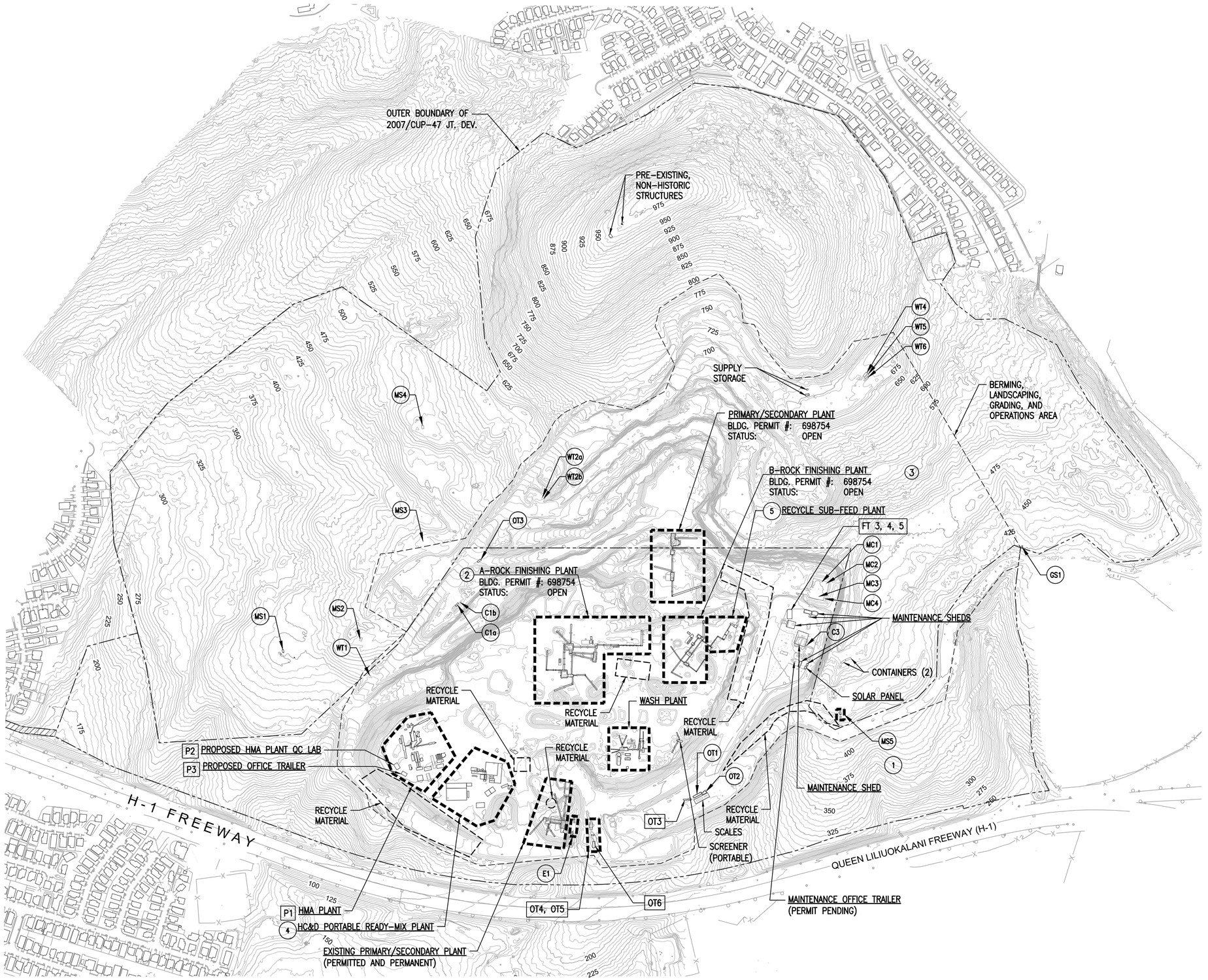
Adjoining Uses

Exhibit "L"

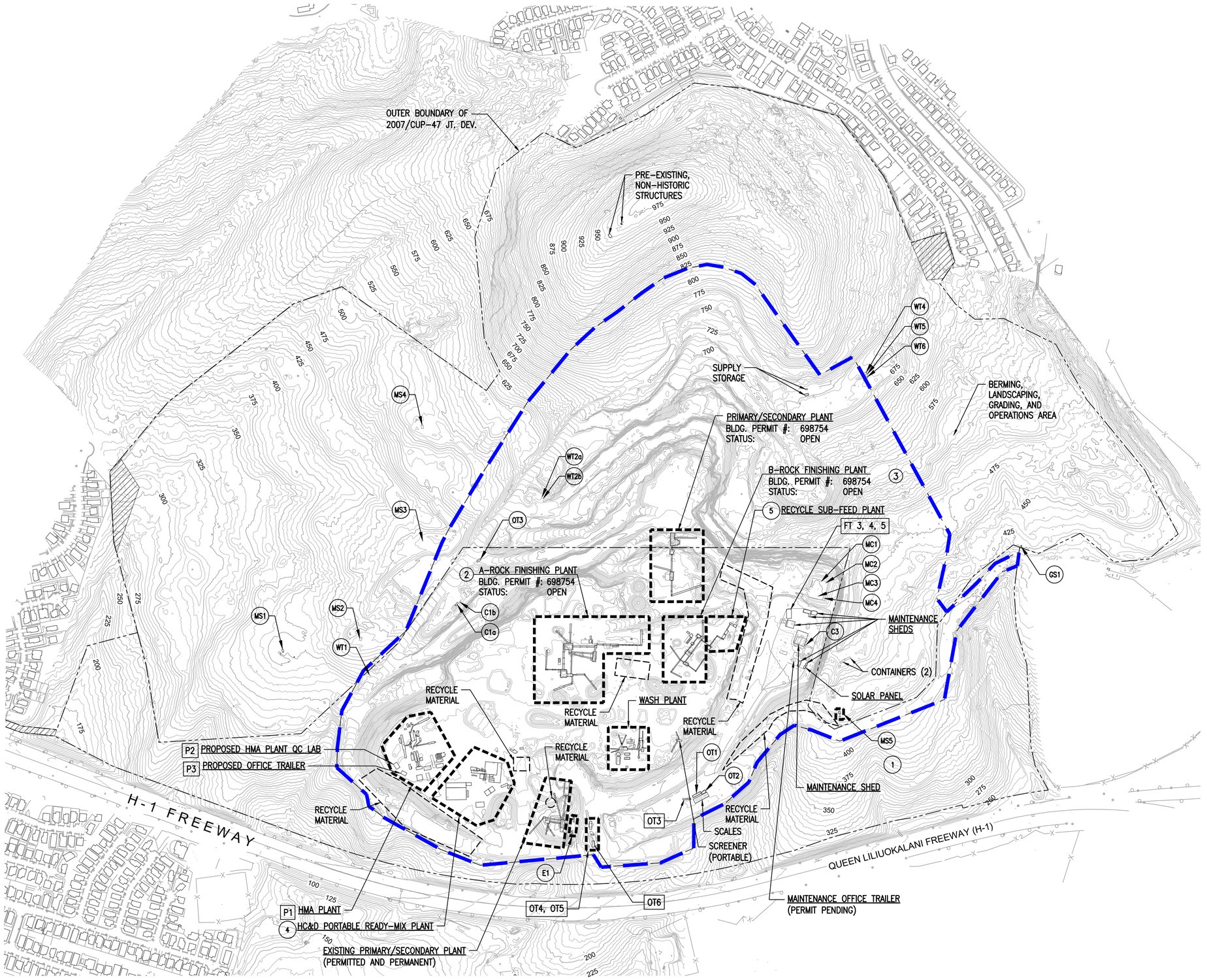


	STATUS	DESCRIPTION	FLOOR AREA (FT²)	LOT COVERAGE (FT²)
MS1	EXISTING	MONITORING ST-TION	0	159
MS2	EXISTING	MONITORING ST-TION	0	268
MS3	EXISTING	MONITORING ST-TION	0	268
MS4	EXISTING	MONITORING ST-TION	0	258
MS5	EXISTING	MONITORING ST-TION	0	177
OT1	EXISTING	OFFICE TR-ILER	540	540
OT2	EXISTING	OFFICE TR-ILER	672	672
C1a	EXISTING	CONT-INER	194	194
C1b	EXISTING	CONT-INER	223	223
C2	EXISTING	CONT-INER	558	558
C3	EXISTING	CONT-INER	317	317
WT1	EXISTING	W-TER T-NK	0	348
WT2a	EXISTING	W-TER T-NK	0	152
WT2b	EXISTING	W-TER T-NK	0	152
WT4	EXISTING	W-TER T-NK	0	335
WT5	EXISTING	W-TER T-NK	0	262
WT6	EXISTING	W-TER T-NK	0	227
FT1	EXISTING	FUEL T-NK	0	125
MC1	EXISTING	M-G-ZINE CONT-INER	192	192
MC2	EXISTING	M-G-ZINE CONT-INER	178	178
MC3	EXISTING	M-G-ZINE CONT-INER	127	127
MC4	EXISTING	M-G-ZINE CONT-INER	94	94
E1	EXISTING	EQUIPMENT	0	0
1	EXISTING	M-INTEN-NCE SHED	4,790	5,600
2	EXISTING	--ROCK FINISHING PL-NT	0	42773
3	EXISTING	B-ROCK FINISHING PL-NT -ND RECYCLE PL-NT	0	16411
4	EXISTING	HC&D PORT-BLE PL-NT	–	32,000
5	EXISTING	RECYCLE SUB-FEED PL-NT	–	4,800
GS1	EXISTING	GU-RD ST-TION	36	36
OT3	EXISTING	OFFICE TR-ILER	240	240
OT4	EXISTING	OFFICE TR-ILER	835	835
OT5	EXISTING	OFFICE TR-ILER	341	341
OT6	EXISTING	-GGREG-TE QU-LITY CONTROL	–	–
FT 3, 4, 5	EXISTING	FUEL T-NKS	–	–
	EXISTING	RECYCLE M-TERI-L		
P1	PROPOSED	HM- PL-NT	–	13,000
P2	PROPOSED	PROPOSED HM- PL-NT QC L-B	–	–
P3	PROPOSED	PROPOSED OFFICE TR-ILER	–	–

NORTH 0 150' 300' SCALE: 1" = 300'

PROJECTED QUARRY SITE PLAN

Exhibit "M"



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WT1	EXISTING	W-TER T-NK	0	348
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WT5	EXISTING	W-TER T-NK	0	262
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FT1	EXISTING	FUEL T-NK	0	125
MC1	EXISTING	M-G-ZINE CONT-INER	192	192
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MC3	EXISTING	M-G-ZINE CONT-INER	127	127
MC4	EXISTING	M-G-ZINE CONT-INER	94	94
E1	EXISTING	EQUIPMENT	0	0
1	EXISTING	M-INTEN-NCE SHED	4,790	5,600
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OT6	EXISTING	-GGREG-TE QU-LITY CONTROL	–	–
FT 3, 4, 5	EXISTING	FUEL T-NKS	–	–
	EXISTING	RECYCLE M-TERI-L		
P1	PROPOSED	HM- PL-NT	–	13,000
P2	PROPOSED	PROPOSED HM- PL-NT QC L-B	–	–
P3	PROPOSED	PROPOSED OFFICE TR-ILER	–	–

NORTH 0 150' 300' SCALE: 1" = 300'

FIGURE 4 - PROJECT QUARRY SITE PLAN
WITH PROPOSED BOUNDARY
AMENDMENTS

Makakilo Quarry Expanded Operations

Mobility Analysis Report

Prepared for:
Grace Pacific

October 4, 2022

SD22-0423

FEHR PEERS

Exhibit "N"

Table of Contents

Appendices

List of Figures

List of Tables

1. Executive Summary

This report documents the assessment of mobility and access associated with the proposed expansion and extension of services at Makakilo Quarry near the Makakilo and Hoʻopili communities of Oahu. The project proposes to extend the life of the quarry from 2032 to 2047, add a hot mix asphalt plant (HMA), increase operations at a recently constructed concrete plant, expand the resource extraction and buffer areas for the quarry, and expand quarry operational hours for some activities to 24 hours a day. Existing vehicular access to the site is provided via Palehua Road at the H-1/Kualakaʻi Parkway interchange and that access is proposed to be maintained with the proposed project. The analysis in this report was conducted for a project opening year of 2024, at which point expanded facilities and modified operations are assumed to be in place.

