301	705			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	21	20	433	993
Volume Left	10	20	0	0
Volume Right	11	0	0	15
cSH	293	705	1700	1700
Volume to Capacity	0.07	0.03	0.25	0.58
Queue Length 95th (ft)	6	2	0	0
Control Delay (s)	24.8	10.2	0.0	0.0
Lane LOS	C	B		
Approach Delay (s)	24.8	0.4		0.0
Approach LOS	C			

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	58.2%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	3	0	3	60	0	46	4	352	40	14	851	13
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	0	3	65	0	50	4	383	43	15	925	14
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1426	1397	932	1379	1383	404	939			426		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1426	1397	932	1379	1383	404	939			426		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	97	100	99	45	100	92	99			99		
cM capacity (veh/h)	103	138	323	119	141	646	730			1133		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	7	115	430	954
Volume Left	3	65	4	15
Volume Right	3	50	43	14
cSH	156	184	730	1133
Volume to Capacity	0.04	0.63	0.01	0.01
Queue Length 95th (ft)	3	89	0	1
Control Delay (s)	29.1	52.6	0.2	0.4
Lane LOS	D	F	A	A
Approach Delay (s)	29.1	52.6	0.2	0.4
Approach LOS	D	F		

Intersection Summary			
Average Delay	4.4		
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Volume (veh/h)	1	477	128	876	13	9	1
Sign Control		Free		Free		Stop	
Grade		0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	518	0	952	14	10	1
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None		None			
Median storage veh)							
Upstream signal (ft)				613			
pX, platoon unblocked			0.00				
vC, conflicting volume	966		0			1480	959
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	966		0			1480	959
tC, single (s)	4.1		0.0			6.4	6.2
tC, 2 stage (s)							
tF (s)	2.2		0.0			3.5	3.3
p0 queue free %	100		0			93	100
cM capacity (veh/h)	713		0			138	312

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	520	966	11
Volume Left	1	0	10
Volume Right	0	14	1
cSH	713	1700	146
Volume to Capacity	0.00	0.57	0.07
Queue Length 95th (ft)	0	0	6
Control Delay (s)	0.0	0.0	31.6
Lane LOS	A		D
Approach Delay (s)	0.0	0.0	31.6
Approach LOS			D

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	92.5%	ICU Level of Service	F
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	305	309	35	333	948	981
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.07	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	125	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	332	336	38	362	1030	1066
RTOR Reduction (vph)	0	186	0	0	0	382
Lane Group Flow (vph)	332	150	38	362	1030	684
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	23.9	23.9	72.9	96.8	65.0	65.0
Effective Green, g (s)	23.9	23.9	72.9	96.8	65.0	65.0
Actuated g/C Ratio	0.23	0.23	0.70	0.92	0.62	0.62
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	403	361	148	1863	1155	981
v/s Ratio Prot	c0.19		0.01	c0.14	c0.55	
v/s Ratio Perm		0.09	0.17	0.06		0.43
v/c Ratio	0.82	0.42	0.26	0.19	0.89	0.70
Uniform Delay, d1	38.4	34.5	19.5	0.4	16.9	13.3
Progression Factor	1.00	0.98	1.00	1.00	1.00	1.00
Incremental Delay, d2	12.7	0.8	0.9	0.1	10.6	4.1
Delay (s)	51.0	34.6	20.4	0.4	27.5	17.4
Level of Service	D	C	C	A	C	B
Approach Delay (s)	42.8			2.3	22.4	
Approach LOS	D			A	C	

Intersection Summary			
HCM 2000 Control Delay	24.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	104.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	25	72	116	990	934	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		0.99	1.00	
Satd. Flow (prot)	1770	1583		3521	3528	
Flt Permitted	0.95	1.00		0.70	1.00	
Satd. Flow (perm)	1770	1583		2464	3528	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	27	78	126	1076	1015	21
RTOR Reduction (vph)	0	73	0	0	1	0
Lane Group Flow (vph)	27	5	0	1202	1035	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	6.1	6.1		85.9	85.9	
Effective Green, g (s)	6.1	6.1		85.9	85.9	
Actuated g/C Ratio	0.06	0.06		0.86	0.86	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	107	96		2116	3030	
v/s Ratio Prot	c0.02				0.29	
v/s Ratio Perm		0.00		c0.49		
v/c Ratio	0.25	0.05		0.57	0.34	
Uniform Delay, d1	44.8	44.2		1.9	1.4	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.2	0.2		1.1	0.3	
Delay (s)	46.0	44.4		3.1	1.7	
Level of Service	D	D		A	A	
Approach Delay (s)	44.8			3.1	1.7	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	30	34	31	901	659	26
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	37	34	979	716	28
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1777	730	716			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1777	730	716			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	63	91	96			
cM capacity (veh/h)	87	422	884			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	70	34	979	745
Volume Left	33	34	0	0
Volume Right	37	0	0	28
cSH	186	884	1700	1700
Volume to Capacity	0.37	0.04	0.58	0.44
Queue Length 95th (ft)	40	3	0	0
Control Delay (s)	40.0	9.2	0.0	0.0
Lane LOS	E	A		
Approach Delay (s)	40.0	0.3		0.0
Approach LOS	E			

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	8	1	6	36	2	29	4	839	88	16	642	4
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	1	7	39	2	32	4	912	96	17	698	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1736	1751	700	1710	1705	960	702			1008		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1736	1751	700	1710	1705	960	702			1008		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	85	99	99	43	98	90	100			97		
cM capacity (veh/h)	59	83	439	68	89	311	895			688		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	16	73	1012	720
Volume Left	9	39	4	17
Volume Right	7	32	96	4
cSH	93	104	895	688
Volume to Capacity	0.17	0.70	0.00	0.03
Queue Length 95th (ft)	15	91	0	2
Control Delay (s)	51.7	96.4	0.1	0.7
Lane LOS	F	F	A	A
Approach Delay (s)	51.7	96.4	0.1	0.7
Approach LOS	F	F		

Intersection Summary			
Average Delay	4.7		
Intersection Capacity Utilization	62.8%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	2	646	695	10	8	12
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	702	755	11	9	13
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			613			
pX, platoon unblocked						
vC, conflicting volume	766				1467	761
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	766				1467	761
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				94	97
cM capacity (veh/h)	847				140	405

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	704	766	22
Volume Left	2	0	9
Volume Right	0	11	13
cSH	847	1700	231
Volume to Capacity	0.00	0.45	0.09
Queue Length 95th (ft)	0	0	8
Control Delay (s)	0.1	0.0	22.2
Lane LOS	A		C
Approach Delay (s)	0.1	0.0	22.2
Approach LOS			C

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	47.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	586	68	108	1098	494	596
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.30	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	565	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	637	74	117	1193	537	648
RTOR Reduction (vph)	0	42	0	0	0	302
Lane Group Flow (vph)	637	32	117	1193	537	346
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	31.0	31.0	71.0	102.0	58.8	58.8
Effective Green, g (s)	31.0	31.0	71.0	102.0	58.8	58.8
Actuated g/C Ratio	0.28	0.28	0.65	0.93	0.53	0.53
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	498	446	454	1863	995	846
v/s Ratio Prot	c0.36		0.02	c0.41	0.29	
v/s Ratio Perm		0.02	0.15	0.23		0.22
v/c Ratio	1.28	0.07	0.26	0.64	0.54	0.41
Uniform Delay, d1	39.5	29.0	9.9	0.7	16.7	15.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	140.4	0.1	0.3	0.8	2.1	1.5
Delay (s)	179.9	29.0	10.2	1.5	18.8	16.7
Level of Service	F	C	B	A	B	B
Approach Delay (s)	164.2			2.3	17.7	
Approach LOS	F			A	B	

Intersection Summary			
HCM 2000 Control Delay	43.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	96.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

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Level Of Service Computation Report

Future Opening Year plus Landfill plus RRP (Ehiku Access)

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Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	28	116	142	576	1050	83
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	0.99	
Flt Protected	0.95	1.00		0.99	1.00	
Satd. Flow (prot)	1770	1583		3505	3500	
Flt Permitted	0.95	1.00		0.57	1.00	
Satd. Flow (perm)	1770	1583		2033	3500	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	30	126	154	626	1141	90
RTOR Reduction (vph)	0	102	0	0	3	0
Lane Group Flow (vph)	30	24	0	780	1228	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	8.0	8.0		84.0	84.0	
Effective Green, g (s)	8.0	8.0		84.0	84.0	
Actuated g/C Ratio	0.08	0.08		0.84	0.84	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	141	126		1707	2940	
v/s Ratio Prot	c0.02				0.35	
v/s Ratio Perm		0.02		c0.38		
v/c Ratio	0.21	0.19		0.46	0.42	
Uniform Delay, d1	43.1	43.0		2.1	2.0	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	0.7		0.9	0.4	
Delay (s)	43.8	43.7		3.0	2.4	
Level of Service	D	D		A	A	
Approach Delay (s)	43.7			3.0	2.4	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	5.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	9	10	18	410	958	14
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	11	20	446	1041	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1534	1049	1041			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1534	1049	1041			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	92	96	97			
cM capacity (veh/h)	124	276	668			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	21	20	446	1057
Volume Left	10	20	0	0
Volume Right	11	0	0	15
cSH	263	668	1700	1700
Volume to Capacity	0.08	0.03	0.26	0.62
Queue Length 95th (ft)	6	2	0	0
Control Delay (s)	27.0	10.6	0.0	0.0
Lane LOS	D	B		
Approach Delay (s)	27.0	0.4		0.0
Approach LOS	D			

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	61.3%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	3	0	3	60	0	46	4	364	40	14	909	13
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	0	3	65	0	50	4	396	43	15	988	14
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1502	1473	995	1455	1459	417	1002			439		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1502	1473	995	1455	1459	417	1002			439		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	96	100	99	38	100	92	99			99		
cM capacity (veh/h)	91	124	297	105	127	635	691			1121		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	7	115	443	1017
Volume Left	3	65	4	15
Volume Right	3	50	43	14
cSH	139	165	691	1121
Volume to Capacity	0.05	0.70	0.01	0.01
Queue Length 95th (ft)	4	104	0	1
Control Delay (s)	32.1	66.2	0.2	0.4
Lane LOS	D	F	A	A
Approach Delay (s)	32.1	66.2	0.2	0.4
Approach LOS	D	F		

Intersection Summary			
Average Delay	5.3		
Intersection Capacity Utilization	72.1%	ICU Level of Service	C
Analysis Period (min)	15		

Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways
Warrant 3 (Peak Hour) Traffic Signal Warrant Worksheet

Intersection # 3 : Kuhio Hwy & Laulima St
AM Peak Hour
Ehiku St access scenario
Future Opening Year + Landfill + RRP

PART A or PART B satisfied YES ☐ NO ☑

PART A **PART A satisfied** YES ☐ NO ☑

(All parts 1, 2, and 3 below must be satisfied)

1. The total stopped time delay experienced by the traffic on one minor-street approach controlled by a STOP sign equals or exceeds: 4 vehicle-hours for a one-lane approach; or 5 vehicle-hours for a two-lane approach, and — Yes ☐ No ☑ — 1.9

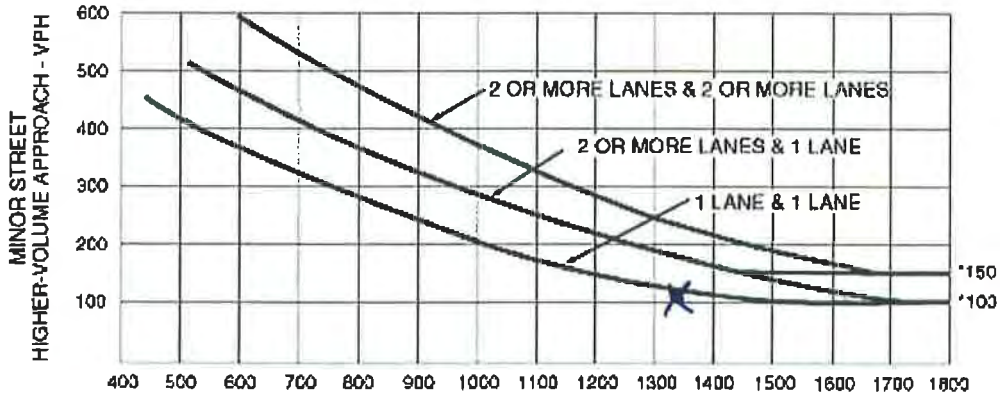
2. The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes, and — Yes ☑ No ☐ — 106

3. The total entering volume serviced during the hour equals or exceeds 650 vehicles per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches. — Yes ☑ No ☐ — 1456

PART B **PART B satisfied** YES ☐ NO ☑

The plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in **Figure 4C-3** for the existing combination of approach lanes.

Figure 4C-3. Warrant 3, Peak Hour



106
1343

MAJOR STREET—TOTAL OF BOTH APPROACHES—
VEHICLES PER HOUR (VPH)

*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Volume (veh/h)	1	489	128	935	13	9	1
Sign Control		Free		Free		Stop	
Grade		0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	532	0	1016	14	10	1
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None		None			
Median storage veh)							
Upstream signal (ft)				604			
pX, platoon unblocked			0.00				
vC, conflicting volume	1030		0			1557	1023
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	1030		0			1557	1023
tC, single (s)	4.1		0.0			6.4	6.2
tC, 2 stage (s)							
tF (s)	2.2		0.0			3.5	3.3
p0 queue free %	100		0			92	100
cM capacity (veh/h)	674		0			124	286

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	533	1030	11
Volume Left	1	0	10
Volume Right	0	14	1
cSH	674	1700	131
Volume to Capacity	0.00	0.61	0.08
Queue Length 95th (ft)	0	0	7
Control Delay (s)	0.0	0.0	34.9
Lane LOS	A		D
Approach Delay (s)	0.0	0.0	34.9
Approach LOS			D

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	96.2%	ICU Level of Service	F
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	317	309	35	333	948	1040
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.06	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	117	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	345	336	38	362	1030	1130
RTOR Reduction (vph)	0	185	0	0	0	386
Lane Group Flow (vph)	345	151	38	362	1030	744
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	24.6	24.6	72.9	97.5	65.0	65.0
Effective Green, g (s)	24.6	24.6	72.9	97.5	65.0	65.0
Actuated g/C Ratio	0.23	0.23	0.69	0.92	0.62	0.62
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	412	369	141	1863	1147	975
v/s Ratio Prot	c0.19		0.01	c0.13	c0.55	
v/s Ratio Perm		0.10	0.17	0.06		0.47
v/c Ratio	0.84	0.41	0.27	0.19	0.90	0.76
Uniform Delay, d1	38.5	34.3	20.1	0.4	17.4	14.7
Progression Factor	0.99	0.97	1.00	1.00	1.00	1.00
Incremental Delay, d2	13.7	0.7	1.0	0.1	11.1	5.7
Delay (s)	52.0	34.0	21.1	0.4	28.5	20.3
Level of Service	D	C	C	A	C	C
Approach Delay (s)	43.2			2.4	24.2	
Approach LOS	D			A	C	

Intersection Summary			
HCM 2000 Control Delay	25.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	105.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	83	143	128	990	934	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		0.99	1.00	
Satd. Flow (prot)	1770	1583		3519	3523	
Flt Permitted	0.95	1.00		0.67	1.00	
Satd. Flow (perm)	1770	1583		2389	3523	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	90	155	139	1076	1015	32
RTOR Reduction (vph)	0	129	0	0	1	0
Lane Group Flow (vph)	90	26	0	1215	1046	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	10.4	10.4		81.6	81.6	
Effective Green, g (s)	10.4	10.4		81.6	81.6	
Actuated g/C Ratio	0.10	0.10		0.82	0.82	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	184	164		1949	2874	
v/s Ratio Prot	c0.05				0.30	
v/s Ratio Perm		0.02		c0.51		
v/c Ratio	0.49	0.16		0.62	0.36	
Uniform Delay, d1	42.3	40.8		3.4	2.4	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.0	0.5		1.5	0.4	
Delay (s)	44.3	41.3		5.0	2.8	
Level of Service	D	D		A	A	
Approach Delay (s)	42.4			5.0	2.8	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	7.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	72.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	30	34	31	959	669	26
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	37	34	1042	727	28
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1851	741	727			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1851	741	727			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	58	91	96			
cM capacity (veh/h)	78	416	876			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	70	34	1042	755
Volume Left	33	34	0	0
Volume Right	37	0	0	28
cSH	167	876	1700	1700
Volume to Capacity	0.42	0.04	0.61	0.44
Queue Length 95th (ft)	46	3	0	0
Control Delay (s)	45.3	9.3	0.0	0.0
Lane LOS	E	A		
Approach Delay (s)	45.3	0.3		0.0
Approach LOS	E			

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	60.5%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	8	1	6	36	2	29	4	897	88	16	652	4
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	1	7	39	2	32	4	975	96	17	709	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1810	1825	711	1784	1779	1023	713			1071		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1810	1825	711	1784	1779	1023	713			1071		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	83	99	98	35	97	89	100			97		
cM capacity (veh/h)	52	75	433	60	80	286	887			651		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	16	73	1075	730
Volume Left	9	39	4	17
Volume Right	7	32	96	4
cSH	83	93	887	651
Volume to Capacity	0.20	0.79	0.00	0.03
Queue Length 95th (ft)	17	103	0	2
Control Delay (s)	59.1	122.5	0.2	0.7
Lane LOS	F	F	A	A
Approach Delay (s)	59.1	122.5	0.2	0.7
Approach LOS	F	F		

Intersection Summary			
Average Delay	5.6		
Intersection Capacity Utilization	65.9%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	2	704	705	10	8	12
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	765	766	11	9	13
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			604			
pX, platoon unblocked						
vC, conflicting volume	777				1541	772
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	777				1541	772
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				93	97
cM capacity (veh/h)	839				126	400

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	767	777	22
Volume Left	2	0	9
Volume Right	0	11	13
cSH	839	1700	214
Volume to Capacity	0.00	0.46	0.10
Queue Length 95th (ft)	0	0	8
Control Delay (s)	0.1	0.0	23.7
Lane LOS	A		C
Approach Delay (s)	0.1	0.0	23.7
Approach LOS			C

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	48.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	644	68	108	1098	494	606
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.30	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	565	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	700	74	117	1193	537	659
RTOR Reduction (vph)	0	38	0	0	0	307
Lane Group Flow (vph)	700	36	117	1193	537	352
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	31.0	31.0	71.0	102.0	58.8	58.8
Effective Green, g (s)	31.0	31.0	71.0	102.0	58.8	58.8
Actuated g/C Ratio	0.28	0.28	0.65	0.93	0.53	0.53
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	498	446	454	1863	995	846
v/s Ratio Prot	c0.40		0.02	c0.41	0.29	
v/s Ratio Perm		0.02	0.15	0.23		0.22
v/c Ratio	1.41	0.08	0.26	0.64	0.54	0.42
Uniform Delay, d1	39.5	29.0	9.9	0.7	16.7	15.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	194.3	0.1	0.3	0.8	2.1	1.5
Delay (s)	233.8	29.1	10.2	1.5	18.8	16.8
Level of Service	F	C	B	A	B	B
Approach Delay (s)	214.2			2.3	17.7	
Approach LOS	F			A	B	

Intersection Summary			
HCM 2000 Control Delay	57.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	100.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

****

Level Of Service Computation Report

Future Opening Year plus Landfill (Maalo Access)

****

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	10	93	62	584	1058	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3522	3530	
Flt Permitted	0.95	1.00		0.74	1.00	
Satd. Flow (perm)	1770	1583		2623	3530	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	101	67	635	1150	20
RTOR Reduction (vph)	0	95	0	0	1	0
Lane Group Flow (vph)	11	6	0	702	1169	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	5.9	5.9		86.1	86.1	
Effective Green, g (s)	5.9	5.9		86.1	86.1	
Actuated g/C Ratio	0.06	0.06		0.86	0.86	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	104	93		2258	3039	
v/s Ratio Prot	c0.01				c0.33	
v/s Ratio Perm		0.00		0.27		
v/c Ratio	0.11	0.06		0.31	0.38	
Uniform Delay, d1	44.6	44.4		1.3	1.4	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.3		0.4	0.4	
Delay (s)	45.0	44.7		1.7	1.8	
Level of Service	D	D		A	A	
Approach Delay (s)	44.8			1.7	1.8	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	15	18	26	391	893	21
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	20	28	425	971	23
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1464	982	971			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1464	982	971			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	88	94	96			
cM capacity (veh/h)	136	302	710			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	36	28	425	993
Volume Left	16	28	0	0
Volume Right	20	0	0	23
cSH	299	710	1700	1700
Volume to Capacity	0.12	0.04	0.25	0.58
Queue Length 95th (ft)	10	3	0	0
Control Delay (s)	25.6	10.3	0.0	0.0
Lane LOS	D	B		
Approach Delay (s)	25.6	0.6		0.0
Approach LOS	D			