The impacts of the proposed project to mobility and access surrounding the project site were evaluated following guidelines and standards of the affected government agencies. Two study intersections in the vicinity of the project were evaluated during the weekday morning (AM) and evening (PM) peak hours for Existing Conditions, Future Year (2024) No Project Conditions, and Future Year (2024) Plus Project Conditions. No extension of Makakilo Drive was assumed for the analysis given that the project was removed from the 2019-2022 STIP/TIP list and won't be completed by 2024.

Vehicle trip generation for the facility was determined based on future employee and truck estimates provided by Grace Pacific, as well existing counts taken at the site driveway for existing land uses. The proposed project is expected to generate a total of 137 net new daily vehicle trips, including 35 net new vehicle trips during the AM peak hour (19 inbound/16 outbound) and 19 net new vehicle trips during the PM peak hour (5 inbound/14 outbound). Note that this analysis conservatively does not consider the reduction in existing trips that would result from current trips between the quarry site and a hot mix asphalt plant in Kalaeloa staying internal to the quarry site with the project in place.

The mobility analysis determined that the project will have no significant impacts to any roadway segments or intersections. Based on a multimodal evaluation of mobility effects from the project, no potential impacts to pedestrian facilities, bicycle facilities, and transit facilities are anticipated.

2. Introduction

The following mobility analysis report (MAR) presents the study conducted by Fehr & Peers for the proposed Makakilo Quarry expansion and its impact on the H-1 freeway (H-1)/Kualaka'i Parkway interchange. This MAR was conducted in accordance with the guidelines and standards of the affected government agencies and addresses the potential impact of the project on all modes of travel. The project site is located within the State Land Use Agricultural District on TMK parcels 9-2-03:074, 9-2-3:082, and 9-1-16:004.

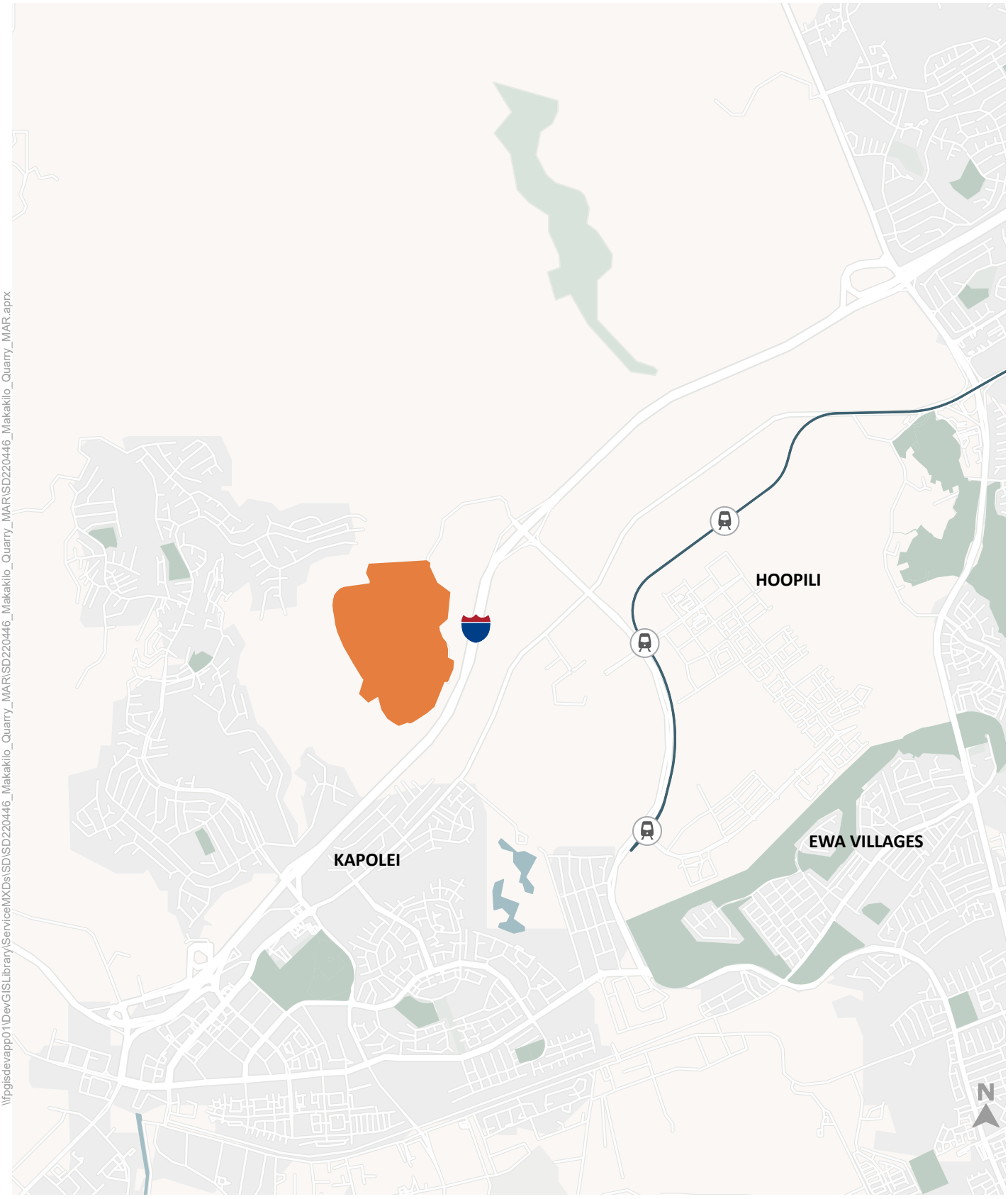
2.1 Project Description

The proposed expansion would add the HMA, increase operations at a recently constructed concrete plant, expand the resource extraction and buffer areas for the quarry, and expand quarry operational hours for some activities to 24 hours a day. This project also includes extension of the life of the quarry from 2032 to 2047. The quarry will generate employee vehicle traffic, as well as truck traffic related to quarry operations. Having conducted studies of similar facilities, we understand that the primary traffic challenges for quarry projects are the increase in commute vehicle traffic, increase in truck traffic, and site access considerations.

The following analysis focused on evaluating the potential project-related transportation impacts at two existing intersections in the vicinity of the proposed project. The analyzed intersections are listed below and shown on **Figure 1**:

1. H-1 Westbound Ramps/Palehua Road/Kaualaka'i Parkway
2. H-1 Eastbound Ramps/ Kaualaka'i Parkway

This study analyzes the potential project-related traffic impacts under typical weekday AM and PM peak hour traffic conditions. The AM and PM peak hour for each intersection are identified as the highest one-hour totals of traffic at each intersection from 6:30 AM to 9:30 AM and from 3:00 to 6:00 PM on a weekday.

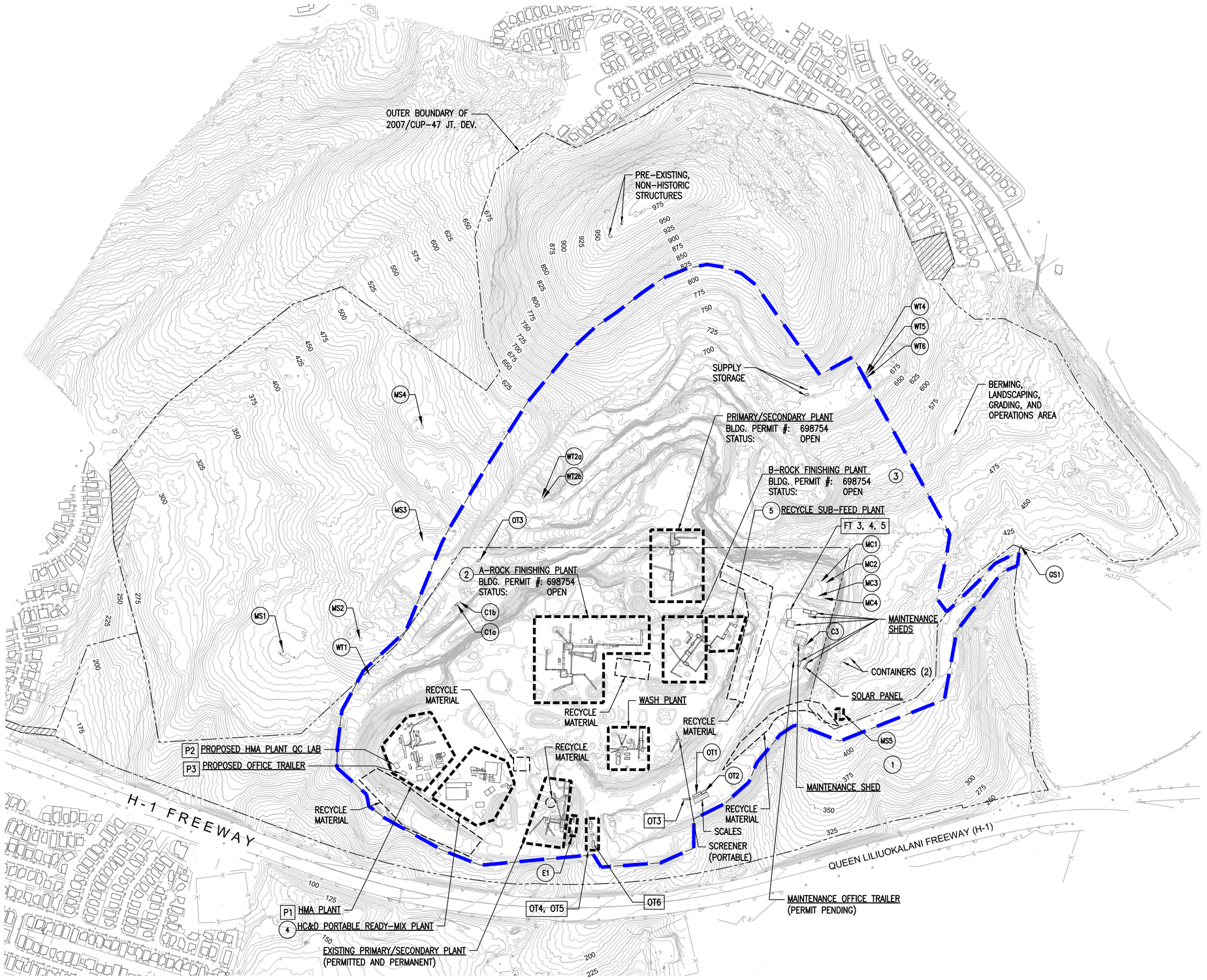


\\fpgisdevapp01\DevGISLibrary\ServiceMXDs\SD\SD220446_Makakilo_Quarry_MAR\SD220446_Makakilo_Quarry_MAR\SD220446_Makakilo_Quarry_MAR.aprx