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	58.3%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	3	0	3	60	0	46	4	352	40	14	851	13
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	0	3	65	0	50	4	383	43	15	925	14
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1426	1397	932	1379	1383	404	939			426		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1426	1397	932	1379	1383	404	939			426		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	97	100	99	45	100	92	99			99		
cM capacity (veh/h)	103	138	323	119	141	646	730			1133		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	7	115	430	954
Volume Left	3	65	4	15
Volume Right	3	50	43	14
cSH	156	184	730	1133
Volume to Capacity	0.04	0.63	0.01	0.01
Queue Length 95th (ft)	3	89	0	1
Control Delay (s)	29.1	52.6	0.2	0.4
Lane LOS	D	F	A	A
Approach Delay (s)	29.1	52.6	0.2	0.4
Approach LOS	D	F		

Intersection Summary			
Average Delay	4.4		
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Volume (veh/h)	1	477	128	876	13	9	1
Sign Control		Free		Free		Stop	
Grade		0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	518	0	952	14	10	1
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None		None			
Median storage veh)							
Upstream signal (ft)				613			
pX, platoon unblocked			0.00				
vC, conflicting volume	966		0			1480	959
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	966		0			1480	959
tC, single (s)	4.1		0.0			6.4	6.2
tC, 2 stage (s)							
tF (s)	2.2		0.0			3.5	3.3
p0 queue free %	100		0			93	100
cM capacity (veh/h)	713		0			138	312

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	520	966	11
Volume Left	1	0	10
Volume Right	0	14	1
cSH	713	1700	146
Volume to Capacity	0.00	0.57	0.07
Queue Length 95th (ft)	0	0	6
Control Delay (s)	0.0	0.0	31.6
Lane LOS	A		D
Approach Delay (s)	0.0	0.0	31.6
Approach LOS			D

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	92.5%	ICU Level of Service	F
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	305	309	35	333	948	981
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.07	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	125	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	332	336	38	362	1030	1066
RTOR Reduction (vph)	0	186	0	0	0	382
Lane Group Flow (vph)	332	150	38	362	1030	684
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	23.9	23.9	72.9	96.8	65.0	65.0
Effective Green, g (s)	23.9	23.9	72.9	96.8	65.0	65.0
Actuated g/C Ratio	0.23	0.23	0.70	0.92	0.62	0.62
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	403	361	148	1863	1155	981
v/s Ratio Prot	c0.19		0.01	c0.14	c0.55	
v/s Ratio Perm		0.09	0.17	0.06		0.43
v/c Ratio	0.82	0.42	0.26	0.19	0.89	0.70
Uniform Delay, d1	38.4	34.5	19.5	0.4	16.9	13.3
Progression Factor	1.00	0.98	1.00	1.00	1.00	1.00
Incremental Delay, d2	12.7	0.8	0.9	0.1	10.6	4.1
Delay (s)	51.0	34.6	20.4	0.4	27.5	17.4
Level of Service	D	C	C	A	C	B
Approach Delay (s)	42.8			2.3	22.4	
Approach LOS	D			A	C	

Intersection Summary			
HCM 2000 Control Delay	24.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	104.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	18	63	109	996	942	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3522	3532	
Flt Permitted	0.95	1.00		0.71	1.00	
Satd. Flow (perm)	1770	1583		2508	3532	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	20	68	118	1083	1024	15
RTOR Reduction (vph)	0	64	0	0	0	0
Lane Group Flow (vph)	20	4	0	1201	1039	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	5.8	5.8		86.2	86.2	
Effective Green, g (s)	5.8	5.8		86.2	86.2	
Actuated g/C Ratio	0.06	0.06		0.86	0.86	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	102	91		2161	3044	
v/s Ratio Prot	c0.01				0.29	
v/s Ratio Perm		0.00		c0.48		
v/c Ratio	0.20	0.04		0.56	0.34	
Uniform Delay, d1	44.9	44.5		1.8	1.3	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	0.2		1.0	0.3	
Delay (s)	45.8	44.7		2.9	1.7	
Level of Service	D	D		A	A	
Approach Delay (s)	44.9			2.9	1.7	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	3.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	37	43	38	894	654	31
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	40	47	41	972	711	34
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1782	728	711			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1782	728	711			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	53	89	95			
cM capacity (veh/h)	86	424	889			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	87	41	972	745
Volume Left	40	41	0	0
Volume Right	47	0	0	34
cSH	186	889	1700	1700
Volume to Capacity	0.47	0.05	0.57	0.44
Queue Length 95th (ft)	56	4	0	0
Control Delay (s)	44.6	9.2	0.0	0.0
Lane LOS	E	A		
Approach Delay (s)	44.6	0.4		0.0
Approach LOS	E			

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	57.1%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	8	1	6	36	2	29	4	839	88	16	642	4
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	1	7	39	2	32	4	912	96	17	698	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1736	1751	700	1710	1705	960	702			1008		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1736	1751	700	1710	1705	960	702			1008		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	85	99	99	43	98	90	100			97		
cM capacity (veh/h)	59	83	439	68	89	311	895			688		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	16	73	1012	720
Volume Left	9	39	4	17
Volume Right	7	32	96	4
cSH	93	104	895	688
Volume to Capacity	0.17	0.70	0.00	0.03
Queue Length 95th (ft)	15	91	0	2
Control Delay (s)	51.7	96.4	0.1	0.7
Lane LOS	F	F	A	A
Approach Delay (s)	51.7	96.4	0.1	0.7
Approach LOS	F	F		

Intersection Summary			
Average Delay	4.7		
Intersection Capacity Utilization	62.8%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	2	646	695	10	8	12
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	702	755	11	9	13
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			613			
pX, platoon unblocked						
vC, conflicting volume	766				1467	761
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	766				1467	761
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				94	97
cM capacity (veh/h)	847				140	405

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	704	766	22
Volume Left	2	0	9
Volume Right	0	11	13
cSH	847	1700	231
Volume to Capacity	0.00	0.45	0.09
Queue Length 95th (ft)	0	0	8
Control Delay (s)	0.1	0.0	22.2
Lane LOS	A		C
Approach Delay (s)	0.1	0.0	22.2
Approach LOS			C

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	47.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	586	68	108	1098	494	596
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.30	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	565	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	637	74	117	1193	537	648
RTOR Reduction (vph)	0	42	0	0	0	302
Lane Group Flow (vph)	637	32	117	1193	537	346
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	31.0	31.0	71.0	102.0	58.8	58.8
Effective Green, g (s)	31.0	31.0	71.0	102.0	58.8	58.8
Actuated g/C Ratio	0.28	0.28	0.65	0.93	0.53	0.53
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	498	446	454	1863	995	846
v/s Ratio Prot	c0.36		0.02	c0.41	0.29	
v/s Ratio Perm		0.02	0.15	0.23		0.22
v/c Ratio	1.28	0.07	0.26	0.64	0.54	0.41
Uniform Delay, d1	39.5	29.0	9.9	0.7	16.7	15.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	140.4	0.1	0.3	0.8	2.1	1.5
Delay (s)	179.9	29.0	10.2	1.5	18.8	16.7
Level of Service	F	C	B	A	B	B
Approach Delay (s)	164.2			2.3	17.7	
Approach LOS	F			A	B	

Intersection Summary			
HCM 2000 Control Delay	43.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	96.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

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Level Of Service Computation Report

Future Opening Year plus Landfill plus RRP (Maalo Access)

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Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	10	93	62	655	1072	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3524	3530	
Flt Permitted	0.95	1.00		0.75	1.00	
Satd. Flow (perm)	1770	1583		2652	3530	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	101	67	712	1165	20
RTOR Reduction (vph)	0	95	0	0	1	0
Lane Group Flow (vph)	11	6	0	779	1184	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	5.9	5.9		86.1	86.1	
Effective Green, g (s)	5.9	5.9		86.1	86.1	
Actuated g/C Ratio	0.06	0.06		0.86	0.86	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	104	93		2283	3039	
v/s Ratio Prot	c0.01				c0.34	
v/s Ratio Perm		0.00		0.29		
v/c Ratio	0.11	0.06		0.34	0.39	
Uniform Delay, d1	44.6	44.4		1.4	1.5	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.3		0.4	0.4	
Delay (s)	45.0	44.7		1.8	1.8	
Level of Service	D	D		A	A	
Approach Delay (s)	44.8			1.8	1.8	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	27	32	98	391	893	79
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	29	35	107	425	971	86
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1652	1014	971			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1652	1014	971			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	68	88	85			
cM capacity (veh/h)	92	290	710			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	64	107	425	1057
Volume Left	29	107	0	0
Volume Right	35	0	0	86
cSH	201	710	1700	1700
Volume to Capacity	0.32	0.15	0.25	0.62
Queue Length 95th (ft)	33	13	0	0
Control Delay (s)	38.4	11.0	0.0	0.0
Lane LOS	E	B		
Approach Delay (s)	38.4	2.2		0.0
Approach LOS	E			

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	70.6%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	3	0	3	60	0	46	4	364	40	14	909	13
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	0	3	65	0	50	4	396	43	15	988	14
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1502	1473	995	1455	1459	417	1002			439		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1502	1473	995	1455	1459	417	1002			439		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	96	100	99	38	100	92	99			99		
cM capacity (veh/h)	91	124	297	105	127	635	691			1121		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	7	115	443	1017
Volume Left	3	65	4	15
Volume Right	3	50	43	14
cSH	139	165	691	1121
Volume to Capacity	0.05	0.70	0.01	0.01
Queue Length 95th (ft)	4	104	0	1
Control Delay (s)	32.1	66.2	0.2	0.4
Lane LOS	D	F	A	A
Approach Delay (s)	32.1	66.2	0.2	0.4
Approach LOS	D	F		

Intersection Summary			
Average Delay	5.3		
Intersection Capacity Utilization	72.1%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Volume (veh/h)	1	489	128	935	13	9	1
Sign Control		Free		Free		Stop	
Grade		0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	532	0	1016	14	10	1
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None		None			
Median storage veh)							
Upstream signal (ft)				604			
pX, platoon unblocked			0.00				
vC, conflicting volume	1030		0			1557	1023
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	1030		0			1557	1023
tC, single (s)	4.1		0.0			6.4	6.2
tC, 2 stage (s)							
tF (s)	2.2		0.0			3.5	3.3
p0 queue free %	100		0			92	100
cM capacity (veh/h)	674		0			124	286

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	533	1030	11
Volume Left	1	0	10
Volume Right	0	14	1
cSH	674	1700	131
Volume to Capacity	0.00	0.61	0.08
Queue Length 95th (ft)	0	0	7
Control Delay (s)	0.0	0.0	34.9
Lane LOS	A		D
Approach Delay (s)	0.0	0.0	34.9
Approach LOS			D

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	96.2%	ICU Level of Service	F
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	317	309	35	333	948	1040
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.06	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	117	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	345	336	38	362	1030	1130
RTOR Reduction (vph)	0	185	0	0	0	386
Lane Group Flow (vph)	345	151	38	362	1030	744
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	24.6	24.6	72.9	97.5	65.0	65.0
Effective Green, g (s)	24.6	24.6	72.9	97.5	65.0	65.0
Actuated g/C Ratio	0.23	0.23	0.69	0.92	0.62	0.62
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	412	369	141	1863	1147	975
v/s Ratio Prot	c0.19		0.01	c0.13	c0.55	
v/s Ratio Perm		0.10	0.17	0.06		0.47
v/c Ratio	0.84	0.41	0.27	0.19	0.90	0.76
Uniform Delay, d1	38.5	34.3	20.1	0.4	17.4	14.7
Progression Factor	0.99	0.97	1.00	1.00	1.00	1.00
Incremental Delay, d2	13.7	0.7	1.0	0.1	11.1	5.7
Delay (s)	52.0	34.0	21.1	0.4	28.5	20.3
Level of Service	D	C	C	A	C	C
Approach Delay (s)	43.2			2.4	24.2	
Approach LOS	D			A	C	

Intersection Summary			
HCM 2000 Control Delay	25.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	105.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	18	63	109	1008	1014	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3522	3532	
Flt Permitted	0.95	1.00		0.69	1.00	
Satd. Flow (perm)	1770	1583		2456	3532	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	20	68	118	1096	1102	15
RTOR Reduction (vph)	0	64	0	0	0	0
Lane Group Flow (vph)	20	4	0	1214	1117	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	5.8	5.8		86.2	86.2	
Effective Green, g (s)	5.8	5.8		86.2	86.2	
Actuated g/C Ratio	0.06	0.06		0.86	0.86	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	102	91		2117	3044	
v/s Ratio Prot	c0.01				0.32	
v/s Ratio Perm		0.00		c0.49		
v/c Ratio	0.20	0.04		0.57	0.37	
Uniform Delay, d1	44.9	44.5		1.9	1.4	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	0.2		1.1	0.3	
Delay (s)	45.8	44.7		3.0	1.7	
Level of Service	D	D		A	A	
Approach Delay (s)	44.9			3.0	1.7	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	72.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	95	114	50	894	654	41
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	103	124	54	972	711	45
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1814	733	711			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1814	733	711			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	71	94			
cM capacity (veh/h)	81	421	889			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	227	54	972	755
Volume Left	103	54	0	0
Volume Right	124	0	0	45
cSH	152	889	1700	1700
Volume to Capacity	1.50	0.06	0.57	0.44
Queue Length 95th (ft)	377	5	0	0
Control Delay (s)	308.9	9.3	0.0	0.0
Lane LOS	F	A		
Approach Delay (s)	308.9	0.5		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	35.2		
Intersection Capacity Utilization	59.0%	ICU Level of Service	B
Analysis Period (min)	15		

Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways
Warrant 3 (Peak Hour) Traffic Signal Warrant Worksheet

Intersection # 2 : Kuhio + Ma'alo
PM Peak Hour
MA'alo Rlaccess scenario
Future Opening Year + Landfill + RRP

PART A or **PART B** satisfied YES ☑ NO ☐

PART A **PART A** satisfied YES ☑ NO ☐

(All parts 1, 2, and 3 below must be satisfied)

1. The total stopped time delay experienced by the traffic on one minor-street approach controlled by a STOP sign equals or exceeds: 4 vehicle-hours for a one-lane approach; or 5 vehicle-hours for a two-lane approach, and — Yes ☑ No ☐ 22.1

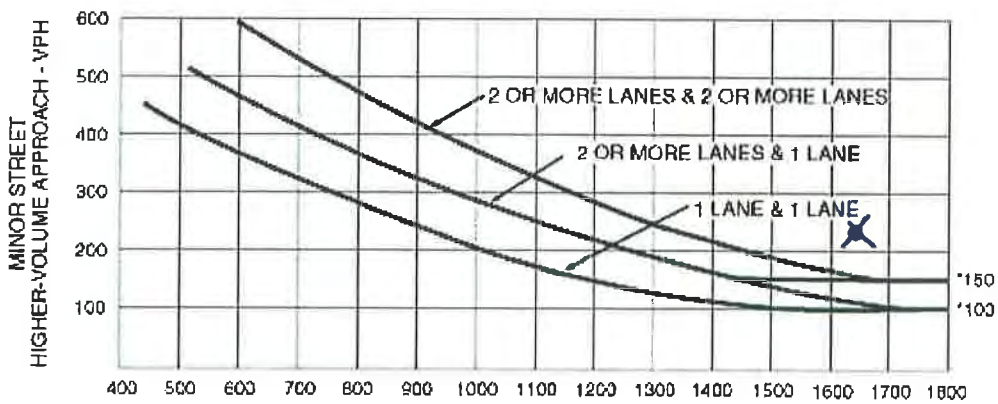
2. The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes, and — Yes ☑ No ☐ 209

3. The total entering volume serviced during the hour equals or exceeds 650 vehicles per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches. — Yes ☑ No ☐ 1848

PART B **PART B** satisfied YES ☑ NO ☐

The plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in **Figure 4C-3** for the existing combination of approach lanes.

Figure 4C-3. Warrant 3, Peak Hour



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MAJOR STREET—TOTAL OF BOTH APPROACHES—
VEHICLES PER HOUR (VPH)

*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	8	1	6	36	2	29	4	897	88	16	652	4
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	1	7	39	2	32	4	975	96	17	709	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1810	1825	711	1784	1779	1023	713			1071		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1810	1825	711	1784	1779	1023	713			1071		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	83	99	98	35	97	89	100			97		
cM capacity (veh/h)	52	75	433	60	80	286	887			651		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	16	73	1075	730
Volume Left	9	39	4	17
Volume Right	7	32	96	4
cSH	83	93	887	651
Volume to Capacity	0.20	0.79	0.00	0.03
Queue Length 95th (ft)	17	103	0	2
Control Delay (s)	59.1	122.5	0.2	0.7
Lane LOS	F	F	A	A
Approach Delay (s)	59.1	122.5	0.2	0.7
Approach LOS	F	F		

Intersection Summary			
Average Delay	5.6		
Intersection Capacity Utilization	65.9%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	2	704	705	10	8	12
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	765	766	11	9	13
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			604			
pX, platoon unblocked						
vC, conflicting volume	777				1541	772
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	777				1541	772
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				93	97
cM capacity (veh/h)	839				126	400

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	767	777	22
Volume Left	2	0	9
Volume Right	0	11	13
cSH	839	1700	214
Volume to Capacity	0.00	0.46	0.10
Queue Length 95th (ft)	0	0	8
Control Delay (s)	0.1	0.0	23.7
Lane LOS	A		C
Approach Delay (s)	0.1	0.0	23.7
Approach LOS			C

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	48.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	644	68	108	1098	494	606
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.30	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	565	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	700	74	117	1193	537	659
RTOR Reduction (vph)	0	38	0	0	0	307
Lane Group Flow (vph)	700	36	117	1193	537	352
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	31.0	31.0	71.0	102.0	58.8	58.8
Effective Green, g (s)	31.0	31.0	71.0	102.0	58.8	58.8
Actuated g/C Ratio	0.28	0.28	0.65	0.93	0.53	0.53
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	498	446	454	1863	995	846
v/s Ratio Prot	c0.40		0.02	c0.41	0.29	
v/s Ratio Perm		0.02	0.15	0.23		0.22
v/c Ratio	1.41	0.08	0.26	0.64	0.54	0.42
Uniform Delay, d1	39.5	29.0	9.9	0.7	16.7	15.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	194.3	0.1	0.3	0.8	2.1	1.5
Delay (s)	233.8	29.1	10.2	1.5	18.8	16.8
Level of Service	F	C	B	A	B	B
Approach Delay (s)	214.2			2.3	17.7	
Approach LOS	F			A	B	

Intersection Summary			
HCM 2000 Control Delay	57.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	100.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

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Level Of Service Computation Report

Future Opening Year plus Landfill (Laulima Access)

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Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	10	93	62	584	1058	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3522	3530	
Flt Permitted	0.95	1.00		0.74	1.00	
Satd. Flow (perm)	1770	1583		2623	3530	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	101	67	635	1150	20
RTOR Reduction (vph)	0	95	0	0	1	0
Lane Group Flow (vph)	11	6	0	702	1169	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	5.9	5.9		86.1	86.1	
Effective Green, g (s)	5.9	5.9		86.1	86.1	
Actuated g/C Ratio	0.06	0.06		0.86	0.86	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	104	93		2258	3039	
v/s Ratio Prot	c0.01				c0.33	
v/s Ratio Perm		0.00		0.27		
v/c Ratio	0.11	0.06		0.31	0.38	
Uniform Delay, d1	44.6	44.4		1.3	1.4	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.3		0.4	0.4	
Delay (s)	45.0	44.7		1.7	1.8	
Level of Service	D	D		A	A	
Approach Delay (s)	44.8			1.7	1.8	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	9	10	18	400	901	14
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	11	20	435	979	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1461	987	979			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1461	987	979			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	96	97			
cM capacity (veh/h)	138	300	705			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	21	20	435	995
Volume Left	10	20	0	0
Volume Right	11	0	0	15
cSH	291	705	1700	1700
Volume to Capacity	0.07	0.03	0.26	0.59
Queue Length 95th (ft)	6	2	0	0
Control Delay (s)	24.8	10.3	0.0	0.0
Lane LOS	C	B		
Approach Delay (s)	24.8	0.4		0.0
Approach LOS	C			

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	58.3%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	0	11	60	0	46	13	345	40	14	844	20
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	0	12	65	0	50	14	375	43	15	917	22
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1434	1405	928	1396	1395	397	939			418		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1434	1405	928	1396	1395	397	939			418		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	89	100	96	41	100	92	98			99		
cM capacity (veh/h)	101	135	325	111	137	653	730			1141		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	23	115	433	954
Volume Left	11	65	14	15
Volume Right	12	50	43	22
cSH	157	174	730	1141
Volume to Capacity	0.14	0.66	0.02	0.01
Queue Length 95th (ft)	12	96	1	1
Control Delay (s)	31.7	58.9	0.6	0.4
Lane LOS	D	F	A	A
Approach Delay (s)	31.7	58.9	0.6	0.4
Approach LOS	D	F		

Intersection Summary			
Average Delay	5.3		
Intersection Capacity Utilization	66.3%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Volume (veh/h)	1	477	128	876	13	9	1
Sign Control		Free		Free		Stop	
Grade		0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	518	0	952	14	10	1
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None		None			
Median storage veh)							
Upstream signal (ft)				613			
pX, platoon unblocked			0.00				
vC, conflicting volume	966		0			1480	959
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	966		0			1480	959
tC, single (s)	4.1		0.0			6.4	6.2
tC, 2 stage (s)							
tF (s)	2.2		0.0			3.5	3.3
p0 queue free %	100		0			93	100
cM capacity (veh/h)	713		0			138	312

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	520	966	11
Volume Left	1	0	10
Volume Right	0	14	1
cSH	713	1700	146
Volume to Capacity	0.00	0.57	0.07
Queue Length 95th (ft)	0	0	6
Control Delay (s)	0.0	0.0	31.6
Lane LOS	A		D
Approach Delay (s)	0.0	0.0	31.6
Approach LOS			D

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	92.5%	ICU Level of Service	F
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	305	309	35	333	948	981
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.07	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	125	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	332	336	38	362	1030	1066
RTOR Reduction (vph)	0	186	0	0	0	382
Lane Group Flow (vph)	332	150	38	362	1030	684
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	23.9	23.9	72.9	96.8	65.0	65.0
Effective Green, g (s)	23.9	23.9	72.9	96.8	65.0	65.0
Actuated g/C Ratio	0.23	0.23	0.70	0.92	0.62	0.62
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	403	361	148	1863	1155	981
v/s Ratio Prot	c0.19		0.01	c0.14	c0.55	
v/s Ratio Perm		0.09	0.17	0.06		0.43
v/c Ratio	0.82	0.42	0.26	0.19	0.89	0.70
Uniform Delay, d1	38.4	34.5	19.5	0.4	16.9	13.3
Progression Factor	1.00	0.98	1.00	1.00	1.00	1.00
Incremental Delay, d2	12.7	0.8	0.9	0.1	10.6	4.1
Delay (s)	51.0	34.6	20.4	0.4	27.5	17.4
Level of Service	D	C	C	A	C	B
Approach Delay (s)	42.8			2.3	22.4	
Approach LOS	D			A	C	

Intersection Summary			
HCM 2000 Control Delay	24.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	104.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	18	63	109	996	942	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3522	3532	
Flt Permitted	0.95	1.00		0.71	1.00	
Satd. Flow (perm)	1770	1583		2508	3532	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	20	68	118	1083	1024	15
RTOR Reduction (vph)	0	64	0	0	0	0
Lane Group Flow (vph)	20	4	0	1201	1039	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	5.8	5.8		86.2	86.2	
Effective Green, g (s)	5.8	5.8		86.2	86.2	
Actuated g/C Ratio	0.06	0.06		0.86	0.86	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	102	91		2161	3044	
v/s Ratio Prot	c0.01				0.29	
v/s Ratio Perm		0.00		c0.48		
v/c Ratio	0.20	0.04		0.56	0.34	
Uniform Delay, d1	44.9	44.5		1.8	1.3	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	0.2		1.0	0.3	
Delay (s)	45.8	44.7		2.9	1.7	
Level of Service	D	D		A	A	
Approach Delay (s)	44.9			2.9	1.7	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	3.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	30	34	31	901	662	26
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	37	34	979	720	28
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1780	734	720			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1780	734	720			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	62	91	96			
cM capacity (veh/h)	87	420	882			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	70	34	979	748
Volume Left	33	34	0	0
Volume Right	37	0	0	28
cSH	185	882	1700	1700
Volume to Capacity	0.38	0.04	0.58	0.44
Queue Length 95th (ft)	41	3	0	0
Control Delay (s)	40.2	9.2	0.0	0.0
Lane LOS	E	A		
Approach Delay (s)	40.2	0.3		0.0
Approach LOS	E			

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	14	1	15	36	2	29	11	832	88	16	637	10
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	15	1	16	39	2	32	12	904	96	17	692	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1741	1757	698	1726	1714	952	703			1000		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1741	1757	698	1726	1714	952	703			1000		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	74	99	96	39	97	90	99			97		
cM capacity (veh/h)	58	82	441	65	87	315	894			692		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	33	73	1012	721
Volume Left	15	39	12	17
Volume Right	16	32	96	11
cSH	105	100	894	692
Volume to Capacity	0.31	0.73	0.01	0.03
Queue Length 95th (ft)	30	95	1	2
Control Delay (s)	54.2	105.4	0.4	0.7
Lane LOS	F	F	A	A
Approach Delay (s)	54.2	105.4	0.4	0.7
Approach LOS	F	F		

Intersection Summary			
Average Delay	5.6		
Intersection Capacity Utilization	66.2%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	2	646	695	10	8	12
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	702	755	11	9	13
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			613			
pX, platoon unblocked						
vC, conflicting volume	766				1467	761
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	766				1467	761
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				94	97
cM capacity (veh/h)	847				140	405

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	704	766	22
Volume Left	2	0	9
Volume Right	0	11	13
cSH	847	1700	231
Volume to Capacity	0.00	0.45	0.09
Queue Length 95th (ft)	0	0	8
Control Delay (s)	0.1	0.0	22.2
Lane LOS	A		C
Approach Delay (s)	0.1	0.0	22.2
Approach LOS			C

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	47.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	586	68	108	1098	494	596
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.30	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	565	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	637	74	117	1193	537	648
RTOR Reduction (vph)	0	42	0	0	0	302
Lane Group Flow (vph)	637	32	117	1193	537	346
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	31.0	31.0	71.0	102.0	58.8	58.8
Effective Green, g (s)	31.0	31.0	71.0	102.0	58.8	58.8
Actuated g/C Ratio	0.28	0.28	0.65	0.93	0.53	0.53
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	498	446	454	1863	995	846
v/s Ratio Prot	c0.36		0.02	c0.41	0.29	
v/s Ratio Perm		0.02	0.15	0.23		0.22
v/c Ratio	1.28	0.07	0.26	0.64	0.54	0.41
Uniform Delay, d1	39.5	29.0	9.9	0.7	16.7	15.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	140.4	0.1	0.3	0.8	2.1	1.5
Delay (s)	179.9	29.0	10.2	1.5	18.8	16.7
Level of Service	F	C	B	A	B	B
Approach Delay (s)	164.2			2.3	17.7	
Approach LOS	F			A	B	

Intersection Summary			
HCM 2000 Control Delay	43.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	96.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

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Level Of Service Computation Report

Future Opening Year plus Landfill plus RRP (Laulima Access)

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Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	10	93	62	655	1072	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3524	3530	
Flt Permitted	0.95	1.00		0.75	1.00	
Satd. Flow (perm)	1770	1583		2652	3530	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	101	67	712	1165	20
RTOR Reduction (vph)	0	95	0	0	1	0
Lane Group Flow (vph)	11	6	0	779	1184	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	5.9	5.9		86.1	86.1	
Effective Green, g (s)	5.9	5.9		86.1	86.1	
Actuated g/C Ratio	0.06	0.06		0.86	0.86	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	104	93		2283	3039	
v/s Ratio Prot	c0.01				c0.34	
v/s Ratio Perm		0.00		0.29		
v/c Ratio	0.11	0.06		0.34	0.39	
Uniform Delay, d1	44.6	44.4		1.4	1.5	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.3		0.4	0.4	
Delay (s)	45.0	44.7		1.8	1.8	
Level of Service	D	D		A	A	
Approach Delay (s)	44.8			1.8	1.8	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	9	10	18	471	916	14
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	11	20	512	996	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1554	1003	996			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1554	1003	996			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	92	96	97			
cM capacity (veh/h)	121	294	695			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	21	20	512	1011
Volume Left	10	20	0	0
Volume Right	11	0	0	15
cSH	255	695	1700	1700
Volume to Capacity	0.08	0.03	0.30	0.59
Queue Length 95th (ft)	7	2	0	0
Control Delay (s)	27.0	10.3	0.0	0.0
Lane LOS	D	B		
Approach Delay (s)	27.0	0.4		0.0
Approach LOS	D			

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	59.1%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	22	0	26	60	0	46	84	345	40	14	844	78
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	24	0	28	65	0	50	91	375	43	15	917	85
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1620	1591	960	1598	1612	397	1002			418		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1620	1591	960	1598	1612	397	1002			418		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	65	100	91	6	100	92	87			99		
cM capacity (veh/h)	68	92	311	69	89	653	691			1141		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	52	115	510	1017
Volume Left	24	65	91	15
Volume Right	28	50	43	85
cSH	118	113	691	1141
Volume to Capacity	0.44	1.02	0.13	0.01
Queue Length 95th (ft)	48	167	11	1
Control Delay (s)	57.7	161.0	3.6	0.4
Lane LOS	F	F	A	A
Approach Delay (s)	57.7	161.0	3.6	0.4
Approach LOS	F	F		

Intersection Summary			
Average Delay	14.0		
Intersection Capacity Utilization	88.6%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Volume (veh/h)	1	489	128	935	13	9	1
Sign Control		Free		Free		Stop	
Grade		0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	532	0	1016	14	10	1
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None		None			
Median storage veh)							
Upstream signal (ft)				604			
pX, platoon unblocked			0.00				
vC, conflicting volume	1030		0			1557	1023
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	1030		0			1557	1023
tC, single (s)	4.1		0.0			6.4	6.2
tC, 2 stage (s)							
tF (s)	2.2		0.0			3.5	3.3
p0 queue free %	100		0			92	100
cM capacity (veh/h)	674		0			124	286

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	533	1030	11
Volume Left	1	0	10
Volume Right	0	14	1
cSH	674	1700	131
Volume to Capacity	0.00	0.61	0.08
Queue Length 95th (ft)	0	0	7
Control Delay (s)	0.0	0.0	34.9
Lane LOS	A		D
Approach Delay (s)	0.0	0.0	34.9
Approach LOS			D

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	96.2%	ICU Level of Service	F
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	317	309	35	333	948	1040
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.06	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	117	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	345	336	38	362	1030	1130
RTOR Reduction (vph)	0	185	0	0	0	386
Lane Group Flow (vph)	345	151	38	362	1030	744
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	24.6	24.6	72.9	97.5	65.0	65.0
Effective Green, g (s)	24.6	24.6	72.9	97.5	65.0	65.0
Actuated g/C Ratio	0.23	0.23	0.69	0.92	0.62	0.62
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	412	369	141	1863	1147	975
v/s Ratio Prot	c0.19		0.01	c0.13	c0.55	
v/s Ratio Perm		0.10	0.17	0.06		0.47
v/c Ratio	0.84	0.41	0.27	0.19	0.90	0.76
Uniform Delay, d1	38.5	34.3	20.1	0.4	17.4	14.7
Progression Factor	0.99	0.97	1.00	1.00	1.00	1.00
Incremental Delay, d2	13.7	0.7	1.0	0.1	11.1	5.7
Delay (s)	52.0	34.0	21.1	0.4	28.5	20.3
Level of Service	D	C	C	A	C	C
Approach Delay (s)	43.2			2.4	24.2	
Approach LOS	D			A	C	

Intersection Summary			
HCM 2000 Control Delay	25.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	105.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	18	63	109	1008	1014	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3522	3532	
Flt Permitted	0.95	1.00		0.69	1.00	
Satd. Flow (perm)	1770	1583		2456	3532	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	20	68	118	1096	1102	15
RTOR Reduction (vph)	0	64	0	0	0	0
Lane Group Flow (vph)	20	4	0	1214	1117	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	5.8	5.8		86.2	86.2	
Effective Green, g (s)	5.8	5.8		86.2	86.2	
Actuated g/C Ratio	0.06	0.06		0.86	0.86	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	102	91		2117	3044	
v/s Ratio Prot	c0.01				0.32	
v/s Ratio Perm		0.00		c0.49		
v/c Ratio	0.20	0.04		0.57	0.37	
Uniform Delay, d1	44.9	44.5		1.9	1.4	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	0.2		1.1	0.3	
Delay (s)	45.8	44.7		3.0	1.7	
Level of Service	D	D		A	A	
Approach Delay (s)	44.9			3.0	1.7	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	72.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	30	34	31	913	734	26
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	37	34	992	798	28
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1872	812	798			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1872	812	798			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	57	90	96			
cM capacity (veh/h)	76	379	824			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	70	34	992	826
Volume Left	33	34	0	0
Volume Right	37	0	0	28
cSH	162	824	1700	1700
Volume to Capacity	0.43	0.04	0.58	0.49
Queue Length 95th (ft)	48	3	0	0
Control Delay (s)	47.7	9.6	0.0	0.0
Lane LOS	E	A		
Approach Delay (s)	47.7	0.3		0.0
Approach LOS	E			

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	58.1%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	73	1	86	36	2	29	23	832	88	16	637	20
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	79	1	93	39	2	32	25	904	96	17	692	22
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1773	1788	703	1834	1751	952	714			1000		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1773	1788	703	1834	1751	952	714			1000		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	99	79	10	97	90	97			97		
cM capacity (veh/h)	55	77	437	44	81	315	886			692		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	174	73	1025	732
Volume Left	79	39	25	17
Volume Right	93	32	96	22
cSH	104	71	886	692
Volume to Capacity	1.68	1.02	0.03	0.03
Queue Length 95th (ft)	340	133	2	2
Control Delay (s)	415.2	213.5	0.8	0.7
Lane LOS	F	F	A	A
Approach Delay (s)	415.2	213.5	0.8	0.7
Approach LOS	F	F		

Intersection Summary			
Average Delay	44.5		
Intersection Capacity Utilization	77.8%	ICU Level of Service	D
Analysis Period (min)	15		

Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways
Warrant 3 (Peak Hour) Traffic Signal Warrant Worksheet

Intersection # 3: Kuhio Hwy & Laulima St
PM peak hour
Laulima St access scenario
Future Opening Year + Landfill + RRP

PART A or **PART B** satisfied YES ☑ NO ☐

PART A **PART A** satisfied YES ☑ NO ☐

(All parts 1, 2, and 3 below must be satisfied)

1. The total stopped time delay experienced by the traffic on one minor-street approach controlled by a STOP sign equals or exceeds: 4 vehicle-hours for a one-lane approach; or 5 vehicle-hours for a two-lane approach, and — Yes ☑ No ☐ 19.1

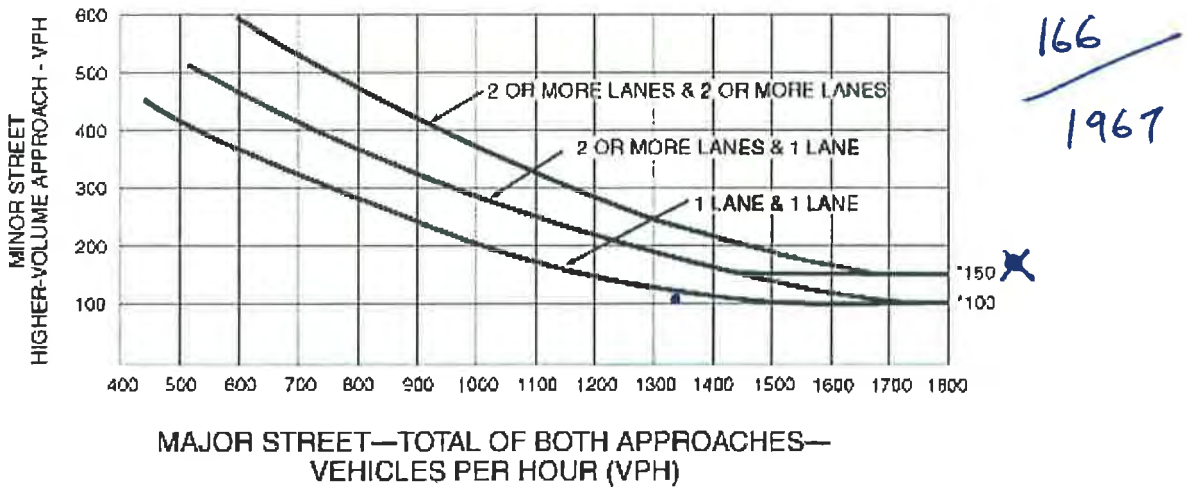
2. The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes, and — Yes ☑ No ☐ 166

3. The total entering volume serviced during the hour equals or exceeds 650 vehicles per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches. — Yes ☑ No ☐ 2215

PART B **PART B** satisfied YES ☑ NO ☐

The plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in **Figure 4C-3** for the existing combination of approach lanes.

Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	2	704	705	10	8	12
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	765	766	11	9	13
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			604			
pX, platoon unblocked						
vC, conflicting volume	777				1541	772
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	777				1541	772
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				93	97
cM capacity (veh/h)	839				126	400

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	767	777	22
Volume Left	2	0	9
Volume Right	0	11	13
cSH	839	1700	214
Volume to Capacity	0.00	0.46	0.10
Queue Length 95th (ft)	0	0	8
Control Delay (s)	0.1	0.0	23.7
Lane LOS	A		C
Approach Delay (s)	0.1	0.0	23.7
Approach LOS			C

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	48.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	644	68	108	1098	494	606
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.30	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	565	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	700	74	117	1193	537	659
RTOR Reduction (vph)	0	38	0	0	0	307
Lane Group Flow (vph)	700	36	117	1193	537	352
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	31.0	31.0	71.0	102.0	58.8	58.8
Effective Green, g (s)	31.0	31.0	71.0	102.0	58.8	58.8
Actuated g/C Ratio	0.28	0.28	0.65	0.93	0.53	0.53
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	498	446	454	1863	995	846
v/s Ratio Prot	c0.40		0.02	c0.41	0.29	
v/s Ratio Perm		0.02	0.15	0.23		0.22
v/c Ratio	1.41	0.08	0.26	0.64	0.54	0.42
Uniform Delay, d1	39.5	29.0	9.9	0.7	16.7	15.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	194.3	0.1	0.3	0.8	2.1	1.5
Delay (s)	233.8	29.1	10.2	1.5	18.8	16.8
Level of Service	F	C	B	A	B	B
Approach Delay (s)	214.2			2.3	17.7	
Approach LOS	F			A	B	

Intersection Summary			
HCM 2000 Control Delay	57.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	100.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

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Level Of Service Computation Report

Future Opening Year plus Landfill (Roberts Driveway Access)

****

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	10	93	62	584	1058	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3522	3530	
Flt Permitted	0.95	1.00		0.74	1.00	
Satd. Flow (perm)	1770	1583		2623	3530	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	101	67	635	1150	20
RTOR Reduction (vph)	0	95	0	0	1	0
Lane Group Flow (vph)	11	6	0	702	1169	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	5.9	5.9		86.1	86.1	
Effective Green, g (s)	5.9	5.9		86.1	86.1	
Actuated g/C Ratio	0.06	0.06		0.86	0.86	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	104	93		2258	3039	
v/s Ratio Prot	c0.01				c0.33	
v/s Ratio Perm		0.00		0.27		
v/c Ratio	0.11	0.06		0.31	0.38	
Uniform Delay, d1	44.6	44.4		1.3	1.4	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.3		0.4	0.4	
Delay (s)	45.0	44.7		1.7	1.8	
Level of Service	D	D		A	A	
Approach Delay (s)	44.8			1.7	1.8	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	9	10	18	400	901	14
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	11	20	435	979	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1461	987	979			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1461	987	979			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	96	97			
cM capacity (veh/h)	138	300	705			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	21	20	435	995
Volume Left	10	20	0	0
Volume Right	11	0	0	15
cSH	291	705	1700	1700
Volume to Capacity	0.07	0.03	0.26	0.59
Queue Length 95th (ft)	6	2	0	0
Control Delay (s)	24.8	10.3	0.0	0.0
Lane LOS	C	B		
Approach Delay (s)	24.8	0.4		0.0
Approach LOS	C			

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	58.3%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	3	0	3	60	0	46	4	353	40	14	852	13
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	0	3	65	0	50	4	384	43	15	926	14
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1428	1399	933	1381	1385	405	940			427		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1428	1399	933	1381	1385	405	940			427		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	97	100	99	45	100	92	99			99		
cM capacity (veh/h)	102	138	323	118	141	645	729			1132		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	7	115	432	955
Volume Left	3	65	4	15
Volume Right	3	50	43	14
cSH	156	183	729	1132
Volume to Capacity	0.04	0.63	0.01	0.01
Queue Length 95th (ft)	3	89	0	1
Control Delay (s)	29.2	53.0	0.2	0.4
Lane LOS	D	F	A	A
Approach Delay (s)	29.2	53.0	0.2	0.4
Approach LOS	D	F		

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Volume (veh/h)	9	471	128	870	20	15	9
Sign Control		Free		Free		Stop	
Grade		0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	512	0	946	22	16	10
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None		None			
Median storage veh)							
Upstream signal (ft)				613			
pX, platoon unblocked			0.00				
vC, conflicting volume	967		0			1488	957
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	967		0			1488	957
tC, single (s)	4.1		0.0			6.4	6.2
tC, 2 stage (s)							
tF (s)	2.2		0.0			3.5	3.3
p0 queue free %	99		0			88	97
cM capacity (veh/h)	712		0			135	313

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	522	967	26
Volume Left	10	0	16
Volume Right	0	22	10
cSH	712	1700	171
Volume to Capacity	0.01	0.57	0.15
Queue Length 95th (ft)	1	0	13
Control Delay (s)	0.4	0.0	29.7
Lane LOS	A		D
Approach Delay (s)	0.4	0.0	29.7
Approach LOS			D