Quarry Site
HART
HART Station
Parks

Figure 1

Vicinity Map



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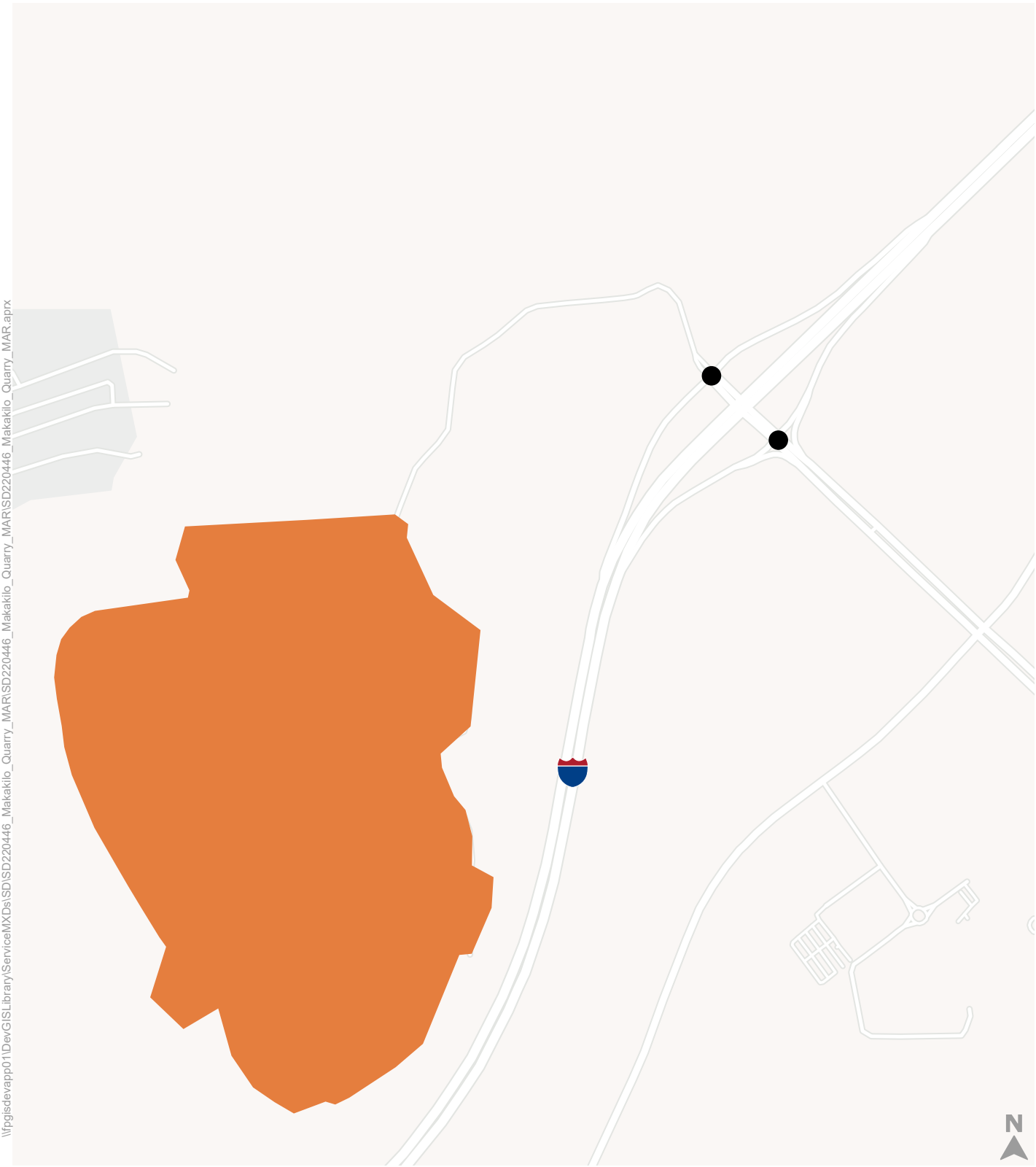
OT4	EXISTING	OFFICE TRAILER	835	835
OT5	EXISTING	OFFICE TRAILER	341	341
OT6	EXISTING	AGGREGATE QUALITY CONTROL	–	–
FT 3, 4, 5	EXISTING	FUEL TANKS	–	–
	EXISTING	RECYCLE MATERIAL		
P1	PROPOSED	HMA PLANT	–	13,000
P2	PROPOSED	PROPOSED HMA PLANT QC LAB	–	–
P3	PROPOSED	PROPOSED OFFICE TRAILER	–	–

NORTH

0 150' 300'

SCALE: 1" = 300'

FIGURE 2 - PROJECT QUARRY SITE PLAN WITH PROPOSED BOUNDARY AMENDMENTS



Study Intersections

Quarry Site

Figure 3

Project Site and Study Intersections

2.2 Study Scenarios

The operations of the study intersections were evaluated during the weekday AM and PM peak hours for the following scenarios:

- **Existing Conditions** – Traffic counts at study intersections were collected in June 2022. Given the ongoing COVID-19 pandemic, traffic counts sometimes do not reflect typical levels of peak hour volumes. 2021 AADT and 2019 AADT reported by the State of Hawaii Department of Transportation – Highways Division – Planning Branch (HDOT) were compared for H-1 nearest the project site. Differences at the time of counts were determined to be nominal, and no adjustments to counts were made because traffic volumes appear to have returned to pre-pandemic conditions at within the study area. HDOT ADT data for H-1 nearest the project site was reviewed by month. Although schools were not in session at the time of counts, differences between June ADT and ADT for months with schools in session were determined to be nominal. The analysis of traffic operations under this scenario was conducted for the peak hours and existing intersection lane configurations. The existing conditions analysis also includes a description of key area roadways and a review of existing transit, bicycle, and pedestrian facilities and services near the site.
- **Future Year (2024) No Project Conditions** – Existing peak-hour counts were grown at 3% per year over two (2) years based on growth shown on Kualaka'i Parkway in the Oahu MPO model. Expected 2024 traffic from the Ho'opili Master Plan development was then added to the grown existing counts to generate 2024 No Project traffic volumes. While some of the background growth would be attributable to Ho'opili development, this approach was used to provide a conservative estimate of traffic conditions.
- **Future Year (2024) Plus Project Conditions** – Traffic volumes generated by all new quarry-related activity were added to 2024 No Project volumes to generate 2024 Plus Project traffic volumes.

2.3 Analysis Methodology

The analysis of roadway operations performed for this study is based on procedures presented in the *Highway Capacity Manual 6th Edition* (HCM 6), published by the Transportation Research Board in 2016. The operations of roadway facilities are described with the term level of service (LOS). LOS is a qualitative description of traffic flow based on factors such as speed, travel time, delay, and freedom to maneuver. Six levels are defined, from LOS A, with the least congested operating conditions, to LOS F, with the most congested operating conditions. LOS E represents "at-capacity" operations. Operations are designated as LOS F when volumes exceed capacity, resulting in stop-and-go conditions.

2.3.1 Signalized Intersections

The methodology described in "Chapter 19: Signalized Intersections" of the *HCM 6* was used to prepare the LOS calculations for the signalized study intersections. This LOS method analyzes a signalized intersection's operation based on average control delay per vehicle. Control delay alone is used to

characterize LOS for the entire intersection or for an approach. Control delay includes the initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. The average control delay for signalized intersections is calculated using Synchro 11.0 analysis software and is correlated to a LOS designation, as shown in **Table 1**.

Table 1: Signalized Intersection LOS Definitions

Level of Service	Description	Delay in Seconds
A	Progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.	≤ 10.0
B	Progression is good, cycle lengths are short, or both. More vehicles stop than with LOS A, causing higher levels of average delay.	> 10.0 to 20.0
C	Higher congestion may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level, though many still pass through the intersection without stopping.	> 20.0 to 35.0
D	The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high V/C ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.	> 35.0 to 55.0
E	This level is considered by many agencies to be the limit of desirable delay. These high-delay values generally indicate poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences.	> 55.0 to 80.0
F	This level is considered undesirable with oversaturation, which is when arrival flow rates exceed the capacity of the intersection. This level may also occur at high V/C ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be contributing factors to such delay levels.	> 80.0

Source: *Highway Capacity Manual 6th Edition*, Transportation Research Board, 2016.

2.3.2 Significant Impact Criteria

The analysis of Future Year Conditions compares no-project operations with conditions when the project is fully built out to determine whether project implementation is expected to result in a significant impact on the surrounding roadways. Based on previous studies conducted for the City & County of Honolulu Department of Planning and Permitting (DPP) Traffic Review Branch (TRB), the minimum desired operating standard for a signalized intersection is typically LOS D. Additionally, HDOT strives to maintain LOS D intersection operations for state facilities. DPP and HDOT both acknowledge that some facilities may operate at worse levels during peak hours. Both agencies typically define a significant intersection impact as when the operation of a signalized intersection changes from LOS D or better to LOS E or F. Impacts are also defined to occur when the addition of project traffic exacerbates locations already operating at or projected to operate at LOS E or F. When evaluating intersection operations at any location, other factors are considered in the analysis, such as traffic volumes and potential secondary impacts to pedestrian, bicycle, and transit travel.

Significant impacts are categorized as either a project-specific or cumulative impact. An impact is considered project-specific at a signalized intersection if the addition of project traffic is expected to degrade LOS D or better operations to LOS E or F operations. An impact is considered a cumulative impact at a signalized intersection if the addition of project trips exacerbates LOS E or F operations and increases the intersection delay by more than five (5) seconds.

DPP TRB and HDOT have not approved detailed criteria for significant pedestrian, bicycle, and transit impacts. However, these impacts are generally evaluated based on whether a proposed project would: 1) conflict with existing or planned pedestrian, bicycle, or transit facilities and services, or 2) create substantive walking, bicycling, or transit use demand without providing adequate and appropriate facilities for non-motorized mobility. Existing facilities for pedestrians, bicycles, and transit users were inventoried to evaluate the quality and scope of facilities/services currently in place. The assessments of planned pedestrian, bicycle, and transit facilities were conducted using information in planning documents, such as the *2019 Oahu Bike Plan Update* and the *Draft Oahu Pedestrian Plan (June 2021)*. For these modes, if the proposed project is expected to conflict with existing or planned improvements to pedestrian and bicycle facilities, or if the project is expected to generate a substantial demand that could warrant additional transit service or walking/bicycling demand that would warrant additional facilities, then the project would be determined to have a project-specific impact to non-motorized modes of transportation.

It should be noted that the City & County Department of Transportation Services (DTS) has developed an analysis methodology for evaluating multimodal operations and impacts for vehicular, bicycle, pedestrian and transit modes in the *City and County of Honolulu Transportation Impact Assessment Guide (November 2020)*. However, it is not required by ordinance to be applied to private development projects. That said, this analysis addresses potential impacts to all modes and recommends improvements where significant impacts are identified, meeting the intent of the DTS TIA methodology.

3. Existing Conditions

This chapter describes the existing roadway network located within the project study area. A discussion of the existing intersection LOS operation results is also included in this chapter.

3.1 Existing Roadway System

The key roadways providing vehicular access in the vicinity of the project site are described below. As noted in the previous section, the site is the H-1/Kaualaka'i Parkway interchange.

Kaualaka'i Parkway is a four- to six-lane divided arterial that extends between Kapolei Parkway and the Ka Makana Ali'i shopping mall at the makai end and the H-1 freeway at the mauka end. The only six-lane section is located between the freeway interchange and Farrington Highway. The posted speed limit is 35 miles per hour (mph). It is one of the primary connections between Kapolei and H-1. This roadway includes right-of-way for six lanes and the mauka terminus is the starting point for a potential future Makakilo Road extension.

H-1/Queen Liluokalan'i Freeway is a major highway running from Route 93 in Kapolei at the east to Route 78 past downtown Honolulu to its west. The posted speed limit is 50 mph, and it has 6 lanes near the project site. The freeway is the primary connection between Kapolei and downtown Honolulu.

Palehua Road is a two-lane roadway north of the H-1/Kaualaka'i Parkway interchange serving Makakilo Quarry, where the main entrance to the quarry property is located approximately 1.25 miles from the mauka side of the interchange. The posted speed limit is 15 mph. A planned extension of Makakilo Drive would replace a portion of Peuonani Street and connect to Kaualaka'i Parkway; however, this project was removed off the STIP/TIP in 2019 and does not have a projected completion date.

3.2 Existing Transit Facilities and Services

No transit service operates at the study area. The nearest bus stop is located at the intersection of Kaualaka'i Parkway and Ho'omohala Avenue served by Route 95. However, this stop over a two-mile walk or bicycle ride from the front entrance to the quarry. Routes 40 and 99 also serve the Farrington Highway, which is aligned parallel to H-1 (approximately 0.4 miles makai of the quarry property), but no pedestrian or bicycle access is provided across the freeway corridor from the quarry site. Because of the excessive distances or barriers to existing bus stops, transit is not considered a viable mode for site employees at this time

3.3 Existing Pedestrian Activity

Given the undeveloped nature of the site and the low-density development of the immediate surrounding area, the site is not conductive to walk trips. As such, walking is not considered a viable mode for site employees at this time..

3.4 Existing Bicycle Facilities

No bicycle facilities exist at or around the project site given the usage of the road as an access point to a major highway and quarry, as well as the profile of the road with signifiant grades. Accordingly, bicycling is not considered a viable mode for site employees at this time..

3.5 Collision History

A review of previously published State of Hawaii Department of Heath motor vehicle crash data from 2008 through 2018 did not show many collisions at or near the two study intersections on Kaualaka'i Parkway. The few motor vehicle collisions documented occurred near the merges/diverges of the on/off ramps on H-1. A summary of the collision type can be found below in **Table 2**.

Table 2: Collision History (2008-2018)

Approximate Location	Motorcycle/Moped	Bicycle	Car/Truck
H-1 Westbound Off-Ramp	1	0	20
H-1 Westbound On-Ramp	1	0	7
H-1 Eastbound Off-Ramp	1	1	7
H-1 Eastbound On-Ramp	0	0	3
H-1 Eastbound Ramps/Palehua Road/Kaualaka'i Parkway	1	0	3
H-1 Westbound Ramps/Kaualaka'i Parkway	0	0	5

Source: Oahu Motor Vehicle Crashes 2007-2018
https://www.arcgis.com/apps/mapviewer/index.html?webmap=667bcd3b19134981888a87535a3e606a

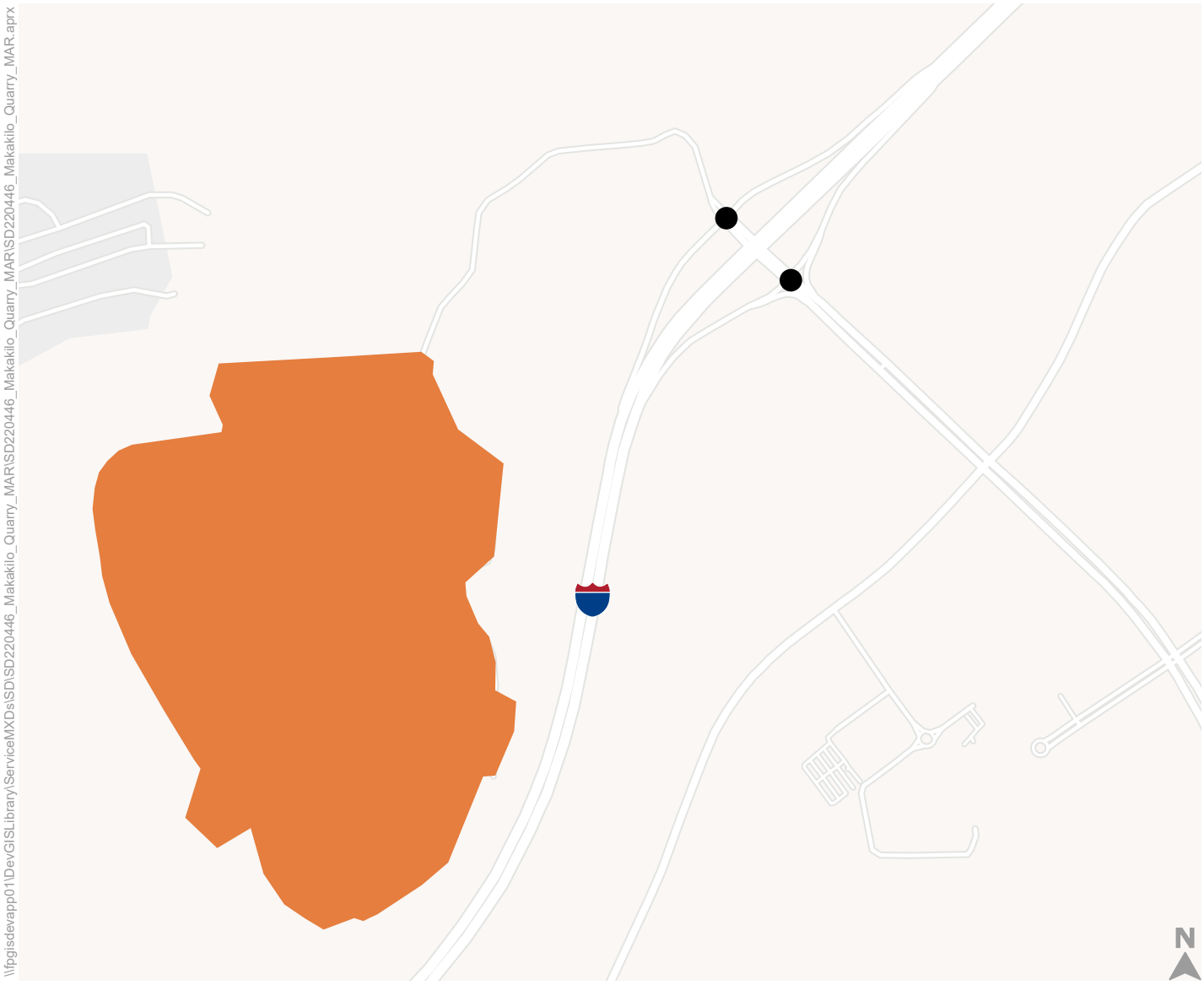
3.6 Existing Traffic Volumes, Lane Configurations, and Operations

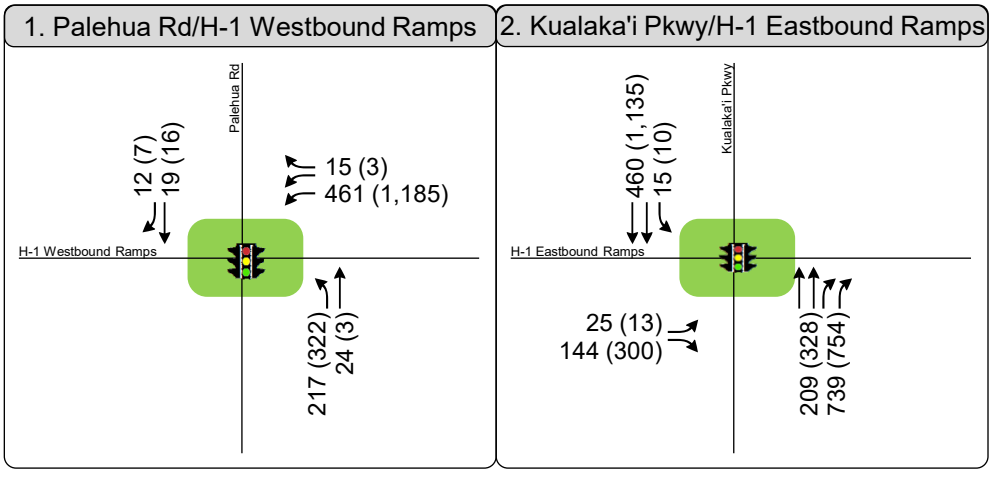
Existing counts and lane configurations are shown in **Figure 4**. This data was used to quantify traffic operations at each of the study intersecitons. **Table 3** shows current operations at the two existing study intersections. **Appendix A** provides traffic count data sheets. Both existing study intersections operate acceptably with little delay.

Table 3: Existing Intersection Levels of Service

Intersection	Traffic Control	Peak Hour	Intersection or Worst Movement	
			Delay (sec/veh)	LOS
1. H-1 Westbound Ramps/Palehua Road/Kaualaka'i Parkway	Signalized	AM	12.8	B
		PM	15.5	B
2. H-1 Eastbound Ramps/Kaualaka'i Parkway	Signalized	AM	8.0	A
		PM	3.7	A

Source: Fehr & Peers, 2022.