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	92.7%	ICU Level of Service	F
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	305	309	35	333	948	981
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.07	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	125	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	332	336	38	362	1030	1066
RTOR Reduction (vph)	0	186	0	0	0	382
Lane Group Flow (vph)	332	150	38	362	1030	684
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	23.9	23.9	72.9	96.8	65.0	65.0
Effective Green, g (s)	23.9	23.9	72.9	96.8	65.0	65.0
Actuated g/C Ratio	0.23	0.23	0.70	0.92	0.62	0.62
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	403	361	148	1863	1155	981
v/s Ratio Prot	c0.19		0.01	c0.14	c0.55	
v/s Ratio Perm		0.09	0.17	0.06		0.43
v/c Ratio	0.82	0.42	0.26	0.19	0.89	0.70
Uniform Delay, d1	38.4	34.5	19.5	0.4	16.9	13.3
Progression Factor	1.00	0.98	1.00	1.00	1.00	1.00
Incremental Delay, d2	12.7	0.8	0.9	0.1	10.6	4.1
Delay (s)	51.0	34.6	20.4	0.4	27.5	17.4
Level of Service	D	C	C	A	C	B
Approach Delay (s)	42.8			2.3	22.4	
Approach LOS	D			A	C	

Intersection Summary			
HCM 2000 Control Delay	24.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	104.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	18	63	109	996	942	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3522	3532	
Flt Permitted	0.95	1.00		0.71	1.00	
Satd. Flow (perm)	1770	1583		2508	3532	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	20	68	118	1083	1024	15
RTOR Reduction (vph)	0	64	0	0	0	0
Lane Group Flow (vph)	20	4	0	1201	1039	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	5.8	5.8		86.2	86.2	
Effective Green, g (s)	5.8	5.8		86.2	86.2	
Actuated g/C Ratio	0.06	0.06		0.86	0.86	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	102	91		2161	3044	
v/s Ratio Prot	c0.01				0.29	
v/s Ratio Perm		0.00		c0.48		
v/c Ratio	0.20	0.04		0.56	0.34	
Uniform Delay, d1	44.9	44.5		1.8	1.3	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	0.2		1.0	0.3	
Delay (s)	45.8	44.7		2.9	1.7	
Level of Service	D	D		A	A	
Approach Delay (s)	44.9			2.9	1.7	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	3.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	30	34	31	901	662	26
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	37	34	979	720	28
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1780	734	720			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1780	734	720			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	62	91	96			
cM capacity (veh/h)	87	420	882			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	70	34	979	748
Volume Left	33	34	0	0
Volume Right	37	0	0	28
cSH	185	882	1700	1700
Volume to Capacity	0.38	0.04	0.58	0.44
Queue Length 95th (ft)	41	3	0	0
Control Delay (s)	40.2	9.2	0.0	0.0
Lane LOS	E	A		
Approach Delay (s)	40.2	0.3		0.0
Approach LOS	E			

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	8	1	6	36	2	29	4	839	88	16	645	4
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	1	7	39	2	32	4	912	96	17	701	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1739	1754	703	1714	1709	960	705			1008		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1739	1754	703	1714	1709	960	705			1008		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	85	99	99	42	98	90	100			97		
cM capacity (veh/h)	59	83	437	68	88	311	893			688		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	16	73	1012	723
Volume Left	9	39	4	17
Volume Right	7	32	96	4
cSH	93	104	893	688
Volume to Capacity	0.18	0.70	0.00	0.03
Queue Length 95th (ft)	15	91	0	2
Control Delay (s)	51.9	97.3	0.1	0.7
Lane LOS	F	F	A	A
Approach Delay (s)	51.9	97.3	0.1	0.7
Approach LOS	F	F		

Intersection Summary			
Average Delay	4.7		
Intersection Capacity Utilization	62.8%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	9	639	689	15	14	20
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	695	749	16	15	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			613			
pX, platoon unblocked						
vC, conflicting volume	765				1471	757
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	765				1471	757
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				89	95
cM capacity (veh/h)	848				138	407

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	704	765	37
Volume Left	10	0	15
Volume Right	0	16	22
cSH	848	1700	226
Volume to Capacity	0.01	0.45	0.16
Queue Length 95th (ft)	1	0	14
Control Delay (s)	0.3	0.0	24.0
Lane LOS	A		C
Approach Delay (s)	0.3	0.0	24.0
Approach LOS			C

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	50.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	586	68	108	1098	494	596
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.30	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	565	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	637	74	117	1193	537	648
RTOR Reduction (vph)	0	42	0	0	0	302
Lane Group Flow (vph)	637	32	117	1193	537	346
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	31.0	31.0	71.0	102.0	58.8	58.8
Effective Green, g (s)	31.0	31.0	71.0	102.0	58.8	58.8
Actuated g/C Ratio	0.28	0.28	0.65	0.93	0.53	0.53
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	498	446	454	1863	995	846
v/s Ratio Prot	c0.36		0.02	c0.41	0.29	
v/s Ratio Perm		0.02	0.15	0.23		0.22
v/c Ratio	1.28	0.07	0.26	0.64	0.54	0.41
Uniform Delay, d1	39.5	29.0	9.9	0.7	16.7	15.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	140.4	0.1	0.3	0.8	2.1	1.5
Delay (s)	179.9	29.0	10.2	1.5	18.8	16.7
Level of Service	F	C	B	A	B	B
Approach Delay (s)	164.2			2.3	17.7	
Approach LOS	F			A	B	

Intersection Summary			
HCM 2000 Control Delay	43.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	96.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

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Level Of Service Computation Report

Future Opening Year plus Landfill plus RRP (Roberts Driveway Access)

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Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	10	93	62	655	1072	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3524	3530	
Flt Permitted	0.95	1.00		0.75	1.00	
Satd. Flow (perm)	1770	1583		2652	3530	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	101	67	712	1165	20
RTOR Reduction (vph)	0	95	0	0	1	0
Lane Group Flow (vph)	11	6	0	779	1184	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	5.9	5.9		86.1	86.1	
Effective Green, g (s)	5.9	5.9		86.1	86.1	
Actuated g/C Ratio	0.06	0.06		0.86	0.86	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	104	93		2283	3039	
v/s Ratio Prot	c0.01				c0.34	
v/s Ratio Perm		0.00		0.29		
v/c Ratio	0.11	0.06		0.34	0.39	
Uniform Delay, d1	44.6	44.4		1.4	1.5	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.3		0.4	0.4	
Delay (s)	45.0	44.7		1.8	1.8	
Level of Service	D	D		A	A	
Approach Delay (s)	44.8			1.8	1.8	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	9	10	18	471	916	14
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	11	20	512	996	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1554	1003	996			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1554	1003	996			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	92	96	97			
cM capacity (veh/h)	121	294	695			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	21	20	512	1011
Volume Left	10	20	0	0
Volume Right	11	0	0	15
cSH	255	695	1700	1700
Volume to Capacity	0.08	0.03	0.30	0.59
Queue Length 95th (ft)	7	2	0	0
Control Delay (s)	27.0	10.3	0.0	0.0
Lane LOS	D	B		
Approach Delay (s)	27.0	0.4		0.0
Approach LOS	D			

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	59.1%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	3	0	3	60	0	46	4	425	40	14	866	13
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	0	3	65	0	50	4	462	43	15	941	14
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1521	1493	948	1474	1478	484	955			505		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1521	1493	948	1474	1478	484	955			505		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	96	100	99	36	100	91	99			99		
cM capacity (veh/h)	87	121	316	102	123	583	720			1059		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	7	115	510	971
Volume Left	3	65	4	15
Volume Right	3	50	43	14
cSH	137	159	720	1059
Volume to Capacity	0.05	0.73	0.01	0.01
Queue Length 95th (ft)	4	110	0	1
Control Delay (s)	32.6	71.9	0.2	0.4
Lane LOS	D	F	A	A
Approach Delay (s)	32.6	71.9	0.2	0.4
Approach LOS	D	F		

Intersection Summary			
Average Delay	5.6		
Intersection Capacity Utilization	70.1%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Volume (veh/h)	81	471	128	870	78	27	24
Sign Control		Free		Free		Stop	
Grade		0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	88	512	0	946	85	29	26
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None		None			
Median storage veh)							
Upstream signal (ft)				604			
pX, platoon unblocked			0.00				
vC, conflicting volume	1030		0			1676	988
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	1030		0			1676	988
tC, single (s)	4.1		0.0			6.4	6.2
tC, 2 stage (s)							
tF (s)	2.2		0.0			3.5	3.3
p0 queue free %	87		0			68	91
cM capacity (veh/h)	674		0			91	300

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	600	1030	55
Volume Left	88	0	29
Volume Right	0	85	26
cSH	674	1700	135
Volume to Capacity	0.13	0.61	0.41
Queue Length 95th (ft)	11	0	44
Control Delay (s)	3.4	0.0	48.9
Lane LOS	A		E
Approach Delay (s)	3.4	0.0	48.9
Approach LOS			E

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	82.7%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	317	309	35	333	948	1040
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.06	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	117	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	345	336	38	362	1030	1130
RTOR Reduction (vph)	0	185	0	0	0	386
Lane Group Flow (vph)	345	151	38	362	1030	744
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	24.6	24.6	72.9	97.5	65.0	65.0
Effective Green, g (s)	24.6	24.6	72.9	97.5	65.0	65.0
Actuated g/C Ratio	0.23	0.23	0.69	0.92	0.62	0.62
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	412	369	141	1863	1147	975
v/s Ratio Prot	c0.19		0.01	c0.13	c0.55	
v/s Ratio Perm		0.10	0.17	0.06		0.47
v/c Ratio	0.84	0.41	0.27	0.19	0.90	0.76
Uniform Delay, d1	38.5	34.3	20.1	0.4	17.4	14.7
Progression Factor	0.99	0.97	1.00	1.00	1.00	1.00
Incremental Delay, d2	13.7	0.7	1.0	0.1	11.1	5.7
Delay (s)	52.0	34.0	21.1	0.4	28.5	20.3
Level of Service	D	C	C	A	C	C
Approach Delay (s)	43.2			2.4	24.2	
Approach LOS	D			A	C	

Intersection Summary			
HCM 2000 Control Delay	25.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	105.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	18	63	109	1008	1014	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3522	3532	
Flt Permitted	0.95	1.00		0.69	1.00	
Satd. Flow (perm)	1770	1583		2456	3532	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	20	68	118	1096	1102	15
RTOR Reduction (vph)	0	64	0	0	0	0
Lane Group Flow (vph)	20	4	0	1214	1117	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	5.8	5.8		86.2	86.2	
Effective Green, g (s)	5.8	5.8		86.2	86.2	
Actuated g/C Ratio	0.06	0.06		0.86	0.86	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	102	91		2117	3044	
v/s Ratio Prot	c0.01				0.32	
v/s Ratio Perm		0.00		c0.49		
v/c Ratio	0.20	0.04		0.57	0.37	
Uniform Delay, d1	44.9	44.5		1.9	1.4	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	0.2		1.1	0.3	
Delay (s)	45.8	44.7		3.0	1.7	
Level of Service	D	D		A	A	
Approach Delay (s)	44.9			3.0	1.7	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	72.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	30	34	31	913	734	26
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	37	34	992	798	28
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1872	812	798			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1872	812	798			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	57	90	96			
cM capacity (veh/h)	76	379	824			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	70	34	992	826
Volume Left	33	34	0	0
Volume Right	37	0	0	28
cSH	162	824	1700	1700
Volume to Capacity	0.43	0.04	0.58	0.49
Queue Length 95th (ft)	48	3	0	0
Control Delay (s)	47.7	9.6	0.0	0.0
Lane LOS	E	A		
Approach Delay (s)	47.7	0.3		0.0
Approach LOS	E			

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	58.1%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	8	1	6	36	2	29	4	851	88	16	717	4
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	1	7	39	2	32	4	925	96	17	779	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1830	1846	782	1805	1800	973	784			1021		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1830	1846	782	1805	1800	973	784			1021		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	83	99	98	33	97	90	99			97		
cM capacity (veh/h)	50	72	395	58	77	306	835			680		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	16	73	1025	801
Volume Left	9	39	4	17
Volume Right	7	32	96	4
cSH	80	91	835	680
Volume to Capacity	0.20	0.80	0.01	0.03
Queue Length 95th (ft)	18	106	0	2
Control Delay (s)	61.2	128.0	0.2	0.7
Lane LOS	F	F	A	A
Approach Delay (s)	61.2	128.0	0.2	0.7
Approach LOS	F	F		

Intersection Summary			
Average Delay	5.8		
Intersection Capacity Utilization	63.5%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	21	639	689	25	73	92
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	23	695	749	27	79	100
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			604			
pX, platoon unblocked						
vC, conflicting volume	776				1503	762
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	776				1503	762
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				39	75
cM capacity (veh/h)	840				130	405

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	717	776	179
Volume Left	23	0	79
Volume Right	0	27	100
cSH	840	1700	209
Volume to Capacity	0.03	0.46	0.86
Queue Length 95th (ft)	2	0	163
Control Delay (s)	0.7	0.0	77.5
Lane LOS	A		F
Approach Delay (s)	0.7	0.0	77.5
Approach LOS			F

Intersection Summary			
Average Delay	8.6		
Intersection Capacity Utilization	66.9%	ICU Level of Service	C
Analysis Period (min)	15		

Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways
Warrant 3 (Peak Hour) Traffic Signal Warrant Worksheet

Intersection # 4 : Kohio + Robert's Driveway
PM Peak Hour
Robert's Driveway Scenario
Future Opening Year + Landfill + RRP

PART A or PART B satisfied YES ☑ NO ☐

PART A **PART A satisfied** YES ~~☑~~ NO ☑

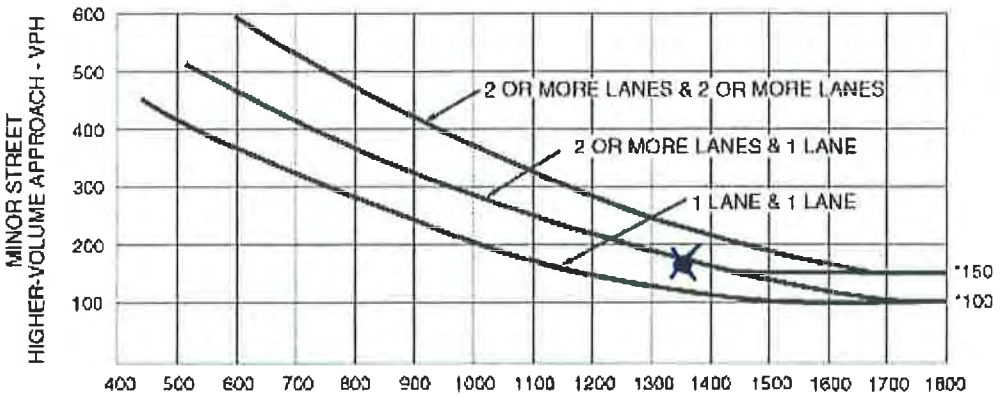
(All parts 1, 2, and 3 below must be satisfied)

1. The total stopped time delay experienced by the traffic on one minor-street approach controlled by a STOP sign equals or exceeds: 4 vehicle-hours for a one-lane approach; or 5 vehicle-hours for a two-lane approach, and — Yes ☐ No ☑ 3.55
2. The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes, and — Yes ☑ No ☐ 164
3. The total entering volume serviced during the hour equals or exceeds 650 vehicles per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches. — Yes ☑ No ☐ 1538

PART B **PART B satisfied** YES ☑ NO ☐

The plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in **Figure 4C-3** for the existing combination of approach lanes.

Figure 4C-3. Warrant 3, Peak Hour



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1374

MAJOR STREET—TOTAL OF BOTH APPROACHES—
VEHICLES PER HOUR (VPH)

*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	644	68	108	1098	494	606
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.30	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	565	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	700	74	117	1193	537	659
RTOR Reduction (vph)	0	38	0	0	0	307
Lane Group Flow (vph)	700	36	117	1193	537	352
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	31.0	31.0	71.0	102.0	58.8	58.8
Effective Green, g (s)	31.0	31.0	71.0	102.0	58.8	58.8
Actuated g/C Ratio	0.28	0.28	0.65	0.93	0.53	0.53
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	498	446	454	1863	995	846
v/s Ratio Prot	c0.40		0.02	c0.41	0.29	
v/s Ratio Perm		0.02	0.15	0.23		0.22
v/c Ratio	1.41	0.08	0.26	0.64	0.54	0.42
Uniform Delay, d1	39.5	29.0	9.9	0.7	16.7	15.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	194.3	0.1	0.3	0.8	2.1	1.5
Delay (s)	233.8	29.1	10.2	1.5	18.8	16.8
Level of Service	F	C	B	A	B	B
Approach Delay (s)	214.2			2.3	17.7	
Approach LOS	F			A	B	

Intersection Summary			
HCM 2000 Control Delay	57.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	100.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

****

Level Of Service Computation Report

Future Long-Range Year

****

HCM Signalized Intersection Capacity Analysis
1: Kuhio Highway & Ehiku Street

1/9/2014

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	12	114	76	703	1281	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3522	3530	
Flt Permitted	0.95	1.00		0.68	1.00	
Satd. Flow (perm)	1770	1583		2400	3530	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	13	124	83	764	1392	24
RTOR Reduction (vph)	0	59	0	0	1	0
Lane Group Flow (vph)	13	65	0	847	1415	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	9.6	9.6		82.4	82.4	
Effective Green, g (s)	9.6	9.6		82.4	82.4	
Actuated g/C Ratio	0.10	0.10		0.82	0.82	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	169	151		1977	2908	
v/s Ratio Prot	0.01				c0.40	
v/s Ratio Perm		c0.04		0.35		
v/c Ratio	0.08	0.43		0.43	0.49	
Uniform Delay, d1	41.2	42.6		2.4	2.6	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	2.0		0.7	0.6	
Delay (s)	41.4	44.6		3.1	3.2	
Level of Service	D	D		A	A	
Approach Delay (s)	44.3			3.1	3.2	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	5.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	10	12	22	477	1090	17
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	13	24	518	1185	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1760	1194	1185			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1760	1194	1185			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	88	94	96			
cM capacity (veh/h)	89	227	589			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	24	24	518	1203
Volume Left	11	24	0	0
Volume Right	13	0	0	18
cSH	196	589	1700	1700
Volume to Capacity	0.12	0.04	0.30	0.71
Queue Length 95th (ft)	10	3	0	0
Control Delay (s)	35.0	11.4	0.0	0.0
Lane LOS	E	B		
Approach Delay (s)	35.0	0.5		0.0
Approach LOS	E			

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	68.4%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	4	0	4	73	0	56	5	421	48	17	1030	16
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	0	4	79	0	61	5	458	52	18	1120	17
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1721	1686	1128	1664	1668	484	1137			510		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1721	1686	1128	1664	1668	484	1137			510		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	93	100	98	0	100	90	99			98		
cM capacity (veh/h)	62	91	248	74	94	583	614			1055		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	9	140	515	1155
Volume Left	4	79	5	18
Volume Right	4	61	52	17
cSH	99	119	614	1055
Volume to Capacity	0.09	1.17	0.01	0.02
Queue Length 95th (ft)	7	217	1	1
Control Delay (s)	44.9	206.3	0.3	0.6
Lane LOS	E	F	A	A
Approach Delay (s)	44.9	206.3	0.3	0.6
Approach LOS	E	F		

Intersection Summary			
Average Delay	16.5		
Intersection Capacity Utilization	82.1%	ICU Level of Service	E
Analysis Period (min)	15		

Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways
Warrant 3 (Peak Hour) Traffic Signal Warrant Worksheet

Intersection # 3 : Kuhio Hwy & Laulima St
AM Peak Hour.
Ehiku St access scenario
Future Long-Range Year

PART A or **PART B** satisfied YES ☑ NO ☐

PART A **PART A** satisfied YES ☑ NO ☐

(All parts 1, 2, and 3 below must be satisfied)

1. The total stopped time delay experienced by the traffic on one minor-street approach controlled by a STOP sign equals or exceeds: 4 vehicle-hours for a one-lane approach; or 5 vehicle-hours for a two-lane approach, and — Yes ☑ No ☐ 7.4

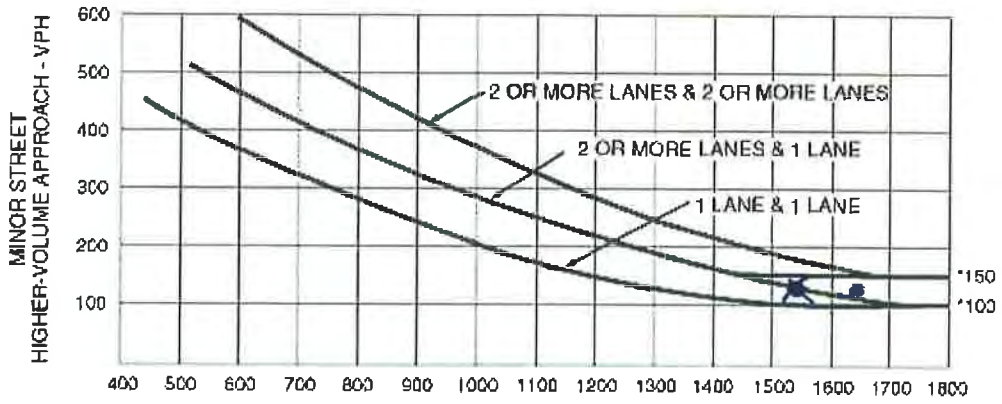
2. The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes, and — Yes ☑ No ☐ 130

3. The total entering volume serviced during the hour equals or exceeds 650 vehicles per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches. — Yes ☑ No ☐ 1675

PART B **PART B** satisfied YES ☑ NO ☐

The plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in **Figure 4C-3** for the existing combination of approach lanes.