A-C D E F

Study Intersections

Quarry Site

Figure 4

Existing Conditions (2022)

4. Future Year (2024) No Project Conditions

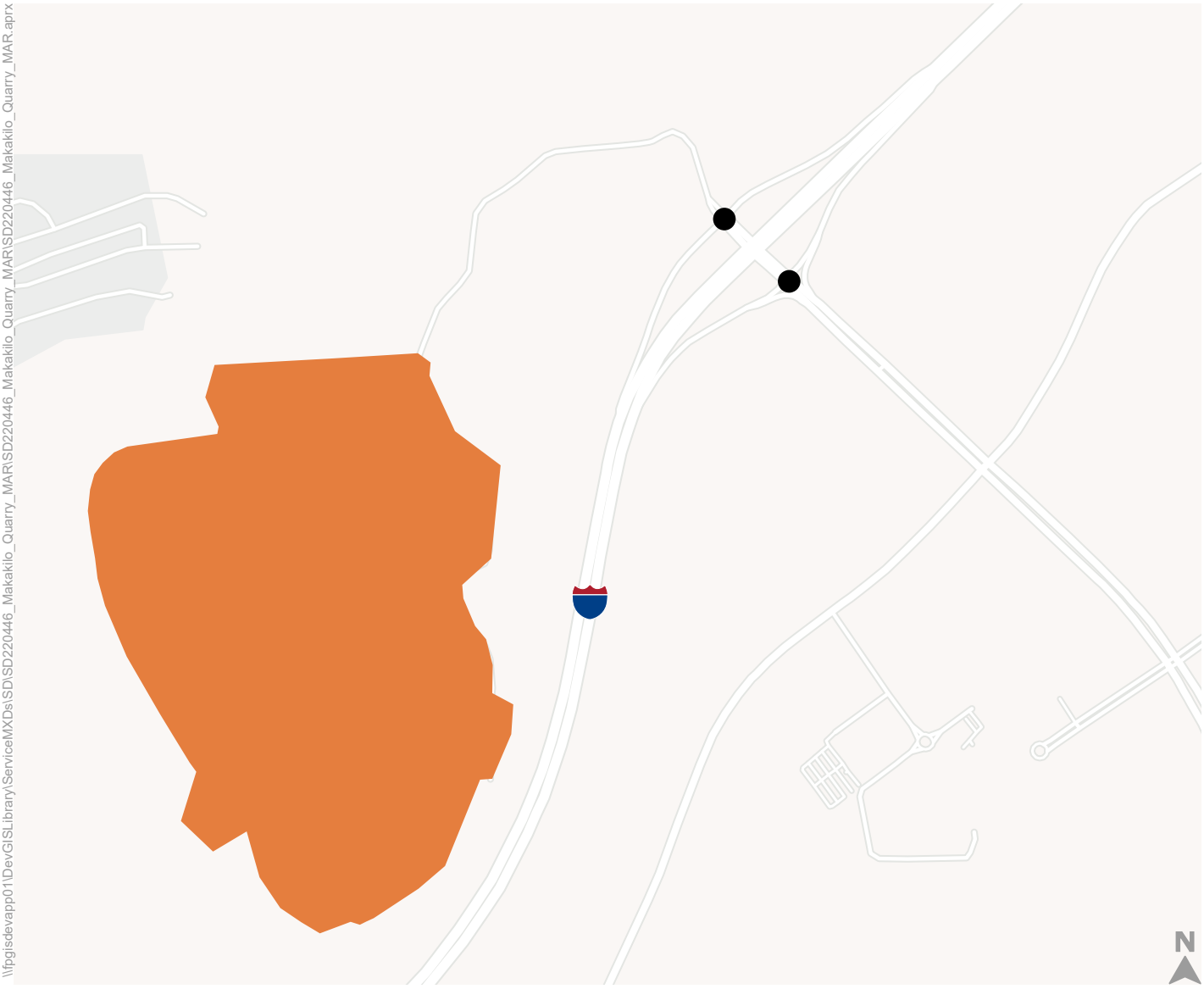
To evaluate the potential traffic impacts generated by the proposed project, it was necessary to first develop estimates of future traffic conditions in the area without the project. Future traffic conditions without the project reflect traffic increases based on regional growth and development near the study site by the time the project is expected to be fully built and operational in 2024. This scenario is referred to as Future Year No Project Conditions.

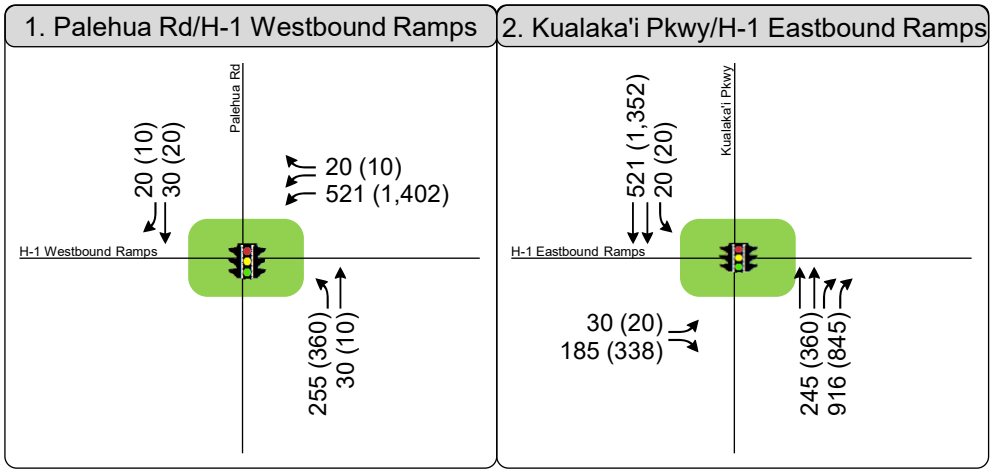
4.1 Future Year (2024) No Project Traffic Projections

A growth factor is typically applied on Existing Conditions traffic volumes to account for future regional growth. For this study, a 3.0% annual growth factor was assumed for all movements at the study intersections, based on growth shown on Kualaka'i Parkway in the Oahu MPO model, compounded over the two-year timeframe.

Preliminary 2024 volumes forecasts for the planned Ho'opili Development were provided by Austin Tsutsumi and Associates. Note that an update to the Transportation Impact Analysis Report (TIAR) for Ho'opili was in process at the time of this report and these volumes were the latest available at the time of this analysis. These volumes were added to the existing counts after the growth factor was applied to develop Future Year (2024) traffic volumes. The use of both the growth factor and the 2024 Ho'opili volumes results in a conservative analysis of traffic operations and accounts for regional growth related to a variety of land uses, including East Kapolei High School and University of Hawaii West Oahu.

Figure 5 illustrates the forecasted peak hour traffic volumes and lane configurations for Future Year (2024) No Project Conditions.





A-C D E F

Study Intersections

Quarry Site

Figure 5

Future Year (2024) No Project Conditions

4.2 Future Year (2024) No Project Intersection Level of Service

Levels of service (LOS) calculations were conducted to evaluate the operating levels of the study intersections under Future Year (2024) No Project Conditions with the forecasted growth in traffic. The results of the LOS analysis for the study intersections are presented in **Table 4.** The corresponding LOS calculation sheets are included in **Appendix B**.

Table 4: Future Year (2024) No Project Intersection Levels of Service

Intersection	Traffic Control	Peak Hour	Intersection or Worst Movement	
			Delay (sec/veh)	LOS
1. H-1 Westbound Ramps/Palehua Road/Kaualaka'i Parkway	Signalized	AM	15.2	B
		PM	20.3	C
2. H-1 Eastbound Ramps/Kaualaka'i Parkway	Signalized	AM	8.3	A
		PM	3.8	A

Source: Fehr & Peers, 2022.

The changes in operations from Existing Conditions are the result of the addition of ambient traffic growth. The analysis results indicate that all intersections will continue to operate at desirable levels of service prior to project implementation.

5. Project Traffic

This section describes the anticipated number of vehicle trips and the directionality of those trips that would result from implementation of the proposed project. Future traffic added to the roadway system by the project is estimated using a three-step process: (1) project trip generation, (2) trip distribution, and (3) trip assignment. The first step estimates the amount of project-generated traffic that would be added to the roadway network. The second step estimates the direction of travel to and from the project site. The new trips are assigned to specific street segments and intersection turning movements during the third step. This process is described in more detail in the following sections.

5.1 Project Trip Generation

The vehicle trip generation for the proposed project was estimated using existing quarry driveway counts as well as future land use and yearly traffic estimates provided by Grace Pacific. A ratio of new to existing yearly traffic estimates was calculated from information provided by Grace Pacific. This ratio was applied to daily and peak hour counts taken on June 2, 2022 at the project driveway to calculate peak hour and daily vehicle trips generated by new operations at the quarry. Detailed trip generation calculations are provided in **Appendix B**.

The ratio of estimated employee trips to customer trucks and truck loads is similar for both new and existing uses. Additionally, the distribution of trips throughout the day is not expected to vary significantly between new and existing land uses. Thus, the percent of trips entering or exiting the quarry that are heavy vehicles or trucks is expected to stay the same for any given period of the day.

As shown in **Table 5**, the proposed project is expected to generate a total of 137 net new daily vehicle trips, including 35 net new vehicle trips during the AM peak hour (19 inbound/16 outbound) and 19 net new vehicle trips during the PM peak hour (5 inbound/14 outbound). Note that this analysis conservatively does not consider the reduction in existing trips that would result from current trips between the quarry site and a hot mix asphalt plant in Kalaeloa staying internal to the quarry site with the project in place.

Table 5: Project Vehicle Trip Generation Estimates

Land Use	Vehicle Trips						
	Daily[1]	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
HMA, Concrete Plant, and Expanded Quarry Operations	137	19	16	35	5	14	19

Source: Fehr & Peers, 2021.

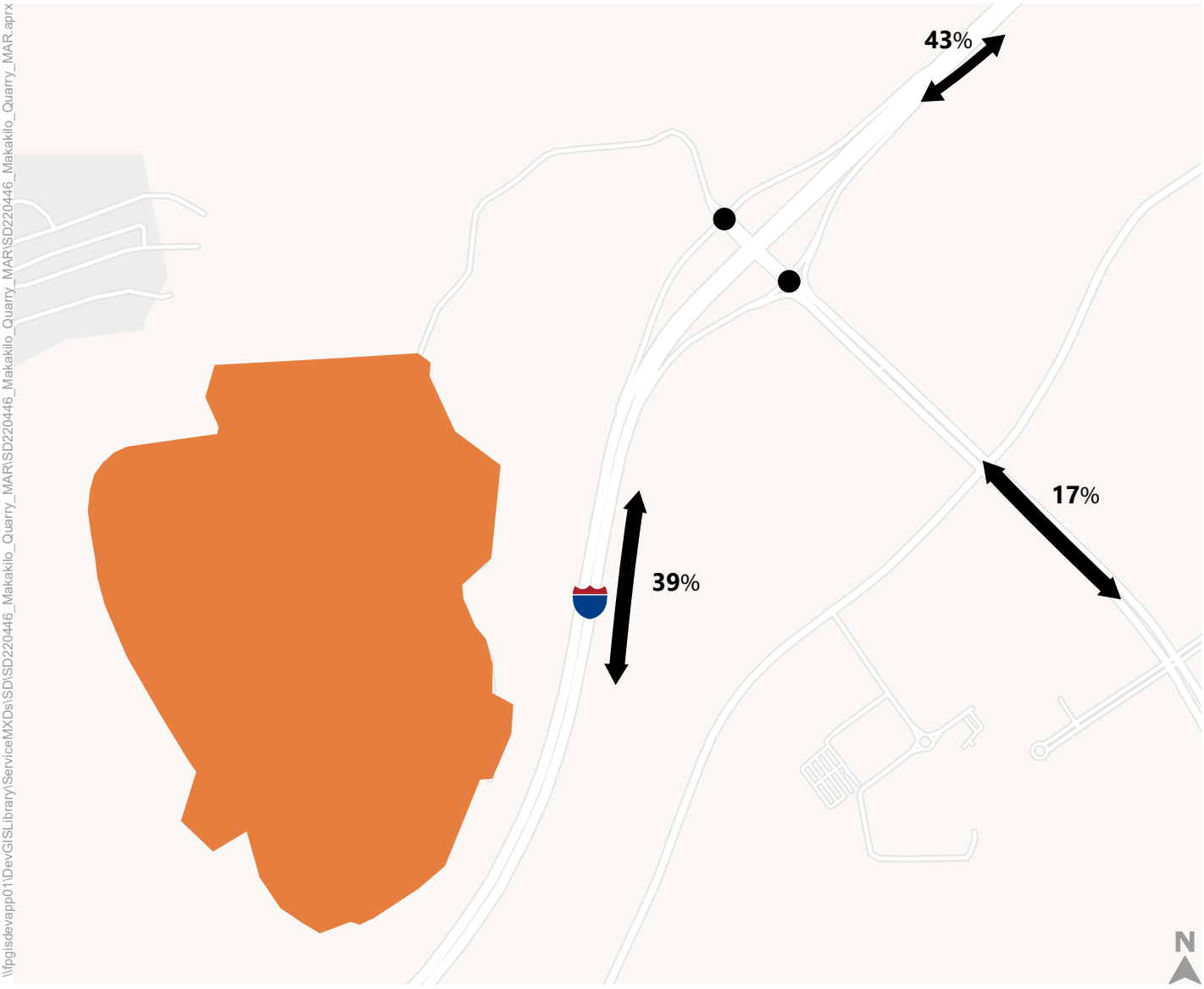
5.2 Project Trip Distribution & Assignment