Figure 4C-3. Warrant 3, Peak Hour



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MAJOR STREET—TOTAL OF BOTH APPROACHES—
VEHICLES PER HOUR (VPH)

*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Volume (veh/h)	1	574	156	1061	16	10	1
Sign Control		Free		Free		Stop	
Grade		0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	624	0	1153	17	11	1
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None		None			
Median storage veh)							
Upstream signal (ft)				608			
pX, platoon unblocked			0.00				
vC, conflicting volume	1171		0			1788	1162
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	1171		0			1788	1162
tC, single (s)	4.1		0.0			6.4	6.2
tC, 2 stage (s)							
tF (s)	2.2		0.0			3.5	3.3
p0 queue free %	100		0			88	100
cM capacity (veh/h)	597		0			89	237

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	625	1171	12
Volume Left	1	0	11
Volume Right	0	17	1
cSH	597	1700	94
Volume to Capacity	0.00	0.69	0.13
Queue Length 95th (ft)	0	0	10
Control Delay (s)	0.1	0.0	48.6
Lane LOS	A		E
Approach Delay (s)	0.1	0.0	48.6
Approach LOS			E

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	109.0%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	364	377	43	407	1156	1189
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.06	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	112	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	396	410	47	442	1257	1292
RTOR Reduction (vph)	0	158	0	0	0	411
Lane Group Flow (vph)	396	252	47	442	1257	881
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	27.4	27.4	72.0	99.4	62.7	62.7
Effective Green, g (s)	27.4	27.4	72.0	99.4	62.7	62.7
Actuated g/C Ratio	0.26	0.26	0.67	0.93	0.58	0.58
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	451	403	156	1863	1087	924
v/s Ratio Prot	c0.22		0.01	c0.16	c0.67	
v/s Ratio Perm		0.16	0.19	0.08		0.56
v/c Ratio	0.88	0.63	0.30	0.24	1.16	0.95
Uniform Delay, d1	38.4	35.5	24.8	0.4	22.4	21.0
Progression Factor	0.99	0.97	1.00	1.00	1.00	1.00
Incremental Delay, d2	17.2	3.0	1.1	0.1	81.0	20.2
Delay (s)	55.1	37.4	25.9	0.4	103.4	41.2
Level of Service	E	D	C	A	F	D
Approach Delay (s)	46.1			2.9	71.9	
Approach LOS	D			A	E	

Intersection Summary			
HCM 2000 Control Delay	57.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	107.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	90.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
1: Kuhio Highway & Ehiku Street

1/9/2014

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	22	77	133	1207	1139	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3522	3532	
Flt Permitted	0.95	1.00		0.64	1.00	
Satd. Flow (perm)	1770	1583		2282	3532	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	24	84	145	1312	1238	18
RTOR Reduction (vph)	0	79	0	0	0	0
Lane Group Flow (vph)	24	5	0	1457	1256	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	6.1	6.1		85.9	85.9	
Effective Green, g (s)	6.1	6.1		85.9	85.9	
Actuated g/C Ratio	0.06	0.06		0.86	0.86	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	107	96		1960	3033	
v/s Ratio Prot	c0.01				0.36	
v/s Ratio Perm		0.00		c0.64		
v/c Ratio	0.22	0.05		0.74	0.41	
Uniform Delay, d1	44.7	44.2		2.8	1.5	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.1	0.2		2.6	0.4	
Delay (s)	45.8	44.5		5.4	2.0	
Level of Service	D	D		A	A	
Approach Delay (s)	44.8			5.4	2.0	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	5.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	37	42	38	1091	798	31
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	40	46	41	1186	867	34
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2153	884	867			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2153	884	867			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	19	87	95			
cM capacity (veh/h)	50	344	776			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	86	41	1186	901
Volume Left	40	41	0	0
Volume Right	46	0	0	34
cSH	102	776	1700	1700
Volume to Capacity	0.85	0.05	0.70	0.53
Queue Length 95th (ft)	119	4	0	0
Control Delay (s)	126.8	9.9	0.0	0.0
Lane LOS	F	A		
Approach Delay (s)	126.8	0.3		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	5.1		
Intersection Capacity Utilization	67.4%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	9	1	8	44	3	35	5	1015	107	20	777	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	1	9	48	3	38	5	1103	116	22	845	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2103	2121	847	2072	2066	1161	850			1220		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2103	2121	847	2072	2066	1161	850			1220		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	66	98	98	0	94	84	99			96		
cM capacity (veh/h)	29	48	362	37	52	238	788			572		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	20	89	1225	872
Volume Left	10	48	5	22
Volume Right	9	38	116	5
cSH	51	58	788	572
Volume to Capacity	0.38	1.53	0.01	0.04
Queue Length 95th (ft)	34	200	1	3
Control Delay (s)	113.8	422.1	0.3	1.1
Lane LOS	F	F	A	A
Approach Delay (s)	113.8	422.1	0.3	1.1
Approach LOS	F	F		

Intersection Summary			
Average Delay	18.7		
Intersection Capacity Utilization	75.0%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	3	780	841	12	9	14
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	848	914	13	10	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			608			
pX, platoon unblocked						
vC, conflicting volume	927				1775	921
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	927				1775	921
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				89	95
cM capacity (veh/h)	737				91	328

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	851	927	25
Volume Left	3	0	10
Volume Right	0	13	15
cSH	737	1700	162
Volume to Capacity	0.00	0.55	0.15
Queue Length 95th (ft)	0	0	13
Control Delay (s)	0.1	0.0	31.3
Lane LOS	A		D
Approach Delay (s)	0.1	0.0	31.3
Approach LOS			D

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	55.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	706	82	132	1340	603	721
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.22	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	404	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	767	89	143	1457	655	784
RTOR Reduction (vph)	0	42	0	0	0	370
Lane Group Flow (vph)	767	47	143	1457	655	414
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	31.0	31.0	71.0	102.0	58.1	58.1
Effective Green, g (s)	31.0	31.0	71.0	102.0	58.1	58.1
Actuated g/C Ratio	0.28	0.28	0.65	0.93	0.53	0.53
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	498	446	371	1863	984	836
v/s Ratio Prot	c0.43		0.03	c0.50	0.35	
v/s Ratio Perm		0.03	0.22	0.28		0.26
v/c Ratio	1.54	0.11	0.39	0.78	0.67	0.50
Uniform Delay, d1	39.5	29.2	12.4	1.1	18.9	16.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	253.0	0.1	0.7	2.2	3.6	2.1
Delay (s)	292.5	29.3	13.1	3.3	22.4	18.7
Level of Service	F	C	B	A	C	B
Approach Delay (s)	265.1			4.1	20.4	
Approach LOS	F			A	C	

Intersection Summary			
HCM 2000 Control Delay	67.5	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	116.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

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Level Of Service Computation Report

Future Long-Range Year plus Landfill (Ehiku Access)

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Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	20	124	86	703	1281	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		0.99	1.00	
Satd. Flow (prot)	1770	1583		3520	3527	
Flt Permitted	0.95	1.00		0.65	1.00	
Satd. Flow (perm)	1770	1583		2314	3527	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	135	93	764	1392	34
RTOR Reduction (vph)	0	58	0	0	1	0
Lane Group Flow (vph)	22	77	0	857	1425	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	10.3	10.3		81.7	81.7	
Effective Green, g (s)	10.3	10.3		81.7	81.7	
Actuated g/C Ratio	0.10	0.10		0.82	0.82	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	182	163		1890	2881	
v/s Ratio Prot	0.01				c0.40	
v/s Ratio Perm		c0.05		0.37		
v/c Ratio	0.12	0.47		0.45	0.49	
Uniform Delay, d1	40.7	42.3		2.7	2.8	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	2.1		0.8	0.6	
Delay (s)	41.0	44.4		3.4	3.4	
Level of Service	D	D		A	A	
Approach Delay (s)	43.9			3.4	3.4	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	6.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	71.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	10	12	22	486	1098	17
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	13	24	528	1193	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1779	1203	1193			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1779	1203	1193			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	87	94	96			
cM capacity (veh/h)	87	225	585			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	24	24	528	1212
Volume Left	11	24	0	0
Volume Right	13	0	0	18
cSH	191	585	1700	1700
Volume to Capacity	0.13	0.04	0.31	0.71
Queue Length 95th (ft)	11	3	0	0
Control Delay (s)	35.8	11.4	0.0	0.0
Lane LOS	E	B		
Approach Delay (s)	35.8	0.5		0.0
Approach LOS	E			

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	68.8%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	4	0	4	73	0	56	5	429	48	17	1038	16
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	0	4	79	0	61	5	466	52	18	1128	17
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1738	1703	1137	1682	1686	492	1146			518		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1738	1703	1137	1682	1686	492	1146			518		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	93	100	98	0	100	89	99			98		
cM capacity (veh/h)	60	89	246	72	91	576	610			1048		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	9	140	524	1164
Volume Left	4	79	5	18
Volume Right	4	61	52	17
cSH	96	116	610	1048
Volume to Capacity	0.09	1.21	0.01	0.02
Queue Length 95th (ft)	7	222	1	1
Control Delay (s)	46.0	219.8	0.3	0.6
Lane LOS	E	F	A	A
Approach Delay (s)	46.0	219.8	0.3	0.6
Approach LOS	E	F		

Intersection Summary			
Average Delay	17.4		
Intersection Capacity Utilization	82.5%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Volume (veh/h)	1	582	156	1070	16	10	1
Sign Control		Free		Free		Stop	
Grade		0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	633	0	1163	17	11	1
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None		None			
Median storage veh)							
Upstream signal (ft)				613			
pX, platoon unblocked			0.00				
vC, conflicting volume	1180		0			1807	1172
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	1180		0			1807	1172
tC, single (s)	4.1		0.0			6.4	6.2
tC, 2 stage (s)							
tF (s)	2.2		0.0			3.5	3.3
p0 queue free %	100		0			87	100
cM capacity (veh/h)	592		0			87	234

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	634	1180	12
Volume Left	1	0	11
Volume Right	0	17	1
cSH	592	1700	92
Volume to Capacity	0.00	0.69	0.13
Queue Length 95th (ft)	0	0	11
Control Delay (s)	0.1	0.0	49.9
Lane LOS	A		E
Approach Delay (s)	0.1	0.0	49.9
Approach LOS			E

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	109.9%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	372	377	43	407	1156	1198
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.06	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	112	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	404	410	47	442	1257	1302
RTOR Reduction (vph)	0	157	0	0	0	414
Lane Group Flow (vph)	404	253	47	442	1257	888
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	27.8	27.8	71.9	99.7	62.6	62.6
Effective Green, g (s)	27.8	27.8	71.9	99.7	62.6	62.6
Actuated g/C Ratio	0.26	0.26	0.67	0.93	0.58	0.58
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	456	408	156	1863	1082	920
v/s Ratio Prot	c0.23		0.01	c0.16	c0.67	
v/s Ratio Perm		0.16	0.19	0.08		0.56
v/c Ratio	0.89	0.62	0.30	0.24	1.16	0.97
Uniform Delay, d1	38.4	35.3	24.8	0.4	22.6	21.5
Progression Factor	0.99	0.97	1.00	1.00	1.00	1.00
Incremental Delay, d2	18.1	2.8	1.1	0.1	83.2	22.4
Delay (s)	56.1	36.9	25.9	0.4	105.8	43.9
Level of Service	E	D	C	A	F	D
Approach Delay (s)	46.4			2.9	74.3	
Approach LOS	D			A	E	

Intersection Summary			
HCM 2000 Control Delay	59.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	107.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	90.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	30	87	142	1207	1139	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		0.99	1.00	
Satd. Flow (prot)	1770	1583		3521	3528	
Flt Permitted	0.95	1.00		0.63	1.00	
Satd. Flow (perm)	1770	1583		2227	3528	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	33	95	154	1312	1238	26
RTOR Reduction (vph)	0	84	0	0	1	0
Lane Group Flow (vph)	33	11	0	1466	1263	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	6.5	6.5		85.5	85.5	
Effective Green, g (s)	6.5	6.5		85.5	85.5	
Actuated g/C Ratio	0.06	0.06		0.86	0.86	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	115	102		1904	3016	
v/s Ratio Prot	c0.02				0.36	
v/s Ratio Perm		0.01		c0.66		
v/c Ratio	0.29	0.11		0.77	0.42	
Uniform Delay, d1	44.5	44.0		3.1	1.6	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.4	0.5		3.1	0.4	
Delay (s)	45.9	44.5		6.1	2.1	
Level of Service	D	D		A	A	
Approach Delay (s)	44.8			6.1	2.1	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	6.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	83.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	37	42	38	1099	805	31
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	40	46	41	1195	875	34
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2169	892	875			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2169	892	875			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	18	87	95			
cM capacity (veh/h)	49	341	771			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	86	41	1195	909
Volume Left	40	41	0	0
Volume Right	46	0	0	34
cSH	99	771	1700	1700
Volume to Capacity	0.87	0.05	0.70	0.53
Queue Length 95th (ft)	122	4	0	0
Control Delay (s)	133.6	9.9	0.0	0.0
Lane LOS	F	A		
Approach Delay (s)	133.6	0.3		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	5.3		
Intersection Capacity Utilization	67.8%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	9	1	8	44	3	35	5	1023	107	20	784	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	1	9	48	3	38	5	1112	116	22	852	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2119	2138	855	2089	2082	1170	858			1228		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2119	2138	855	2089	2082	1170	858			1228		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	65	98	98	0	94	84	99			96		
cM capacity (veh/h)	28	47	358	36	51	235	783			567		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	20	89	1234	879
Volume Left	10	48	5	22
Volume Right	9	38	116	5
cSH	50	57	783	567
Volume to Capacity	0.39	1.57	0.01	0.04
Queue Length 95th (ft)	35	203	1	3
Control Delay (s)	118.4	442.0	0.3	1.2
Lane LOS	F	F	A	A
Approach Delay (s)	118.4	442.0	0.3	1.2
Approach LOS	F	F		

Intersection Summary			
Average Delay	19.4		
Intersection Capacity Utilization	75.4%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	3	788	848	12	9	14
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	857	922	13	10	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			613			
pX, platoon unblocked						
vC, conflicting volume	935				1791	928
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	935				1791	928
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				89	95
cM capacity (veh/h)	732				88	325

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	860	935	25
Volume Left	3	0	10
Volume Right	0	13	15
cSH	732	1700	159
Volume to Capacity	0.00	0.55	0.16
Queue Length 95th (ft)	0	0	14
Control Delay (s)	0.1	0.0	31.9
Lane LOS	A		D
Approach Delay (s)	0.1	0.0	31.9
Approach LOS			D

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	55.4%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	715	82	132	1340	603	728
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.22	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	404	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	777	89	143	1457	655	791
RTOR Reduction (vph)	0	41	0	0	0	373
Lane Group Flow (vph)	777	48	143	1457	655	418
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	31.0	31.0	71.0	102.0	58.1	58.1
Effective Green, g (s)	31.0	31.0	71.0	102.0	58.1	58.1
Actuated g/C Ratio	0.28	0.28	0.65	0.93	0.53	0.53
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	498	446	371	1863	984	836
v/s Ratio Prot	c0.44		0.03	c0.50	0.35	
v/s Ratio Perm		0.03	0.22	0.28		0.26
v/c Ratio	1.56	0.11	0.39	0.78	0.67	0.50
Uniform Delay, d1	39.5	29.3	12.4	1.1	18.9	16.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	261.8	0.1	0.7	2.2	3.6	2.1
Delay (s)	301.3	29.4	13.1	3.3	22.4	18.8
Level of Service	F	C	B	A	C	B
Approach Delay (s)	273.4			4.1	20.4	
Approach LOS	F			A	C	

Intersection Summary			
HCM 2000 Control Delay	69.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	116.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

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Level Of Service Computation Report

Future Long-Range Year plus Landfill plus RRP (Ehiku Access)

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Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	32	138	158	703	1281	89
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	0.99	
Flt Protected	0.95	1.00		0.99	1.00	
Satd. Flow (prot)	1770	1583		3507	3505	
Flt Permitted	0.95	1.00		0.53	1.00	
Satd. Flow (perm)	1770	1583		1866	3505	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	35	150	172	764	1392	97
RTOR Reduction (vph)	0	58	0	0	3	0
Lane Group Flow (vph)	35	92	0	936	1486	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	11.1	11.1		80.9	80.9	
Effective Green, g (s)	11.1	11.1		80.9	80.9	
Actuated g/C Ratio	0.11	0.11		0.81	0.81	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	196	175		1509	2835	
v/s Ratio Prot	0.02				0.42	
v/s Ratio Perm		c0.06		c0.50		
v/c Ratio	0.18	0.53		0.62	0.52	
Uniform Delay, d1	40.3	42.0		3.7	3.2	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	2.8		1.9	0.7	
Delay (s)	40.8	44.8		5.6	3.9	
Level of Service	D	D		A	A	
Approach Delay (s)	44.1			5.6	3.9	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	7.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	75.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	10	12	22	497	1157	17
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	13	24	540	1258	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1855	1267	1258			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1855	1267	1258			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	86	94	96			
cM capacity (veh/h)	78	206	553			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	24	24	540	1276
Volume Left	11	24	0	0
Volume Right	13	0	0	18
cSH	171	553	1700	1700
Volume to Capacity	0.14	0.04	0.32	0.75
Queue Length 95th (ft)	12	3	0	0
Control Delay (s)	39.6	11.8	0.0	0.0
Lane LOS	E	B		
Approach Delay (s)	39.6	0.5		0.0
Approach LOS	E			

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	71.9%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	4	0	4	73	0	56	5	441	48	17	1097	16
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	0	4	79	0	61	5	479	52	18	1192	17
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1815	1780	1201	1759	1763	505	1210			532		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1815	1780	1201	1759	1763	505	1210			532		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	92	100	98	0	100	89	99			98		
cM capacity (veh/h)	53	80	225	64	82	567	577			1036		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	9	140	537	1228
Volume Left	4	79	5	18
Volume Right	4	61	52	17
cSH	85	103	577	1036
Volume to Capacity	0.10	1.36	0.01	0.02
Queue Length 95th (ft)	8	248	1	1
Control Delay (s)	51.8	286.6	0.3	0.6
Lane LOS	F	F	A	A
Approach Delay (s)	51.8	286.6	0.3	0.6
Approach LOS	F	F		

Intersection Summary			
Average Delay	21.7		
Intersection Capacity Utilization	85.7%	ICU Level of Service	E
Analysis Period (min)	15		

Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways
Warrant 3 (Peak Hour) Traffic Signal Warrant Worksheet

Intersection # 3 : Kuhio Hwy & Laulima St
AM Peak Hour
Ehiku St access scenario
Future Long-Range Year + Landfill + RRP

PART A or PART B satisfied YES ☑ NO ☐

PART A **PART A satisfied** YES ☑ NO ☐

(All parts 1, 2, and 3 below must be satisfied)

1. The total stopped time delay experienced by the traffic on one minor-street approach controlled by a STOP sign equals or exceeds: 4 vehicle-hours for a one-lane approach; or 5 vehicle-hours for a two-lane approach, and — Yes ☑ No ☐ — 10.3

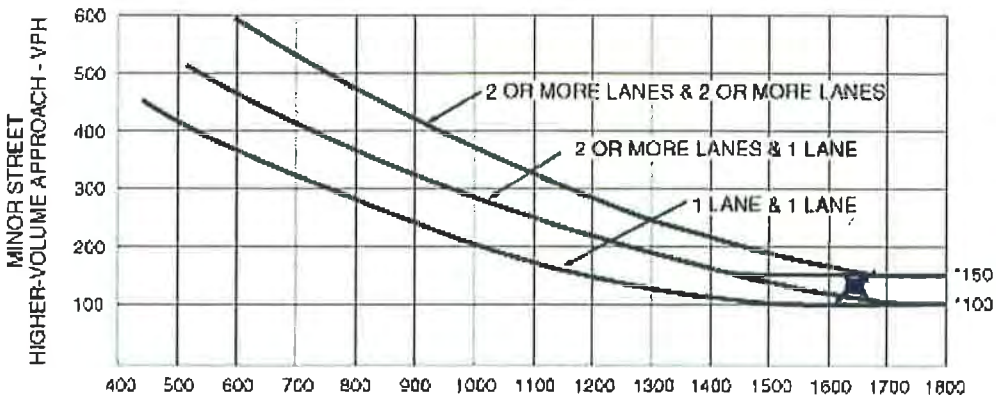
2. The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes, and — Yes ☑ No ☐ — 130

3. The total entering volume serviced during the hour equals or exceeds 650 vehicles per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches. — Yes ☑ No ☐ — 1761

PART B **PART B satisfied** YES ☑ NO ☐

The plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in **Figure 4C-3** for the existing combination of approach lanes.