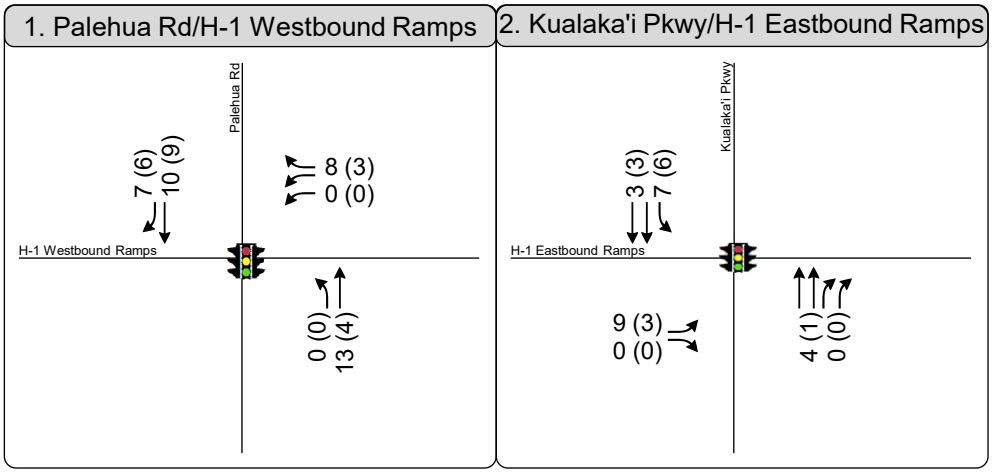
The geographic distribution of trips generated by the proposed project is dependent on characteristics of the street system serving the project site, the level of accessibility of routes to and from the project site, and primary land uses to which project tenants would be drawn (e.g., job centers, residential areas, shopping destinations, services, and schools).

The project's trip distribution pattern was primarily developed by determining locations of complementary land uses (i.e., businesses and residential development) and existing turning movement counts to determine the likely geographic distribution of project trips. The more localized distribution was based on available travel paths. The resulting overall trip distribution pattern estimates for the peak hour project-generated traffic are as follows:

- 17% to/from south along Kaualaka'i Parkway
- 39% to/from west along H-1
- 43% to/from east along H-1

Using the estimated trip generation and the distribution patterns discussed above, the traffic generated by the proposed project was assigned to the individual turning movements at intersections within the street network. **Figure 6** details the project's trip distribution and trip assignment at each study intersection.





Study Intersections

Quarry Site

Figure 6

Trip Distribution and Assignment

6. Future Year (2024) Plus Project Conditions

This section describes the analysis of potential impacts on the roadway system due to projected future increases in traffic, including traffic generated by the project in 2024 when all new on-site facilities are operating at expected levels and expanded operations are expected to be in place. The Future Year (2024) Plus Project roadway network is the same network assumed under the Future Year (2024) No Project scenario. The analysis compares the project levels of service (LOS) at each study intersection with and without the addition of project-generated trips to determine potential impacts to the transportation network.

6.1 Future Year (2024) Plus Project Traffic Projections

To forecast the peak hour operating conditions at each study intersection, the project trip assignment was superimposed on Future Year (2024) No Project traffic volumes to yield Future Year (2024) Plus Project volumes.

6.2 Future Year (2024) Plus Project Intersection Level of Service

Figure 7 presents the forecasted Future Year (2024) Plus Project AM and PM peak hour volumes. The peak hour volumes were used to analyze operations using the LOS methodology described in **Section 2.3**. The comparative LOS analysis results for the study intersections under Future Year (2024) No Project and Plus Project Conditions are presented in **Table 6**. Detailed LOS results are included in **Appendix C**.

The results presented in **Table 6** indicate that under Future Year (2024) Plus Project Conditions, the LOS at the signalized intersections will be generally unchanged with the addition of project-generated traffic, and all intersections are forecast to operate acceptably. Storage for turning movements was found to be adequate with little to no queue spillback expected. For perspective, the southbound left-turn pocket includes 350 feet or storage, which is adequate to accommodate 5 tandem trailer combinations or 10 to 12 dump or concrete trucks, depending on dimensions. While the addition of heavy truck traffic will add some minor delays to selected turning movements, the limited number of new vehicles will not significantly affect overall operations.

This analysis conservatively assumed no signal timing changes between Existing Conditions and Future Year (2024) No Project and With Project Conditions.

Table 6: Future Year (2024) No Project and Plus Project Intersection Levels of Service

Intersection	Traffic Control	Peak Hour	Future Year No Project Conditions		Future Year Plus Project Conditions		Change in Delay (sec/veh)
			Overall Intersection or Worst Movement		Overall Intersection or Worst Movement		
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	
1. H-1 Westbound Ramps/Palehua Road/Kaualaka'i Parkway	Signalized	AM	15.2	A	15.5	B	0.3
		PM	20.3	C	21.1	C	0.8
2. H-1 Eastbound Ramps/Kaualaka'i Parkway	Signalized	AM	8.3	A	9.2	A	0.9
		PM	3.8	A	3.9	A	0.1

Source: Fehr & Peers, 2022.

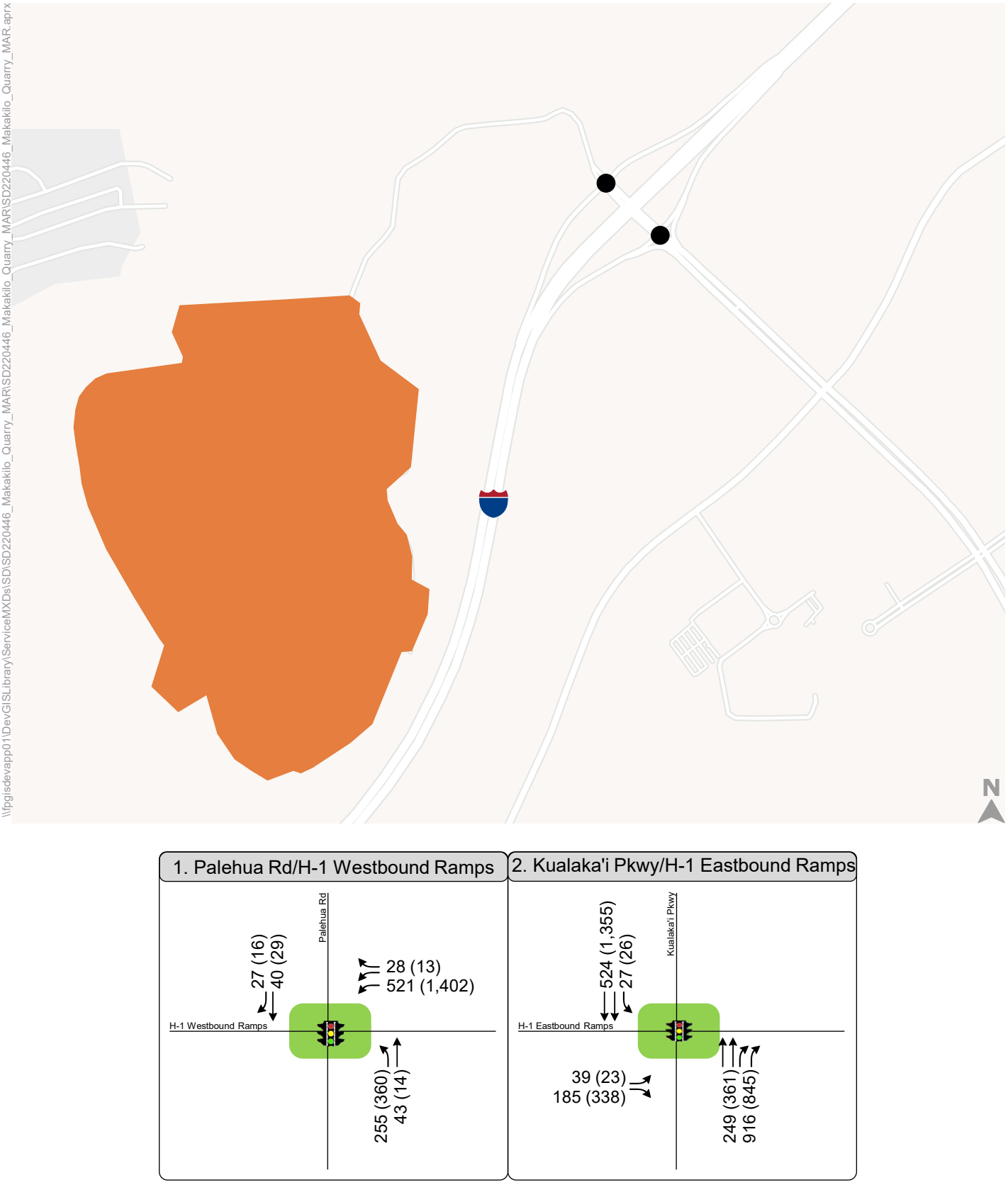


Figure 7

Future Year (2024) Plus Project Conditions

6.3 Collision Assessment

As noted in the Existing Conditions section of this report, a review of previously published State of Hawaii Department of Heath motor vehicle crash data through 2018 did not show any collisions in the immediate study area. The closest motor vehicle collisions occurred near the start of the on/off ramps on the H-1 freeway. While the project will add a small amount of traffic to these facilities, the project is not anticipated to change the crash rate or notably affect safety. Ramp queues are not expected to extend to the freeway mainline as a result of the project. Given that it is not possible to perfectly predict human behavior and random fluctuations in crash locations or frequency, additional factors and influences may obfuscate the effects of the proposed project. This does not constitute, and is not meant to be, a comprehensive review of safety in the study or surrounding area, which could be much broader in scope (e.g., including a review of individual collision records, human factors considerations, and comparisons of the collision rates and frequencies with similar localities).

6.4 Recommended Traffic Improvements

Because no significant operations impacts are anticipated, no vehicular capacity or operations improvements are needed to accommodate project-related traffic.

7. Site Access, Circulation, and Parking

This chapter includes a review of the site access and on-site circulation for vehicles, bicyclists, and pedestrians.

7.1 Site Access

As shown in the site plan (**Figure 2**), vehicle access to the site will remain via Palehua Road. Turn volumes at the H-1 interchange are projected to be low enough such that:

- the existing traffic signal is sufficient traffic control at the Kaualaka'i Parkway/H-1 WB Ramps intersection
- no additional dedicated turn pockets are necessary,
- no additional storage length is necessary.

Overall, the proposed vehicular site access is considered adequate.

7.2 On Site Circulation and Parking

On-site vehicular circulation will be provided via private roadways providing access to the quarry shop and mining facilities. All employee and truck parking will be accommodated on site and more than a mile from any public street or highway. As such, no substantial circulation or parking issues are anticipated with construction of the proposed project.

8. Multimodal Assessment

This chapter includes a review of multimodal access to the site and circulation for buses, other vehicles, pedestrians, and bicyclists surrounding the site. While separate bicycle, pedestrian, and transit facilities are typically encouraged to reduce vehicle traffic, the rural circulation system, a dearth of nearby land uses, and nature of the proposed project are typically not conducive to multi-modal travel.

8.1 Transit Facilities and Services

As noted in the Existing Conditions section of this report, transit service is currently provided along Kualaka'i Parkway by TheBus. the nearest bus stops are located more than a two-mile walk or bicycle ride from the project entrance on Palehua Road. This makes the likelihood of any bus service use highly unlikely for both existing and future employees until the Makakilo Drive extension is built at some future date and more proximate bus service becomes available.

In the future, rail service operated by the Honolulu Authority for Rapid Transportation (HART) will initially extend from Kapolei to Aloha Stadium and is expected to be available in late 2022 or some time in 2023. Full operations with service from the stadium station to the Ka'ākaukukui (Civic Center) station is anticipated sometime after 2026. The closest stop to the site will be the Keone'ae (UH West Oahu) station roughly 2.1 miles from the project site entrance.

Overall, implementation of the proposed project is not expected to conflict with any existing or planned transit service within the project study area. Accordingly, no significant impacts to transit are anticipated to occur with buildout of the proposed project.

8.2 Bicycle Facilities

No bicycle facilities exist at or around the project site given the usage of the private site road as an access point to a major highway and quarry. The project is expected to generate little or no bicycle trip demand, and the existing gravel sections of Palehua Road are not conducive to bicycle travel.

Implementation of the proposed project is not expected to conflict with any existing bikeways or planned bicycle facilities. Accordingly, no significant impacts to bicyclists are expected to occur with buildout of the proposed project.

8.3 Pedestrian Facilities

Given the undeveloped nature of the site and no proximate land uses within a reasonable walking distance, no potential conflict between site-generated traffic and non-automobile modes including walking are anticipated. In addition, implementation of the proposed project is not expected to conflict with any existing or planned pedestrian facilities. Accordingly, no significant impacts to pedestrians are expected to occur with buildout of the proposed project.

Appendix A: Traffic Count Data

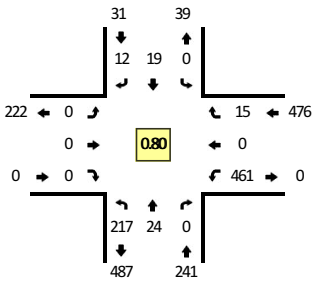
Type of peak hour being reported: Intersection Peak

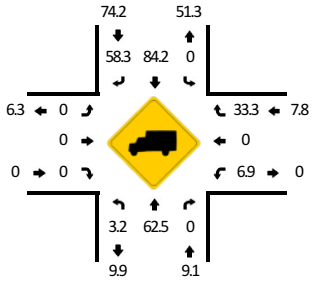
Method for determining peak hour: Total Entering Volume

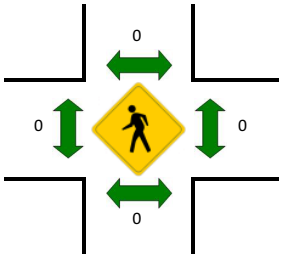
LOCATION: Kualakai Pkwy -- H1 Westbound Ramps
CITY/STATE: Makakilo, HI

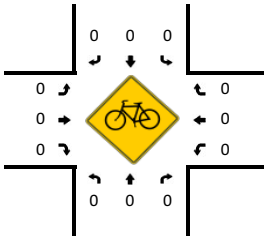
QC JOB #: 15845101
DATE: Thu, Jun 2 2022

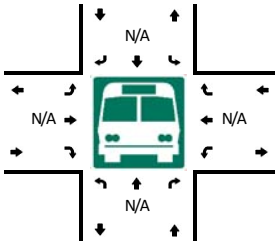
Peak-Hour: 7:15 AM -- 8:15 AM
Peak 15-Min: 7:40 AM -- 7:55 AM

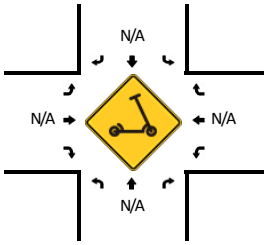












5-Min Count Period Beginning At	Kualakai Pkwy (Northbound)				Kualakai Pkwy (Southbound)				H1 Westbound Ramps (Eastbound)				H1 Westbound Ramps (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:30 AM	8	2	0	0	0	0	0	0	0	0	0	0	34	0	0	0	44	
6:35 AM	22	2	0	1	0	0	0	0	0	0	0	0	41	0	2	0	68	
6:40 AM	19	0	0	0	0	1	0	0	0	0	0	0	33	0	1	0	54	
6:45 AM	16	3	0	0	0	2	0	0	0	0	0	0	37	1	0	0	59	
6:50 AM	14	0	0	0	0	0	4	0	0	0	0	0	47	0	0	0	65	
6:55 AM	13	2	0	0	0	3	2	0	0	0	0	0	35	0	2	0	57	
7:00 AM	11	2	0	1	0	2	1	0	0	0	0	0	38	0	1	0	56	
7:05 AM	14	2	0	0	0	3	1	0	0	0	0	0	18	0	3	0	41	
7:10 AM	15	1	0	0	0	0	0	0	0	0	0	0	30	0	2	0	48	
7:15 AM	19	1	0	0	0	2	0	0	0	0	0	0	37	0	3	0	62	
7:20 AM	15	3	0	0	0	3	0	0	0	0	0	0	43	0	2	0	66	
7:25 AM	15	2	0	0	0	1	0	0	0	0	0	0	26	0	1	0	45	665
7:30 AM	22	3	0	1	0	1	0	0	0	0	0	0	39	0	0	0	66	687
7:35 AM	18	2	0	1	0	0	1	0	0	0	0	0	32	0	2	0	56	675
7:40 AM	26	1	0	1	0	2	1	0	0	0	0	0	38	0	0	0	69	690
7:45 AM	12	3	0	1	0	3	1	0	0	0	0	0	67	0	1	0	88	719
7:50 AM	26	1	0	0	0	0	3	0	0	0	0	0	43	0	4	0	77	731
7:55 AM	7	1	0	2	0	3	4	0	0	0	0	0	37	0	1	0	55	729
8:00 AM	14	2	0	0	0	0	0	0	0	0	0	0	39	0	1	0	56	729
8:05 AM	21	2	0	1	0	0	1	0	0	0	0	0	31	0	0	0	56	744
8:10 AM	15	3	0	0	0	4	1	0	0	0	0	0	29	0	0	0	52	748
8:15 AM	8	3	0	2	0	2	3	0	0	0	0	0	31	0	0	0	49	735
8:20 AM	18	3	0	0	0	0	0	0	0	0	0	0	38	0	0	0	59	728
8:25 AM	23	0	0	0	0	1	1	0	0	0	0	0	30	0	1	0	56	739
8:30 AM	16	2	0	0	0	0	1	0	0	0	0	0	45	0	2	0	66	739
8:35 AM	17	1	0	1	0	0	0	0	0	0	0	0	30	1	2	0	52	735
8:40 AM	11	1	0	2	0	2	1	0	0	0	0	0	46	1	0	0	64	730
8:45 AM	16	0	0	1	0	1	2	0	0	0	0	0	40	1	2	0	63	705
8:50 AM	15	1	0	1	0	2	1	0	0	0	0	0	33	2	1	0	56	684
8:55 AM	13	2	0	1	0	2	1	0	0	0	0	0	37	0	1	0	57	686
9:00 AM	12	0	0	0	0	0	2	0	0	0	0	0	35	0	3	0	52	682
9:05 AM	17	2	0	1	0	3	0	0	0	0	0	0	30	0	2	0	55	681
9:10 AM	12	1	0	1	0	0	0	0	0	0	0	0	31	0	2	0	47	676
9:15 AM	15	3	0	0	0	1	1	0	0	0	0	0	27	0	1	0	48	675
9:20 AM	10	2	0	1	0	3	0	0	0	0	0	0	39	0	1	0	56	672
9:25 AM	22	2	0	1	0	2	0	0	0	0	0	0	36	0	0	0	63	679

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	256	20	0	8	0	20	20	0	0	0	0	0	592	0	20	0	936
Heavy Trucks	8	8	0		0	16	16		0	0	0		48	0	12		108
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 6/20/2022 2:45 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

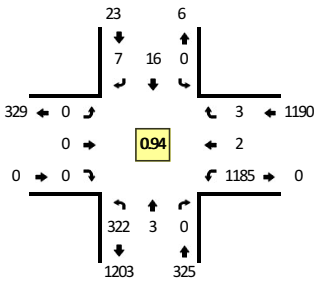
Type of peak hour being reported: Intersection Peak

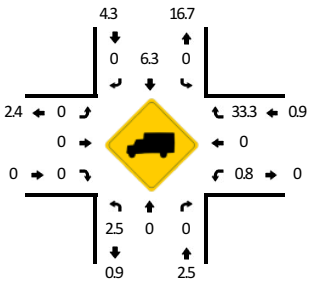
Method for determining peak hour: Total Entering Volume

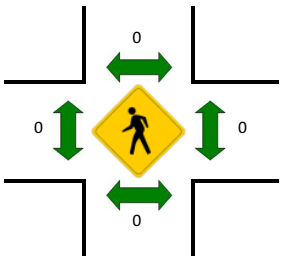
LOCATION: Kualakai Pkwy -- H1 Westbound Ramps
CITY/STATE: Makakilo, HI

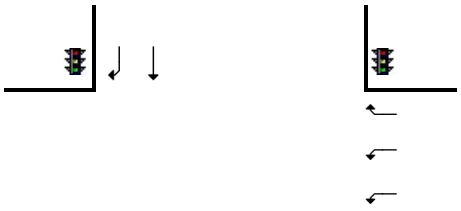
QC JOB #: 15845102
DATE: Thu, Jun 2 2022

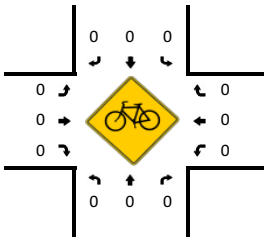
Peak-Hour: 3:45 PM -- 4:45 PM
Peak 15-Min: 4:20 PM -- 4:35 PM