Figure 4C-3. Warrant 3, Peak Hour



MAJOR STREET—TOTAL OF BOTH APPROACHES—
VEHICLES PER HOUR (VPH)

*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

130
1624

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Volume (veh/h)	1	594	156	1128	16	10	1
Sign Control		Free		Free		Stop	
Grade		0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	646	0	1226	17	11	1
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None		None			
Median storage veh)							
Upstream signal (ft)				604			
pX, platoon unblocked			0.00				
vC, conflicting volume	1243		0			1883	1235
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	1243		0			1883	1235
tC, single (s)	4.1		0.0			6.4	6.2
tC, 2 stage (s)							
tF (s)	2.2		0.0			3.5	3.3
p0 queue free %	100		0			86	99
cM capacity (veh/h)	560		0			78	215

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	647	1243	12
Volume Left	1	0	11
Volume Right	0	17	1
cSH	560	1700	83
Volume to Capacity	0.00	0.73	0.14
Queue Length 95th (ft)	0	0	12
Control Delay (s)	0.1	0.0	55.8
Lane LOS	A		F
Approach Delay (s)	0.1	0.0	55.8
Approach LOS			F

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	113.6%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	383	377	43	407	1156	1256
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.06	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	112	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	416	410	47	442	1257	1365
RTOR Reduction (vph)	0	157	0	0	0	416
Lane Group Flow (vph)	416	253	47	442	1257	949
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	28.2	28.2	71.9	100.1	62.6	62.6
Effective Green, g (s)	28.2	28.2	71.9	100.1	62.6	62.6
Actuated g/C Ratio	0.26	0.26	0.67	0.93	0.58	0.58
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	461	412	155	1863	1078	916
v/s Ratio Prot	c0.24		0.01	c0.16	c0.67	
v/s Ratio Perm		0.16	0.19	0.08		0.60
v/c Ratio	0.90	0.61	0.30	0.24	1.17	1.04
Uniform Delay, d1	38.6	35.2	24.8	0.4	22.7	22.7
Progression Factor	0.99	0.97	1.00	1.00	1.00	1.00
Incremental Delay, d2	20.5	2.7	1.1	0.1	85.0	39.5
Delay (s)	58.6	36.7	25.9	0.4	107.8	62.2
Level of Service	E	D	C	A	F	E
Approach Delay (s)	47.7			2.9	84.1	
Approach LOS	D			A	F	

Intersection Summary			
HCM 2000 Control Delay	66.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	108.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	90.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	89	159	154	1207	1139	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		0.99	1.00	
Satd. Flow (prot)	1770	1583		3519	3524	
Flt Permitted	0.95	1.00		0.60	1.00	
Satd. Flow (perm)	1770	1583		2124	3524	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	97	173	167	1312	1238	37
RTOR Reduction (vph)	0	80	0	0	1	0
Lane Group Flow (vph)	97	93	0	1479	1274	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	11.6	11.6		80.4	80.4	
Effective Green, g (s)	11.6	11.6		80.4	80.4	
Actuated g/C Ratio	0.12	0.12		0.80	0.80	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	205	183		1707	2833	
v/s Ratio Prot	0.05				0.36	
v/s Ratio Perm		c0.06		c0.70		
v/c Ratio	0.47	0.51		0.87	0.45	
Uniform Delay, d1	41.3	41.5		6.3	3.0	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.7	2.4		6.2	0.5	
Delay (s)	43.1	43.9		12.5	3.5	
Level of Service	D	D		B	A	
Approach Delay (s)	43.6			12.5	3.5	
Approach LOS	D			B	A	

Intersection Summary			
HCM 2000 Control Delay	11.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	85.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	37	42	38	1158	815	31
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	40	46	41	1259	886	34
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2244	903	886			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2244	903	886			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	8	86	95			
cM capacity (veh/h)	44	336	764			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	86	41	1259	920
Volume Left	40	41	0	0
Volume Right	46	0	0	34
cSH	87	764	1700	1700
Volume to Capacity	0.98	0.05	0.74	0.54
Queue Length 95th (ft)	140	4	0	0
Control Delay (s)	177.8	10.0	0.0	0.0
Lane LOS	F	A		
Approach Delay (s)	177.8	0.3		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	6.8		
Intersection Capacity Utilization	70.9%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	9	1	8	44	3	35	5	1082	107	20	794	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	1	9	48	3	38	5	1176	116	22	863	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2194	2212	866	2164	2157	1234	868			1292		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2194	2212	866	2164	2157	1234	868			1292		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	60	97	98	0	93	82	99			96		
cM capacity (veh/h)	24	42	353	31	45	215	776			536		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	20	89	1298	890
Volume Left	10	48	5	22
Volume Right	9	38	116	5
cSH	43	50	776	536
Volume to Capacity	0.45	1.77	0.01	0.04
Queue Length 95th (ft)	40	217	1	3
Control Delay (s)	144.4	544.9	0.3	1.3
Lane LOS	F	F	A	A
Approach Delay (s)	144.4	544.9	0.3	1.3
Approach LOS	F	F		

Intersection Summary			
Average Delay	23.0		
Intersection Capacity Utilization	78.5%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	3	846	858	12	9	14
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	920	933	13	10	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			604			
pX, platoon unblocked						
vC, conflicting volume	946				1865	939
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	946				1865	939
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				88	95
cM capacity (veh/h)	726				80	320

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	923	946	25
Volume Left	3	0	10
Volume Right	0	13	15
cSH	726	1700	147
Volume to Capacity	0.00	0.56	0.17
Queue Length 95th (ft)	0	0	15
Control Delay (s)	0.1	0.0	34.5
Lane LOS	A		D
Approach Delay (s)	0.1	0.0	34.5
Approach LOS			D

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	56.9%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	773	82	132	1340	603	737
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.22	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	404	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	840	89	143	1457	655	801
RTOR Reduction (vph)	0	38	0	0	0	378
Lane Group Flow (vph)	840	51	143	1457	655	423
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	31.0	31.0	71.0	102.0	58.1	58.1
Effective Green, g (s)	31.0	31.0	71.0	102.0	58.1	58.1
Actuated g/C Ratio	0.28	0.28	0.65	0.93	0.53	0.53
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	498	446	371	1863	984	836
v/s Ratio Prot	c0.47		0.03	c0.50	0.35	
v/s Ratio Perm		0.03	0.22	0.28		0.27
v/c Ratio	1.69	0.11	0.39	0.78	0.67	0.51
Uniform Delay, d1	39.5	29.3	12.4	1.1	18.9	16.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	317.7	0.1	0.7	2.2	3.6	2.2
Delay (s)	357.2	29.4	13.1	3.3	22.4	18.9
Level of Service	F	C	B	A	C	B
Approach Delay (s)	325.8			4.1	20.5	
Approach LOS	F			A	C	

Intersection Summary			
HCM 2000 Control Delay	85.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	120.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

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Level Of Service Computation Report

Future Long-Range Year plus Landfill (Maalo Access)

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Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	12	114	76	713	1291	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3522	3530	
Flt Permitted	0.95	1.00		0.68	1.00	
Satd. Flow (perm)	1770	1583		2399	3530	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	13	124	83	775	1403	24
RTOR Reduction (vph)	0	58	0	0	1	0
Lane Group Flow (vph)	13	66	0	858	1426	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	9.7	9.7		82.3	82.3	
Effective Green, g (s)	9.7	9.7		82.3	82.3	
Actuated g/C Ratio	0.10	0.10		0.82	0.82	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	171	153		1974	2905	
v/s Ratio Prot	0.01				c0.40	
v/s Ratio Perm		c0.04		0.36		
v/c Ratio	0.08	0.43		0.43	0.49	
Uniform Delay, d1	41.1	42.6		2.4	2.6	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	2.0		0.7	0.6	
Delay (s)	41.3	44.5		3.1	3.2	
Level of Service	D	D		A	A	
Approach Delay (s)	44.2			3.1	3.2	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	5.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	71.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	19	22	33	477	1090	26
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	21	24	36	518	1185	28
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1789	1199	1185			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1789	1199	1185			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	75	89	94			
cM capacity (veh/h)	84	226	589			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	45	36	518	1213
Volume Left	21	36	0	0
Volume Right	24	0	0	28
cSH	181	589	1700	1700
Volume to Capacity	0.25	0.06	0.30	0.71
Queue Length 95th (ft)	23	5	0	0
Control Delay (s)	40.8	11.5	0.0	0.0
Lane LOS	E	B		
Approach Delay (s)	40.8	0.7		0.0
Approach LOS	E			

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	68.9%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	4	0	4	73	0	56	5	429	48	17	1038	16
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	0	4	79	0	61	5	466	52	18	1128	17
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1738	1703	1137	1682	1686	492	1146			518		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1738	1703	1137	1682	1686	492	1146			518		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	93	100	98	0	100	89	99			98		
cM capacity (veh/h)	60	89	246	72	91	576	610			1048		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	9	140	524	1164
Volume Left	4	79	5	18
Volume Right	4	61	52	17
cSH	96	116	610	1048
Volume to Capacity	0.09	1.21	0.01	0.02
Queue Length 95th (ft)	7	222	1	1
Control Delay (s)	46.0	219.8	0.3	0.6
Lane LOS	E	F	A	A
Approach Delay (s)	46.0	219.8	0.3	0.6
Approach LOS	E	F		

Intersection Summary			
Average Delay	17.4		
Intersection Capacity Utilization	82.5%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Volume (veh/h)	1	582	156	1070	16	10	1
Sign Control		Free		Free		Stop	
Grade		0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	633	0	1163	17	11	1
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None		None			
Median storage veh)							
Upstream signal (ft)				613			
pX, platoon unblocked			0.00				
vC, conflicting volume	1180		0			1807	1172
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	1180		0			1807	1172
tC, single (s)	4.1		0.0			6.4	6.2
tC, 2 stage (s)							
tF (s)	2.2		0.0			3.5	3.3
p0 queue free %	100		0			87	100
cM capacity (veh/h)	592		0			87	234

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	634	1180	12
Volume Left	1	0	11
Volume Right	0	17	1
cSH	592	1700	92
Volume to Capacity	0.00	0.69	0.13
Queue Length 95th (ft)	0	0	11
Control Delay (s)	0.1	0.0	49.9
Lane LOS	A		E
Approach Delay (s)	0.1	0.0	49.9
Approach LOS			E

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	109.9%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	372	377	43	407	1156	1198
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.06	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	112	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	404	410	47	442	1257	1302
RTOR Reduction (vph)	0	157	0	0	0	414
Lane Group Flow (vph)	404	253	47	442	1257	888
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	27.8	27.8	71.9	99.7	62.6	62.6
Effective Green, g (s)	27.8	27.8	71.9	99.7	62.6	62.6
Actuated g/C Ratio	0.26	0.26	0.67	0.93	0.58	0.58
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	456	408	156	1863	1082	920
v/s Ratio Prot	c0.23		0.01	c0.16	c0.67	
v/s Ratio Perm		0.16	0.19	0.08		0.56
v/c Ratio	0.89	0.62	0.30	0.24	1.16	0.97
Uniform Delay, d1	38.4	35.3	24.8	0.4	22.6	21.5
Progression Factor	0.99	0.97	1.00	1.00	1.00	1.00
Incremental Delay, d2	18.1	2.8	1.1	0.1	83.2	22.4
Delay (s)	56.1	36.9	25.9	0.4	105.8	43.9
Level of Service	E	D	C	A	F	D
Approach Delay (s)	46.4			2.9	74.3	
Approach LOS	D			A	E	

Intersection Summary			
HCM 2000 Control Delay	59.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	107.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	90.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	22	77	133	1216	1149	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3522	3532	
Flt Permitted	0.95	1.00		0.64	1.00	
Satd. Flow (perm)	1770	1583		2276	3532	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	24	84	145	1322	1249	18
RTOR Reduction (vph)	0	79	0	0	0	0
Lane Group Flow (vph)	24	5	0	1467	1267	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	6.1	6.1		85.9	85.9	
Effective Green, g (s)	6.1	6.1		85.9	85.9	
Actuated g/C Ratio	0.06	0.06		0.86	0.86	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	107	96		1955	3033	
v/s Ratio Prot	c0.01				0.36	
v/s Ratio Perm		0.00		c0.64		
v/c Ratio	0.22	0.05		0.75	0.42	
Uniform Delay, d1	44.7	44.2		2.8	1.6	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.1	0.2		2.7	0.4	
Delay (s)	45.8	44.5		5.5	2.0	
Level of Service	D	D		A	A	
Approach Delay (s)	44.8			5.5	2.0	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	5.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	83.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	45	52	46	1091	798	38
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	49	57	50	1186	867	41
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2174	888	867			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2174	888	867			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	84	94			
cM capacity (veh/h)	48	343	776			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	105	50	1186	909
Volume Left	49	50	0	0
Volume Right	57	0	0	41
cSH	95	776	1700	1700
Volume to Capacity	1.12	0.06	0.70	0.53
Queue Length 95th (ft)	175	5	0	0
Control Delay (s)	209.6	10.0	0.0	0.0
Lane LOS	F	A		
Approach Delay (s)	209.6	0.4		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	10.0		
Intersection Capacity Utilization	67.4%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	9	1	8	44	3	35	5	1023	107	20	784	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	1	9	48	3	38	5	1112	116	22	852	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2119	2138	855	2089	2082	1170	858			1228		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2119	2138	855	2089	2082	1170	858			1228		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	65	98	98	0	94	84	99			96		
cM capacity (veh/h)	28	47	358	36	51	235	783			567		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	20	89	1234	879
Volume Left	10	48	5	22
Volume Right	9	38	116	5
cSH	50	57	783	567
Volume to Capacity	0.39	1.57	0.01	0.04
Queue Length 95th (ft)	35	203	1	3
Control Delay (s)	118.4	442.0	0.3	1.2
Lane LOS	F	F	A	A
Approach Delay (s)	118.4	442.0	0.3	1.2
Approach LOS	F	F		

Intersection Summary			
Average Delay	19.4		
Intersection Capacity Utilization	75.4%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	3	788	848	12	9	14
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	857	922	13	10	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			613			
pX, platoon unblocked						
vC, conflicting volume	935				1791	928
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	935				1791	928
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				89	95
cM capacity (veh/h)	732				88	325

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	860	935	25
Volume Left	3	0	10
Volume Right	0	13	15
cSH	732	1700	159
Volume to Capacity	0.00	0.55	0.16
Queue Length 95th (ft)	0	0	14
Control Delay (s)	0.1	0.0	31.9
Lane LOS	A		D
Approach Delay (s)	0.1	0.0	31.9
Approach LOS			D

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	55.4%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	715	82	132	1340	603	728
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.22	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	404	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	777	89	143	1457	655	791
RTOR Reduction (vph)	0	41	0	0	0	373
Lane Group Flow (vph)	777	48	143	1457	655	418
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	31.0	31.0	71.0	102.0	58.1	58.1
Effective Green, g (s)	31.0	31.0	71.0	102.0	58.1	58.1
Actuated g/C Ratio	0.28	0.28	0.65	0.93	0.53	0.53
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	498	446	371	1863	984	836
v/s Ratio Prot	c0.44		0.03	c0.50	0.35	
v/s Ratio Perm		0.03	0.22	0.28		0.26
v/c Ratio	1.56	0.11	0.39	0.78	0.67	0.50
Uniform Delay, d1	39.5	29.3	12.4	1.1	18.9	16.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	261.8	0.1	0.7	2.2	3.6	2.1
Delay (s)	301.3	29.4	13.1	3.3	22.4	18.8
Level of Service	F	C	B	A	C	B
Approach Delay (s)	273.4			4.1	20.4	
Approach LOS	F			A	C	

Intersection Summary			
HCM 2000 Control Delay	69.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	116.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

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Level Of Service Computation Report

Future Long-Range Year plus Landfill plus RRP (Maalo Access)

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Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	12	114	76	784	1305	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3524	3530	
Flt Permitted	0.95	1.00		0.68	1.00	
Satd. Flow (perm)	1770	1583		2421	3530	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	13	124	83	852	1418	24
RTOR Reduction (vph)	0	56	0	0	1	0
Lane Group Flow (vph)	13	68	0	935	1441	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	9.8	9.8		82.2	82.2	
Effective Green, g (s)	9.8	9.8		82.2	82.2	
Actuated g/C Ratio	0.10	0.10		0.82	0.82	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	173	155		1990	2901	
v/s Ratio Prot	0.01				c0.41	
v/s Ratio Perm		c0.04		0.39		
v/c Ratio	0.08	0.44		0.47	0.50	
Uniform Delay, d1	41.0	42.5		2.6	2.7	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	2.0		0.8	0.6	
Delay (s)	41.2	44.5		3.4	3.3	
Level of Service	D	D		A	A	
Approach Delay (s)	44.2			3.4	3.3	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	5.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	74.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	30	36	104	477	1090	84
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	39	113	518	1185	91
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1975	1230	1185			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1975	1230	1185			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	41	82	81			
cM capacity (veh/h)	55	216	589			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	72	113	518	1276
Volume Left	33	113	0	0
Volume Right	39	0	0	91
cSH	121	589	1700	1700
Volume to Capacity	0.59	0.19	0.30	0.75
Queue Length 95th (ft)	74	18	0	0
Control Delay (s)	77.0	12.6	0.0	0.0
Lane LOS	F	B		
Approach Delay (s)	77.0	2.2		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	81.6%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	4	0	4	73	0	56	5	441	48	17	1097	16
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	0	4	79	0	61	5	479	52	18	1192	17
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1815	1780	1201	1759	1763	505	1210			532		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1815	1780	1201	1759	1763	505	1210			532		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	92	100	98	0	100	89	99			98		
cM capacity (veh/h)	53	80	225	64	82	567	577			1036		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	9	140	537	1228
Volume Left	4	79	5	18
Volume Right	4	61	52	17
cSH	85	103	577	1036
Volume to Capacity	0.10	1.36	0.01	0.02
Queue Length 95th (ft)	8	248	1	1
Control Delay (s)	51.8	286.6	0.3	0.6
Lane LOS	F	F	A	A
Approach Delay (s)	51.8	286.6	0.3	0.6
Approach LOS	F	F		

Intersection Summary			
Average Delay	21.7		
Intersection Capacity Utilization	85.7%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Volume (veh/h)	1	594	156	1128	16	10	1
Sign Control		Free		Free		Stop	
Grade		0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	646	0	1226	17	11	1
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None		None			
Median storage veh)							
Upstream signal (ft)				604			
pX, platoon unblocked			0.00				
vC, conflicting volume	1243		0			1883	1235
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	1243		0			1883	1235
tC, single (s)	4.1		0.0			6.4	6.2
tC, 2 stage (s)							
tF (s)	2.2		0.0			3.5	3.3
p0 queue free %	100		0			86	99
cM capacity (veh/h)	560		0			78	215

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	647	1243	12
Volume Left	1	0	11
Volume Right	0	17	1
cSH	560	1700	83
Volume to Capacity	0.00	0.73	0.14
Queue Length 95th (ft)	0	0	12
Control Delay (s)	0.1	0.0	55.8
Lane LOS	A		F
Approach Delay (s)	0.1	0.0	55.8
Approach LOS			F

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	113.6%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	383	377	43	407	1156	1256
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.06	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	112	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	416	410	47	442	1257	1365
RTOR Reduction (vph)	0	157	0	0	0	416
Lane Group Flow (vph)	416	253	47	442	1257	949
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	28.2	28.2	71.9	100.1	62.6	62.6
Effective Green, g (s)	28.2	28.2	71.9	100.1	62.6	62.6
Actuated g/C Ratio	0.26	0.26	0.67	0.93	0.58	0.58
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	461	412	155	1863	1078	916
v/s Ratio Prot	c0.24		0.01	c0.16	c0.67	
v/s Ratio Perm		0.16	0.19	0.08		0.60
v/c Ratio	0.90	0.61	0.30	0.24	1.17	1.04
Uniform Delay, d1	38.6	35.2	24.8	0.4	22.7	22.7
Progression Factor	0.99	0.97	1.00	1.00	1.00	1.00
Incremental Delay, d2	20.5	2.7	1.1	0.1	85.0	39.5
Delay (s)	58.6	36.7	25.9	0.4	107.8	62.2
Level of Service	E	D	C	A	F	E
Approach Delay (s)	47.7			2.9	84.1	
Approach LOS	D			A	F	

Intersection Summary			
HCM 2000 Control Delay	66.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	108.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	90.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	22	77	133	1228	1221	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3522	3532	
Flt Permitted	0.95	1.00		0.63	1.00	
Satd. Flow (perm)	1770	1583		2220	3532	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	24	84	145	1335	1327	18
RTOR Reduction (vph)	0	70	0	0	0	0
Lane Group Flow (vph)	24	14	0	1480	1345	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	6.2	6.2		85.8	85.8	
Effective Green, g (s)	6.2	6.2		85.8	85.8	
Actuated g/C Ratio	0.06	0.06		0.86	0.86	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	109	98		1904	3030	
v/s Ratio Prot	c0.01				0.38	
v/s Ratio Perm		0.01		c0.67		
v/c Ratio	0.22	0.14		0.78	0.44	
Uniform Delay, d1	44.6	44.4		3.0	1.6	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.0	0.7		3.2	0.5	
Delay (s)	45.6	45.0		6.2	2.1	
Level of Service	D	D		A	A	
Approach Delay (s)	45.2			6.2	2.1	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	5.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	85.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	103	123	58	1091	798	48
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	112	134	63	1186	867	52
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2205	893	867			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2205	893	867			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	61	92			
cM capacity (veh/h)	45	340	776			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	246	63	1186	920
Volume Left	112	63	0	0
Volume Right	134	0	0	52
cSH	86	776	1700	1700
Volume to Capacity	2.86	0.08	0.70	0.54
Queue Length 95th (ft)	595	7	0	0
Control Delay (s)	941.7	10.0	0.0	0.0
Lane LOS	F	B		
Approach Delay (s)	941.7	0.5		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	96.1		
Intersection Capacity Utilization	69.8%	ICU Level of Service	C
Analysis Period (min)	15		

Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways
Warrant 3 (Peak Hour) Traffic Signal Warrant Worksheet

Intersection # 2 : Kuhio Hwy + Ma'alo Rd
PM Peak Hour
~~Robert~~ Ma'alo Rd access scenario
Future Long Range Year + Landfill + RRP

PART A or **PART B** satisfied YES ☑ NO ☐

PART A **PART A** satisfied YES ☑ NO ☐

(All parts 1, 2, and 3 below must be satisfied)

1. The total stopped time delay experienced by the traffic on one minor-street approach controlled by a STOP sign equals or exceeds: 4 vehicle-hours for a one-lane approach; or 5 vehicle-hours for a two-lane approach, and — Yes ☑ No ☐ 59.1

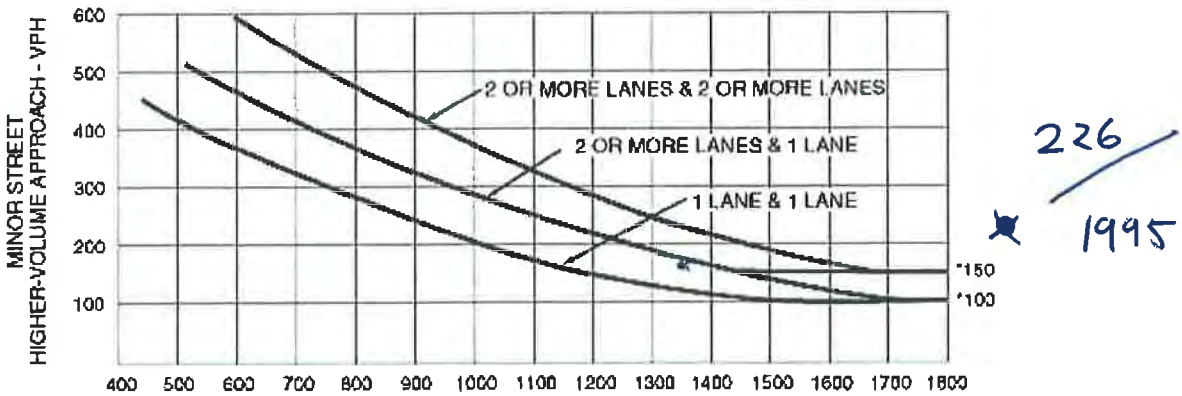
2. The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes, and — Yes ☑ No ☐ 226

3. The total entering volume serviced during the hour equals or exceeds 650 vehicles per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches. — Yes ☑ No ☐ 2222

PART B **PART B** satisfied YES ☑ NO ☐

The plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in **Figure 4C-3** for the existing combination of approach lanes.

Figure 4C-3. Warrant 3, Peak Hour



MAJOR STREET—TOTAL OF BOTH APPROACHES—
VEHICLES PER HOUR (VPH)

*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	9	1	8	44	3	35	5	1082	107	20	794	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	1	9	48	3	38	5	1176	116	22	863	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2194	2212	866	2164	2157	1234	868			1292		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2194	2212	866	2164	2157	1234	868			1292		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	60	97	98	0	93	82	99			96		
cM capacity (veh/h)	24	42	353	31	45	215	776			536		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	20	89	1298	890
Volume Left	10	48	5	22
Volume Right	9	38	116	5
cSH	43	50	776	536
Volume to Capacity	0.45	1.77	0.01	0.04
Queue Length 95th (ft)	40	217	1	3
Control Delay (s)	144.4	544.9	0.3	1.3
Lane LOS	F	F	A	A
Approach Delay (s)	144.4	544.9	0.3	1.3
Approach LOS	F	F		

Intersection Summary			
Average Delay	23.0		
Intersection Capacity Utilization	78.5%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	3	846	858	12	9	14
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	920	933	13	10	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			604			
pX, platoon unblocked						
vC, conflicting volume	946				1865	939
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	946				1865	939
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				88	95
cM capacity (veh/h)	726				80	320

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	923	946	25
Volume Left	3	0	10
Volume Right	0	13	15
cSH	726	1700	147
Volume to Capacity	0.00	0.56	0.17
Queue Length 95th (ft)	0	0	15
Control Delay (s)	0.1	0.0	34.5
Lane LOS	A		D
Approach Delay (s)	0.1	0.0	34.5
Approach LOS			D

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	56.9%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	773	82	132	1340	603	737
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.22	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	404	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	840	89	143	1457	655	801
RTOR Reduction (vph)	0	38	0	0	0	378
Lane Group Flow (vph)	840	51	143	1457	655	423
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	31.0	31.0	71.0	102.0	58.1	58.1
Effective Green, g (s)	31.0	31.0	71.0	102.0	58.1	58.1
Actuated g/C Ratio	0.28	0.28	0.65	0.93	0.53	0.53
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	498	446	371	1863	984	836
v/s Ratio Prot	c0.47		0.03	c0.50	0.35	
v/s Ratio Perm		0.03	0.22	0.28		0.27
v/c Ratio	1.69	0.11	0.39	0.78	0.67	0.51
Uniform Delay, d1	39.5	29.3	12.4	1.1	18.9	16.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	317.7	0.1	0.7	2.2	3.6	2.2
Delay (s)	357.2	29.4	13.1	3.3	22.4	18.9
Level of Service	F	C	B	A	C	B
Approach Delay (s)	325.8			4.1	20.5	
Approach LOS	F			A	C	

Intersection Summary			
HCM 2000 Control Delay	85.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	120.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

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Level Of Service Computation Report

Future Long-Range Year plus Landfill (Laulima Access)

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Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	12	114	76	713	1291	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3522	3530	
Flt Permitted	0.95	1.00		0.68	1.00	
Satd. Flow (perm)	1770	1583		2399	3530	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	13	124	83	775	1403	24
RTOR Reduction (vph)	0	58	0	0	1	0
Lane Group Flow (vph)	13	66	0	858	1426	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	9.7	9.7		82.3	82.3	
Effective Green, g (s)	9.7	9.7		82.3	82.3	
Actuated g/C Ratio	0.10	0.10		0.82	0.82	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	171	153		1974	2905	
v/s Ratio Prot	0.01				c0.40	
v/s Ratio Perm		c0.04		0.36		
v/c Ratio	0.08	0.43		0.43	0.49	
Uniform Delay, d1	41.1	42.6		2.4	2.6	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	2.0		0.7	0.6	
Delay (s)	41.3	44.5		3.1	3.2	
Level of Service	D	D		A	A	
Approach Delay (s)	44.2			3.1	3.2	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	5.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	71.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	10	12	22	488	1100	17
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	13	24	530	1196	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1783	1205	1196			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1783	1205	1196			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	87	94	96			
cM capacity (veh/h)	86	224	584			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	24	24	530	1214
Volume Left	11	24	0	0
Volume Right	13	0	0	18
cSH	190	584	1700	1700
Volume to Capacity	0.13	0.04	0.31	0.71
Queue Length 95th (ft)	11	3	0	0
Control Delay (s)	36.0	11.4	0.0	0.0
Lane LOS	E	B		
Approach Delay (s)	36.0	0.5		0.0
Approach LOS	E			

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	68.9%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	12	0	14	73	0	56	16	421	48	17	1030	24
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	0	15	79	0	61	17	458	52	18	1120	26
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1749	1714	1133	1703	1701	484	1146			510		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1749	1714	1133	1703	1701	484	1146			510		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	78	100	94	0	100	90	97			98		
cM capacity (veh/h)	58	86	247	66	88	583	610			1055		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	28	140	527	1164
Volume Left	13	79	17	18
Volume Right	15	61	52	26
cSH	99	107	610	1055
Volume to Capacity	0.29	1.32	0.03	0.02
Queue Length 95th (ft)	27	241	2	1
Control Delay (s)	55.5	267.9	0.8	0.6
Lane LOS	F	F	A	A
Approach Delay (s)	55.5	267.9	0.8	0.6
Approach LOS	F	F		

Intersection Summary			
Average Delay	21.6		
Intersection Capacity Utilization	79.6%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Volume (veh/h)	1	582	156	1070	16	10	1
Sign Control		Free		Free		Stop	
Grade		0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	633	0	1163	17	11	1
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None		None			
Median storage veh)							
Upstream signal (ft)				613			
pX, platoon unblocked			0.00				
vC, conflicting volume	1180		0			1807	1172
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	1180		0			1807	1172
tC, single (s)	4.1		0.0			6.4	6.2
tC, 2 stage (s)							
tF (s)	2.2		0.0			3.5	3.3
p0 queue free %	100		0			87	100
cM capacity (veh/h)	592		0			87	234

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	634	1180	12
Volume Left	1	0	11
Volume Right	0	17	1
cSH	592	1700	92
Volume to Capacity	0.00	0.69	0.13
Queue Length 95th (ft)	0	0	11
Control Delay (s)	0.1	0.0	49.9
Lane LOS	A		E
Approach Delay (s)	0.1	0.0	49.9
Approach LOS			E

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	109.9%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	372	377	43	407	1156	1198
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.06	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	112	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	404	410	47	442	1257	1302
RTOR Reduction (vph)	0	157	0	0	0	414
Lane Group Flow (vph)	404	253	47	442	1257	888
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	27.8	27.8	71.9	99.7	62.6	62.6
Effective Green, g (s)	27.8	27.8	71.9	99.7	62.6	62.6
Actuated g/C Ratio	0.26	0.26	0.67	0.93	0.58	0.58
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	456	408	156	1863	1082	920
v/s Ratio Prot	c0.23		0.01	c0.16	c0.67	
v/s Ratio Perm		0.16	0.19	0.08		0.56
v/c Ratio	0.89	0.62	0.30	0.24	1.16	0.97
Uniform Delay, d1	38.4	35.3	24.8	0.4	22.6	21.5
Progression Factor	0.99	0.97	1.00	1.00	1.00	1.00
Incremental Delay, d2	18.1	2.8	1.1	0.1	83.2	22.4
Delay (s)	56.1	36.9	25.9	0.4	105.8	43.9
Level of Service	E	D	C	A	F	D
Approach Delay (s)	46.4			2.9	74.3	
Approach LOS	D			A	E	

Intersection Summary			
HCM 2000 Control Delay	59.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	107.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	90.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	22	77	133	1216	1149	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3522	3532	
Flt Permitted	0.95	1.00		0.64	1.00	
Satd. Flow (perm)	1770	1583		2276	3532	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	24	84	145	1322	1249	18
RTOR Reduction (vph)	0	79	0	0	0	0
Lane Group Flow (vph)	24	5	0	1467	1267	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	6.1	6.1		85.9	85.9	
Effective Green, g (s)	6.1	6.1		85.9	85.9	
Actuated g/C Ratio	0.06	0.06		0.86	0.86	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	107	96		1955	3033	
v/s Ratio Prot	c0.01				0.36	
v/s Ratio Perm		0.00		c0.64		
v/c Ratio	0.22	0.05		0.75	0.42	
Uniform Delay, d1	44.7	44.2		2.8	1.6	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.1	0.2		2.7	0.4	
Delay (s)	45.8	44.5		5.5	2.0	
Level of Service	D	D		A	A	
Approach Delay (s)	44.8			5.5	2.0	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	5.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	83.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	37	42	38	1099	808	31
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	40	46	41	1195	878	34
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2172	895	878			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2172	895	878			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	17	87	95			
cM capacity (veh/h)	49	339	769			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	86	41	1195	912
Volume Left	40	41	0	0
Volume Right	46	0	0	34
cSH	99	769	1700	1700
Volume to Capacity	0.87	0.05	0.70	0.54
Queue Length 95th (ft)	123	4	0	0
Control Delay (s)	135.0	9.9	0.0	0.0
Lane LOS	F	A		
Approach Delay (s)	135.0	0.3		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	5.4		
Intersection Capacity Utilization	67.8%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	17	1	18	44	3	35	13	1015	107	20	777	12
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	1	20	48	3	38	14	1103	116	22	845	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2124	2142	851	2104	2091	1161	858			1220		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2124	2142	851	2104	2091	1161	858			1220		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	34	98	95	0	93	84	98			96		
cM capacity (veh/h)	28	46	360	33	50	238	783			572		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	39	89	1234	879
Volume Left	18	48	14	22
Volume Right	20	38	116	13
cSH	53	54	783	572
Volume to Capacity	0.74	1.66	0.02	0.04
Queue Length 95th (ft)	77	210	1	3
Control Delay (s)	177.1	487.3	0.7	1.1
Lane LOS	F	F	A	A
Approach Delay (s)	177.1	487.3	0.7	1.1
Approach LOS	F	F		

Intersection Summary			
Average Delay	23.3		
Intersection Capacity Utilization	78.9%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	3	788	848	12	9	14
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	857	922	13	10	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			613			
pX, platoon unblocked						
vC, conflicting volume	935				1791	928
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	935				1791	928
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				89	95
cM capacity (veh/h)	732				88	325

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	860	935	25
Volume Left	3	0	10
Volume Right	0	13	15
cSH	732	1700	159
Volume to Capacity	0.00	0.55	0.16
Queue Length 95th (ft)	0	0	14
Control Delay (s)	0.1	0.0	31.9
Lane LOS	A		D
Approach Delay (s)	0.1	0.0	31.9
Approach LOS			D

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	55.4%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	715	82	132	1340	603	728
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.22	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	404	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	777	89	143	1457	655	791
RTOR Reduction (vph)	0	41	0	0	0	373
Lane Group Flow (vph)	777	48	143	1457	655	418
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	31.0	31.0	71.0	102.0	58.1	58.1
Effective Green, g (s)	31.0	31.0	71.0	102.0	58.1	58.1
Actuated g/C Ratio	0.28	0.28	0.65	0.93	0.53	0.53
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	498	446	371	1863	984	836
v/s Ratio Prot	c0.44		0.03	c0.50	0.35	
v/s Ratio Perm		0.03	0.22	0.28		0.26
v/c Ratio	1.56	0.11	0.39	0.78	0.67	0.50
Uniform Delay, d1	39.5	29.3	12.4	1.1	18.9	16.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	261.8	0.1	0.7	2.2	3.6	2.1
Delay (s)	301.3	29.4	13.1	3.3	22.4	18.8
Level of Service	F	C	B	A	C	B
Approach Delay (s)	273.4			4.1	20.4	
Approach LOS	F			A	C	

Intersection Summary			
HCM 2000 Control Delay	69.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	116.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

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Level Of Service Computation Report

Future Long-Range Year plus Landfill plus RRP (Laulima Access)

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Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	12	114	76	784	1305	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3524	3530	
Flt Permitted	0.95	1.00		0.68	1.00	
Satd. Flow (perm)	1770	1583		2421	3530	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	13	124	83	852	1418	24
RTOR Reduction (vph)	0	56	0	0	1	0
Lane Group Flow (vph)	13	68	0	935	1441	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	9.8	9.8		82.2	82.2	
Effective Green, g (s)	9.8	9.8		82.2	82.2	
Actuated g/C Ratio	0.10	0.10		0.82	0.82	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	173	155		1990	2901	
v/s Ratio Prot	0.01				c0.41	
v/s Ratio Perm		c0.04		0.39		
v/c Ratio	0.08	0.44		0.47	0.50	
Uniform Delay, d1	41.0	42.5		2.6	2.7	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	2.0		0.8	0.6	
Delay (s)	41.2	44.5		3.4	3.3	
Level of Service	D	D		A	A	
Approach Delay (s)	44.2			3.4	3.3	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	5.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	74.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	10	12	22	559	1114	17
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	13	24	608	1211	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1876	1220	1211			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1876	1220	1211			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	86	94	96			
cM capacity (veh/h)	75	220	576			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	24	24	608	1229
Volume Left	11	24	0	0
Volume Right	13	0	0	18
cSH	166	576	1700	1700
Volume to Capacity	0.14	0.04	0.36	0.72
Queue Length 95th (ft)	12	3	0	0
Control Delay (s)	39.8	11.5	0.0	0.0
Lane LOS	E	B		
Approach Delay (s)	39.8	0.4		0.0
Approach LOS	E			

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	69.7%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	24	0	28	73	0	56	87	421	48	17	1030	83
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	26	0	30	79	0	61	95	458	52	18	1120	90
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1935	1901	1165	1905	1920	484	1210			510		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1935	1901	1165	1905	1920	484	1210			510		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	32	100	87	0	100	90	84			98		
cM capacity (veh/h)	38	57	237	39	55	583	577			1055		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	57	140	604	1228
Volume Left	26	79	95	18
Volume Right	30	61	52	90
cSH	70	66	577	1055
Volume to Capacity	0.81	2.13	0.16	0.02
Queue Length 95th (ft)	96	332	15	1
Control Delay (s)	157.2	655.8	4.4	0.6
Lane LOS	F	F	A	A
Approach Delay (s)	157.2	655.8	4.4	0.6
Approach LOS	F	F		

Intersection Summary			
Average Delay	51.4		
Intersection Capacity Utilization	96.1%	ICU Level of Service	F
Analysis Period (min)	15		

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Volume (veh/h)	1	594	156	1128	16	10	1
Sign Control		Free		Free		Stop	
Grade		0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	646	0	1226	17	11	1
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None		None			
Median storage veh)							
Upstream signal (ft)				604			
pX, platoon unblocked			0.00				
vC, conflicting volume	1243		0			1883	1235
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	1243		0			1883	1235
tC, single (s)	4.1		0.0			6.4	6.2
tC, 2 stage (s)							
tF (s)	2.2		0.0			3.5	3.3
p0 queue free %	100		0			86	99
cM capacity (veh/h)	560		0			78	215

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	647	1243	12
Volume Left	1	0	11
Volume Right	0	17	1
cSH	560	1700	83
Volume to Capacity	0.00	0.73	0.14
Queue Length 95th (ft)	0	0	12
Control Delay (s)	0.1	0.0	55.8
Lane LOS	A		F
Approach Delay (s)	0.1	0.0	55.8
Approach LOS			F

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	113.6%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	383	377	43	407	1156	1256
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.06	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	112	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	416	410	47	442	1257	1365
RTOR Reduction (vph)	0	157	0	0	0	416
Lane Group Flow (vph)	416	253	47	442	1257	949
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	28.2	28.2	71.9	100.1	62.6	62.6
Effective Green, g (s)	28.2	28.2	71.9	100.1	62.6	62.6
Actuated g/C Ratio	0.26	0.26	0.67	0.93	0.58	0.58
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	461	412	155	1863	1078	916
v/s Ratio Prot	c0.24		0.01	c0.16	c0.67	
v/s Ratio Perm		0.16	0.19	0.08		0.60
v/c Ratio	0.90	0.61	0.30	0.24	1.17	1.04
Uniform Delay, d1	38.6	35.2	24.8	0.4	22.7	22.7
Progression Factor	0.99	0.97	1.00	1.00	1.00	1.00
Incremental Delay, d2	20.5	2.7	1.1	0.1	85.0	39.5
Delay (s)	58.6	36.7	25.9	0.4	107.8	62.2
Level of Service	E	D	C	A	F	E
Approach Delay (s)	47.7			2.9	84.1	
Approach LOS	D			A	F	

Intersection Summary			
HCM 2000 Control Delay	66.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	108.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	90.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	22	77	133	1228	1221	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3522	3532	
Flt Permitted	0.95	1.00		0.63	1.00	
Satd. Flow (perm)	1770	1583		2220	3532	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	24	84	145	1335	1327	18
RTOR Reduction (vph)	0	70	0	0	0	0
Lane Group Flow (vph)	24	14	0	1480	1345	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	6.2	6.2		85.8	85.8	
Effective Green, g (s)	6.2	6.2		85.8	85.8	
Actuated g/C Ratio	0.06	0.06		0.86	0.86	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	109	98		1904	3030	
v/s Ratio Prot	c0.01				0.38	
v/s Ratio Perm		0.01		c0.67		
v/c Ratio	0.22	0.14		0.78	0.44	
Uniform Delay, d1	44.6	44.4		3.0	1.6	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.0	0.7		3.2	0.5	
Delay (s)	45.6	45.0		6.2	2.1	
Level of Service	D	D		A	A	
Approach Delay (s)	45.2			6.2	2.1	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	5.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	85.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	37	42	38	1111	879	31
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	40	46	41	1208	955	34
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2262	972	955			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2262	972	955			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	5	85	94			
cM capacity (veh/h)	42	306	720			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	86	41	1208	989
Volume Left	40	41	0	0
Volume Right	46	0	0	34
cSH	84	720	1700	1700
Volume to Capacity	1.02	0.06	0.71	0.58
Queue Length 95th (ft)	144	5	0	0
Control Delay (s)	191.8	10.3	0.0	0.0
Lane LOS	F	B		
Approach Delay (s)	191.8	0.3		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	7.3		
Intersection Capacity Utilization	68.5%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	76	1	89	44	3	35	26	1015	107	20	777	22
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	83	1	97	48	3	38	28	1103	116	22	845	24
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2158	2176	857	2215	2130	1161	868			1220		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2158	2176	857	2215	2130	1161	868			1220		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	97	73	0	93	84	96			96		
cM capacity (veh/h)	26	43	357	21	46	238	776			572		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	180	89	1248	890
Volume Left	83	48	28	22
Volume Right	97	38	116	24
cSH	52	36	776	572
Volume to Capacity	3.49	2.49	0.04	0.04
Queue Length 95th (ft)	Err	250	3	3
Control Delay (s)	Err	916.9	1.5	1.2
Lane LOS	F	F	A	A
Approach Delay (s)	Err	916.9	1.5	1.2
Approach LOS	F	F		

Intersection Summary			
Average Delay	784.5		
Intersection Capacity Utilization	90.3%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	3	846	858	12	9	14
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	920	933	13	10	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			604			
pX, platoon unblocked						
vC, conflicting volume	946				1865	939
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	946				1865	939
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				88	95
cM capacity (veh/h)	726				80	320

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	923	946	25
Volume Left	3	0	10
Volume Right	0	13	15
cSH	726	1700	147
Volume to Capacity	0.00	0.56	0.17
Queue Length 95th (ft)	0	0	15
Control Delay (s)	0.1	0.0	34.5
Lane LOS	A		D
Approach Delay (s)	0.1	0.0	34.5
Approach LOS			D

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	56.9%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	773	82	132	1340	603	737
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.22	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	404	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	840	89	143	1457	655	801
RTOR Reduction (vph)	0	38	0	0	0	378
Lane Group Flow (vph)	840	51	143	1457	655	423
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	31.0	31.0	71.0	102.0	58.1	58.1
Effective Green, g (s)	31.0	31.0	71.0	102.0	58.1	58.1
Actuated g/C Ratio	0.28	0.28	0.65	0.93	0.53	0.53
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	498	446	371	1863	984	836
v/s Ratio Prot	c0.47		0.03	c0.50	0.35	
v/s Ratio Perm		0.03	0.22	0.28		0.27
v/c Ratio	1.69	0.11	0.39	0.78	0.67	0.51
Uniform Delay, d1	39.5	29.3	12.4	1.1	18.9	16.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	317.7	0.1	0.7	2.2	3.6	2.2
Delay (s)	357.2	29.4	13.1	3.3	22.4	18.9
Level of Service	F	C	B	A	C	B
Approach Delay (s)	325.8			4.1	20.5	
Approach LOS	F			A	C	

Intersection Summary			
HCM 2000 Control Delay	85.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	120.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

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Level Of Service Computation Report

Future Long-Range Year plus Landfill (Roberts Driveway Access)

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Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	12	114	76	713	1291	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3522	3530	
Flt Permitted	0.95	1.00		0.68	1.00	
Satd. Flow (perm)	1770	1583		2399	3530	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	13	124	83	775	1403	24
RTOR Reduction (vph)	0	58	0	0	1	0
Lane Group Flow (vph)	13	66	0	858	1426	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	9.7	9.7		82.3	82.3	
Effective Green, g (s)	9.7	9.7		82.3	82.3	
Actuated g/C Ratio	0.10	0.10		0.82	0.82	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	171	153		1974	2905	
v/s Ratio Prot	0.01				c0.40	
v/s Ratio Perm		c0.04		0.36		
v/c Ratio	0.08	0.43		0.43	0.49	
Uniform Delay, d1	41.1	42.6		2.4	2.6	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	2.0		0.7	0.6	
Delay (s)	41.3	44.5		3.1	3.2	
Level of Service	D	D		A	A	
Approach Delay (s)	44.2			3.1	3.2	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	5.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	71.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	10	12	22	488	1100	17
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	13	24	530	1196	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1783	1205	1196			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1783	1205	1196			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	87	94	96			
cM capacity (veh/h)	86	224	584			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	24	24	530	1214
Volume Left	11	24	0	0
Volume Right	13	0	0	18
cSH	190	584	1700	1700
Volume to Capacity	0.13	0.04	0.31	0.71
Queue Length 95th (ft)	11	3	0	0
Control Delay (s)	36.0	11.4	0.0	0.0
Lane LOS	E	B		
Approach Delay (s)	36.0	0.5		0.0
Approach LOS	E			

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	68.9%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	4	0	4	73	0	56	5	432	48	17	1039	16
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	0	4	79	0	61	5	470	52	18	1129	17
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1742	1708	1138	1686	1690	496	1147			522		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1742	1708	1138	1686	1690	496	1147			522		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	93	100	98	0	100	89	99			98		
cM capacity (veh/h)	59	89	245	72	91	574	609			1045		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	9	140	527	1165
Volume Left	4	79	5	18
Volume Right	4	61	52	17
cSH	96	116	609	1045
Volume to Capacity	0.09	1.21	0.01	0.02
Queue Length 95th (ft)	7	224	1	1
Control Delay (s)	46.3	223.4	0.3	0.6
Lane LOS	E	F	A	A
Approach Delay (s)	46.3	223.4	0.3	0.6
Approach LOS	E	F		

Intersection Summary			
Average Delay	17.7		
Intersection Capacity Utilization	82.6%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Volume (veh/h)	12	574	156	1061	24	19	11
Sign Control		Free		Free		Stop	
Grade		0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	624	0	1153	26	21	12
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None		None			
Median storage veh)							
Upstream signal (ft)				613			
pX, platoon unblocked			0.00				
vC, conflicting volume	1179		0			1816	1166
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	1179		0			1816	1166
tC, single (s)	4.1		0.0			6.4	6.2
tC, 2 stage (s)							
tF (s)	2.2		0.0			3.5	3.3
p0 queue free %	98		0			75	95
cM capacity (veh/h)	592		0			84	236

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	637	1179	33
Volume Left	13	0	21
Volume Right	0	26	12
cSH	592	1700	110
Volume to Capacity	0.02	0.69	0.30
Queue Length 95th (ft)	2	0	28
Control Delay (s)	0.6	0.0	51.1
Lane LOS	A		F
Approach Delay (s)	0.6	0.0	51.1
Approach LOS			F

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	110.1%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	372	377	43	407	1156	1198
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.06	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	112	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	404	410	47	442	1257	1302
RTOR Reduction (vph)	0	157	0	0	0	414
Lane Group Flow (vph)	404	253	47	442	1257	888
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	27.8	27.8	71.9	99.7	62.6	62.6
Effective Green, g (s)	27.8	27.8	71.9	99.7	62.6	62.6
Actuated g/C Ratio	0.26	0.26	0.67	0.93	0.58	0.58
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	456	408	156	1863	1082	920
v/s Ratio Prot	c0.23		0.01	c0.16	c0.67	
v/s Ratio Perm		0.16	0.19	0.08		0.56
v/c Ratio	0.89	0.62	0.30	0.24	1.16	0.97
Uniform Delay, d1	38.4	35.3	24.8	0.4	22.6	21.5
Progression Factor	0.99	0.97	1.00	1.00	1.00	1.00
Incremental Delay, d2	18.1	2.8	1.1	0.1	83.2	22.4
Delay (s)	56.1	36.9	25.9	0.4	105.8	43.9
Level of Service	E	D	C	A	F	D
Approach Delay (s)	46.4			2.9	74.3	
Approach LOS	D			A	E	

Intersection Summary			
HCM 2000 Control Delay	59.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	107.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	90.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	22	77	133	1216	1149	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3522	3532	
Flt Permitted	0.95	1.00		0.64	1.00	
Satd. Flow (perm)	1770	1583		2276	3532	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	24	84	145	1322	1249	18
RTOR Reduction (vph)	0	79	0	0	0	0
Lane Group Flow (vph)	24	5	0	1467	1267	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	6.1	6.1		85.9	85.9	
Effective Green, g (s)	6.1	6.1		85.9	85.9	
Actuated g/C Ratio	0.06	0.06		0.86	0.86	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	107	96		1955	3033	
v/s Ratio Prot	c0.01				0.36	
v/s Ratio Perm		0.00		c0.64		
v/c Ratio	0.22	0.05		0.75	0.42	
Uniform Delay, d1	44.7	44.2		2.8	1.6	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.1	0.2		2.7	0.4	
Delay (s)	45.8	44.5		5.5	2.0	
Level of Service	D	D		A	A	
Approach Delay (s)	44.8			5.5	2.0	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	5.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	83.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	37	42	38	1099	808	31
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	40	46	41	1195	878	34
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2172	895	878			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2172	895	878			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	17	87	95			
cM capacity (veh/h)	49	339	769			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	86	41	1195	912
Volume Left	40	41	0	0
Volume Right	46	0	0	34
cSH	99	769	1700	1700
Volume to Capacity	0.87	0.05	0.70	0.54
Queue Length 95th (ft)	123	4	0	0
Control Delay (s)	135.0	9.9	0.0	0.0
Lane LOS	F	A		
Approach Delay (s)	135.0	0.3		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	5.4		
Intersection Capacity Utilization	67.8%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	9	1	8	44	3	35	5	1023	107	20	787	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	1	9	48	3	38	5	1112	116	22	855	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2122	2141	858	2092	2085	1170	861			1228		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2122	2141	858	2092	2085	1170	861			1228		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	65	98	98	0	94	84	99			96		
cM capacity (veh/h)	28	47	356	36	51	235	781			567		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	20	89	1234	883
Volume Left	10	48	5	22
Volume Right	9	38	116	5
cSH	49	57	781	567
Volume to Capacity	0.40	1.57	0.01	0.04
Queue Length 95th (ft)	36	204	1	3
Control Delay (s)	119.3	445.9	0.3	1.2
Lane LOS	F	F	A	A
Approach Delay (s)	119.3	445.9	0.3	1.2
Approach LOS	F	F		

Intersection Summary			
Average Delay	19.5		
Intersection Capacity Utilization	75.4%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	11	780	841	19	17	24
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	848	914	21	18	26
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			613			
pX, platoon unblocked						
vC, conflicting volume	935				1796	924
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	935				1796	924
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				79	92
cM capacity (veh/h)	732				87	326

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	860	935	45
Volume Left	12	0	18
Volume Right	0	21	26
cSH	732	1700	152
Volume to Capacity	0.02	0.55	0.29
Queue Length 95th (ft)	1	0	29
Control Delay (s)	0.5	0.0	38.2
Lane LOS	A		E
Approach Delay (s)	0.5	0.0	38.2
Approach LOS			E

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	59.8%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	715	82	132	1340	603	728
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.22	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	404	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	777	89	143	1457	655	791
RTOR Reduction (vph)	0	41	0	0	0	373
Lane Group Flow (vph)	777	48	143	1457	655	418
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	31.0	31.0	71.0	102.0	58.1	58.1
Effective Green, g (s)	31.0	31.0	71.0	102.0	58.1	58.1
Actuated g/C Ratio	0.28	0.28	0.65	0.93	0.53	0.53
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	498	446	371	1863	984	836
v/s Ratio Prot	c0.44		0.03	c0.50	0.35	
v/s Ratio Perm		0.03	0.22	0.28		0.26
v/c Ratio	1.56	0.11	0.39	0.78	0.67	0.50
Uniform Delay, d1	39.5	29.3	12.4	1.1	18.9	16.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	261.8	0.1	0.7	2.2	3.6	2.1
Delay (s)	301.3	29.4	13.1	3.3	22.4	18.8
Level of Service	F	C	B	A	C	B
Approach Delay (s)	273.4			4.1	20.4	
Approach LOS	F			A	C	

Intersection Summary			
HCM 2000 Control Delay	69.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	116.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

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Level Of Service Computation Report

Future Long-Range Year plus Landfill plus RRP (Roberts Driveway Access)

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Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	12	114	76	784	1305	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3524	3530	
Flt Permitted	0.95	1.00		0.68	1.00	
Satd. Flow (perm)	1770	1583		2421	3530	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	13	124	83	852	1418	24
RTOR Reduction (vph)	0	56	0	0	1	0
Lane Group Flow (vph)	13	68	0	935	1441	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	9.8	9.8		82.2	82.2	
Effective Green, g (s)	9.8	9.8		82.2	82.2	
Actuated g/C Ratio	0.10	0.10		0.82	0.82	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	173	155		1990	2901	
v/s Ratio Prot	0.01				c0.41	
v/s Ratio Perm		c0.04		0.39		
v/c Ratio	0.08	0.44		0.47	0.50	
Uniform Delay, d1	41.0	42.5		2.6	2.7	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	2.0		0.8	0.6	
Delay (s)	41.2	44.5		3.4	3.3	
Level of Service	D	D		A	A	
Approach Delay (s)	44.2			3.4	3.3	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	5.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	74.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	10	12	22	559	1114	17
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	13	24	608	1211	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1876	1220	1211			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1876	1220	1211			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	86	94	96			
cM capacity (veh/h)	75	220	576			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	24	24	608	1229
Volume Left	11	24	0	0
Volume Right	13	0	0	18
cSH	166	576	1700	1700
Volume to Capacity	0.14	0.04	0.36	0.72
Queue Length 95th (ft)	12	3	0	0
Control Delay (s)	39.8	11.5	0.0	0.0
Lane LOS	E	B		
Approach Delay (s)	39.8	0.4		0.0
Approach LOS	E			

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	69.7%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	4	0	4	73	0	56	5	503	48	17	1054	16
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	0	4	79	0	61	5	547	52	18	1146	17
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1836	1801	1154	1779	1784	573	1163			599		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1836	1801	1154	1779	1784	573	1163			599		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	91	100	98	0	100	88	99			98		
cM capacity (veh/h)	50	77	240	61	79	519	601			978		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	9	140	604	1182
Volume Left	4	79	5	18
Volume Right	4	61	52	17
cSH	83	100	601	978
Volume to Capacity	0.10	1.41	0.01	0.02
Queue Length 95th (ft)	8	256	1	1
Control Delay (s)	53.2	310.1	0.3	0.7
Lane LOS	F	F	A	A
Approach Delay (s)	53.2	310.1	0.3	0.7
Approach LOS	F	F		

Intersection Summary			
Average Delay	23.2		
Intersection Capacity Utilization	83.7%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Volume (veh/h)	83	574	156	1061	83	30	26
Sign Control		Free		Free		Stop	
Grade		0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	90	624	0	1153	90	33	28
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None		None			
Median storage veh)							
Upstream signal (ft)				604			
pX, platoon unblocked			0.00				
vC, conflicting volume	1243		0			2003	1198
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	1243		0			2003	1198
tC, single (s)	4.1		0.0			6.4	6.2
tC, 2 stage (s)							
tF (s)	2.2		0.0			3.5	3.3
p0 queue free %	84		0			41	87
cM capacity (veh/h)	560		0			55	226

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	714	1243	61
Volume Left	90	0	33
Volume Right	0	90	28
cSH	560	1700	85
Volume to Capacity	0.16	0.73	0.72
Queue Length 95th (ft)	14	0	88
Control Delay (s)	4.4	0.0	117.2
Lane LOS	A		F
Approach Delay (s)	4.4	0.0	117.2
Approach LOS			F

Intersection Summary			
Average Delay	5.1		
Intersection Capacity Utilization	101.3%	ICU Level of Service	G
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	383	377	43	407	1156	1256
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.06	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	112	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	416	410	47	442	1257	1365
RTOR Reduction (vph)	0	157	0	0	0	416
Lane Group Flow (vph)	416	253	47	442	1257	949
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	28.2	28.2	71.9	100.1	62.6	62.6
Effective Green, g (s)	28.2	28.2	71.9	100.1	62.6	62.6
Actuated g/C Ratio	0.26	0.26	0.67	0.93	0.58	0.58
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	461	412	155	1863	1078	916
v/s Ratio Prot	c0.24		0.01	c0.16	c0.67	
v/s Ratio Perm		0.16	0.19	0.08		0.60
v/c Ratio	0.90	0.61	0.30	0.24	1.17	1.04
Uniform Delay, d1	38.6	35.2	24.8	0.4	22.7	22.7
Progression Factor	0.99	0.97	1.00	1.00	1.00	1.00
Incremental Delay, d2	20.5	2.7	1.1	0.1	85.0	39.5
Delay (s)	58.6	36.7	25.9	0.4	107.8	62.2
Level of Service	E	D	C	A	F	E
Approach Delay (s)	47.7			2.9	84.1	
Approach LOS	D			A	F	

Intersection Summary			
HCM 2000 Control Delay	66.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	108.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	90.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	22	77	133	1228	1221	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		3522	3532	
Flt Permitted	0.95	1.00		0.63	1.00	
Satd. Flow (perm)	1770	1583		2220	3532	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	24	84	145	1335	1327	18
RTOR Reduction (vph)	0	70	0	0	0	0
Lane Group Flow (vph)	24	14	0	1480	1345	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	6.2	6.2		85.8	85.8	
Effective Green, g (s)	6.2	6.2		85.8	85.8	
Actuated g/C Ratio	0.06	0.06		0.86	0.86	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	109	98		1904	3030	
v/s Ratio Prot	c0.01				0.38	
v/s Ratio Perm		0.01		c0.67		
v/c Ratio	0.22	0.14		0.78	0.44	
Uniform Delay, d1	44.6	44.4		3.0	1.6	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.0	0.7		3.2	0.5	
Delay (s)	45.6	45.0		6.2	2.1	
Level of Service	D	D		A	A	
Approach Delay (s)	45.2			6.2	2.1	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	5.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	85.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	37	42	38	1111	879	31
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	40	46	41	1208	955	34
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2262	972	955			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2262	972	955			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	5	85	94			
cM capacity (veh/h)	42	306	720			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	86	41	1208	989
Volume Left	40	41	0	0
Volume Right	46	0	0	34
cSH	84	720	1700	1700
Volume to Capacity	1.02	0.06	0.71	0.58
Queue Length 95th (ft)	144	5	0	0
Control Delay (s)	191.8	10.3	0.0	0.0
Lane LOS	F	B		
Approach Delay (s)	191.8	0.3		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	7.3		
Intersection Capacity Utilization	68.5%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	9	1	8	44	3	35	5	1036	107	20	858	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	1	9	48	3	38	5	1126	116	22	933	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2214	2232	935	2183	2177	1184	938			1242		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2214	2232	935	2183	2177	1184	938			1242		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	59	97	97	0	93	83	99			96		
cM capacity (veh/h)	24	41	322	30	44	230	730			560		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	20	89	1248	960
Volume Left	10	48	5	22
Volume Right	9	38	116	5
cSH	42	49	730	560
Volume to Capacity	0.46	1.81	0.01	0.04
Queue Length 95th (ft)	41	220	1	3
Control Delay (s)	149.5	567.0	0.3	1.3
Lane LOS	F	F	A	A
Approach Delay (s)	149.5	567.0	0.3	1.3
Approach LOS	F	F		

Intersection Summary			
Average Delay	23.8		
Intersection Capacity Utilization	76.2%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	23	780	841	28	76	96
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	25	848	914	30	83	104
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			604			
pX, platoon unblocked						
vC, conflicting volume	945				1827	929
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	945				1827	929
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				0	68
cM capacity (veh/h)	726				82	324

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	873	945	187
Volume Left	25	0	83
Volume Right	0	30	104
cSH	726	1700	140
Volume to Capacity	0.03	0.56	1.34
Queue Length 95th (ft)	3	0	295
Control Delay (s)	1.0	0.0	251.6
Lane LOS	A		F
Approach Delay (s)	1.0	0.0	251.6
Approach LOS			F

Intersection Summary			
Average Delay	23.9		
Intersection Capacity Utilization	76.4%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	773	82	132	1340	603	737
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.22	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	404	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	840	89	143	1457	655	801
RTOR Reduction (vph)	0	38	0	0	0	378
Lane Group Flow (vph)	840	51	143	1457	655	423
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2	4		6
Actuated Green, G (s)	31.0	31.0	71.0	102.0	58.1	58.1
Effective Green, g (s)	31.0	31.0	71.0	102.0	58.1	58.1
Actuated g/C Ratio	0.28	0.28	0.65	0.93	0.53	0.53
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	498	446	371	1863	984	836
v/s Ratio Prot	c0.47		0.03	c0.50	0.35	
v/s Ratio Perm		0.03	0.22	0.28		0.27
v/c Ratio	1.69	0.11	0.39	0.78	0.67	0.51
Uniform Delay, d1	39.5	29.3	12.4	1.1	18.9	16.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	317.7	0.1	0.7	2.2	3.6	2.2
Delay (s)	357.2	29.4	13.1	3.3	22.4	18.9
Level of Service	F	C	B	A	C	B
Approach Delay (s)	325.8			4.1	20.5	
Approach LOS	F			A	C	

Intersection Summary			
HCM 2000 Control Delay	85.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	120.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			