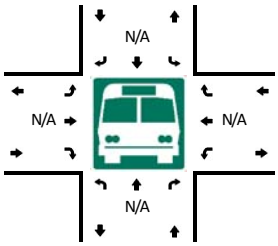


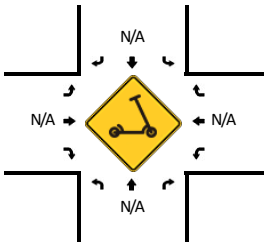












5-Min Count Period Beginning At	Kualakai Pkwy (Northbound)				Kualakai Pkwy (Southbound)				H1 Westbound Ramps (Eastbound)				H1 Westbound Ramps (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	30	0	0	0	0	2	1	0	0	0	0	0	60	0	1	0	94	
3:05 PM	24	0	0	0	0	6	0	0	0	0	0	0	74	0	0	0	104	
3:10 PM	22	0	0	1	0	0	0	0	0	0	0	0	81	0	1	0	105	
3:15 PM	28	1	0	1	0	4	0	0	0	0	0	0	82	0	0	0	116	
3:20 PM	21	0	0	0	0	1	1	0	0	0	0	0	83	0	0	0	106	
3:25 PM	28	1	0	0	0	0	0	0	0	0	0	0	83	0	0	0	112	
3:30 PM	38	0	0	0	0	1	0	0	0	0	0	0	74	0	1	0	114	
3:35 PM	28	1	0	0	0	0	1	0	0	0	0	0	80	0	0	0	110	
3:40 PM	24	0	0	0	0	1	0	0	0	0	0	0	104	0	0	0	129	
3:45 PM	34	0	0	0	0	0	0	0	0	0	0	0	118	0	0	0	152	
3:50 PM	24	1	0	0	0	1	0	0	0	0	0	0	101	0	0	0	127	
3:55 PM	27	0	0	0	0	0	0	0	0	0	0	0	90	1	0	0	118	1387
4:00 PM	29	0	0	0	0	1	0	0	0	0	0	0	81	0	0	0	111	1404
4:05 PM	18	0	0	0	0	0	1	0	0	0	0	0	109	1	0	0	129	1429
4:10 PM	31	0	0	0	0	0	1	0	0	0	0	0	75	0	0	0	107	1431
4:15 PM	24	1	0	1	0	4	1	0	0	0	0	0	94	0	1	0	126	1441
4:20 PM	34	0	0	0	0	1	0	0	0	0	0	0	113	0	0	0	148	1483
4:25 PM	28	0	0	0	0	2	0	0	0	0	0	0	87	0	1	0	118	1489
4:30 PM	19	1	0	1	0	1	2	0	0	0	0	0	120	0	0	0	144	1519
4:35 PM	27	0	0	0	0	0	1	0	0	0	0	0	97	0	1	0	126	1535
4:40 PM	25	0	0	0	0	6	1	0	0	0	0	0	100	0	0	0	132	1538
4:45 PM	26	0	0	0	0	2	1	0	0	0	0	0	73	0	0	0	102	1488
4:50 PM	26	0	0	0	0	0	0	0	0	0	0	0	122	2	1	0	151	1512
4:55 PM	25	0	0	0	0	1	1	0	0	0	0	0	93	0	0	0	120	1514
5:00 PM	21	0	0	0	0	0	0	0	0	0	0	0	92	0	0	0	113	1516
5:05 PM	24	0	0	0	0	0	1	0	0	0	0	0	100	0	0	0	125	1512
5:10 PM	27	0	0	0	0	0	0	0	0	0	0	0	94	0	0	0	121	1526
5:15 PM	33	0	0	0	0	0	0	0	0	0	0	0	84	0	0	0	117	1517
5:20 PM	19	0	0	0	0	0	0	0	0	0	0	0	110	0	0	0	129	1498
5:25 PM	17	0	0	0	0	0	0	0	0	0	0	0	106	0	0	0	123	1503
5:30 PM	20	0	0	0	0	0	0	0	0	0	0	0	89	0	0	0	109	1468
5:35 PM	24	0	0	0	0	0	0	0	0	0	0	0	93	0	0	0	117	1459
5:40 PM	26	0	0	0	0	1	0	0	0	0	0	0	85	0	0	0	112	1439
5:45 PM	26	0	0	0	0	0	0	0	0	0	0	0	84	0	0	0	110	1447
5:50 PM	11	0	0	0	0	0	0	0	0	0	0	0	117	0	0	0	128	1424
5:55 PM	25	0	0	0	0	0	0	0	0	0	0	0	98	0	0	0	123	1427

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	324	4	0	4	0	16	8	0	0	0	0	0	1280	0	4	0	1640
Heavy Trucks	0	0	0		0	0	0		0	0	0		4	0	0		4
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 6/20/2022 2:45 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

LOCATION: Kualakai Pkwy -- H1 Eastbound Ramps

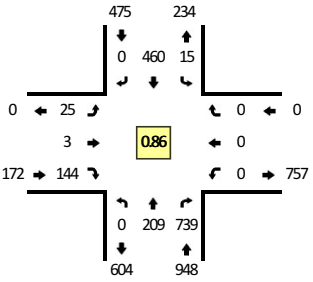
CITY/STATE: Makakilo, HI

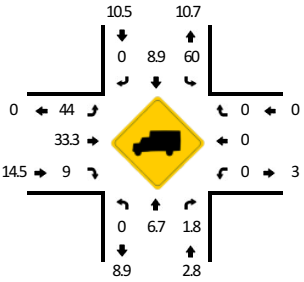
QC JOB #: 15845103

DATE: Thu, Jun 2 2022

Peak-Hour: 7:00 AM -- 8:00 AM

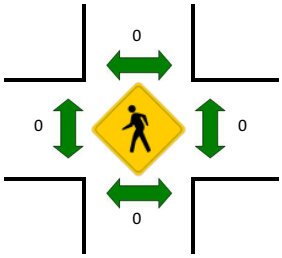
Peak 15-Min: 7:35 AM -- 7:50 AM

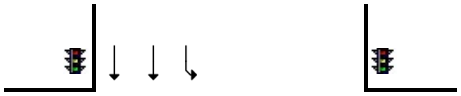


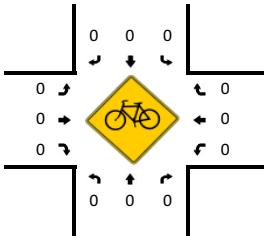


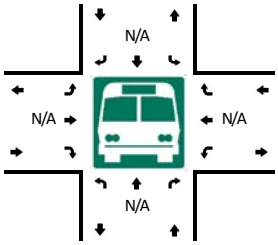
Quality Counts

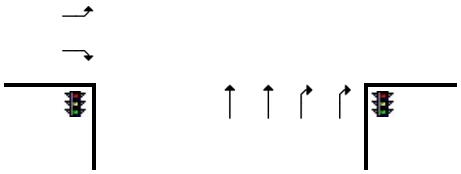
DATA THAT DRIVES COMMUNITIES

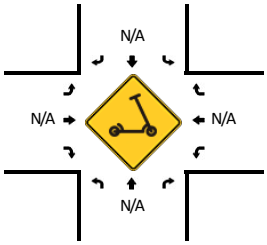












5-Min Count Period Beginning At	Kualakai Pkwy (Northbound)				Kualakai Pkwy (Southbound)				H1 Eastbound Ramps (Eastbound)				H1 Eastbound Ramps (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:30 AM	0	20	62	0	0	41	0	0	2	0	25	0	0	0	0	0	150	
6:35 AM	0	20	66	0	0	33	0	0	2	1	19	0	0	0	0	0	141	
6:40 AM	0	16	74	0	0	37	0	0	1	0	17	0	0	0	0	0	145	
6:45 AM	0	12	51	0	1	38	0	0	1	0	15	0	0	0	0	0	118	
6:50 AM	0	19	61	0	0	41	0	0	1	1	14	0	0	0	0	0	137	
6:55 AM	0	9	44	0	4	38	0	0	2	1	10	0	0	0	0	0	108	
7:00 AM	0	14	66	0	1	41	0	0	1	0	6	0	0	0	0	0	129	
7:05 AM	0	16	64	0	0	22	0	0	0	0	9	0	0	0	0	0	111	
7:10 AM	0	11	65	0	0	38	0	0	1	0	10	0	0	0	0	0	125	
7:15 AM	0	22	78	0	1	34	0	0	3	0	12	0	0	0	0	0	150	
7:20 AM	0	14	54	0	3	34	0	0	2	0	13	0	0	0	0	0	120	
7:25 AM	0	19	61	0	0	35	0	0	3	2	10	0	0	0	0	0	130	1564
7:30 AM	0	16	47	0	1	32	0	0	4	0	11	0	0	0	0	0	111	1525
7:35 AM	0	27	61	0	1	53	0	0	2	0	16	0	0	0	0	0	160	1544
7:40 AM	0	24	56	0	3	44	0	0	0	0	17	0	0	0	0	0	144	1543
7:45 AM	0	21	72	0	1	56	0	0	4	0	8	0	0	0	0	0	162	1587
7:50 AM	0	12	52	0	0	38	0	0	3	0	17	0	0	0	0	0	122	1572
7:55 AM	0	13	63	0	4	33	0	0	2	1	15	0	0	0	0	0	131	1595
8:00 AM	0	16	36	0	0	39	0	0	4	0	11	0	0	0	0	0	106	1572
8:05 AM	0	14	58	0	2	37	0	0	0	0	11	0	0	0	0	0	122	1583
8:10 AM	0	15	56	0	2	23	0	0	5	0	9	0	0	0	0	0	110	1568
8:15 AM	0	16	61	0	2	35	0	0	4	1	18	0	0	0	0	0	137	1555
8:20 AM	0	12	34	0	1	41	0	0	3	0	12	0	0	0	0	0	103	1538
8:25 AM	0	18	58	0	1	38	0	0	1	0	16	0	0	0	0	0	132	1540
8:30 AM	0	23	50	0	0	42	0	0	3	0	13	0	0	0	0	0	131	1560
8:35 AM	0	13	58	0	0	28	0	0	1	1	14	0	0	0	0	0	115	1515
8:40 AM	0	18	64	0	3	48	0	0	2	0	9	0	0	0	0	0	144	1515
8:45 AM	0	15	42	0	2	39	0	0	0	0	14	0	0	0	0	0	112	1465
8:50 AM	0	13	34	0	1	33	0	0	2	0	16	0	0	0	0	0	99	1442
8:55 AM	0	10	39	0	1	34	0	0	4	0	10	0	0	0	0	0	98	1409
9:00 AM	0	14	31	0	0	44	0	0	2	0	14	0	0	0	0	0	105	1408
9:05 AM	0	19	52	0	2	30	0	0	2	0	10	0	0	0	0	0	115	1401
9:10 AM	0	13	35	0	0	32	0	0	1	1	13	0	0	0	0	0	95	1386
9:15 AM	0	9	49	0	1	27	0	0	4	0	9	0	0	0	0	0	99	1348
9:20 AM	0	19	41	0	4	39	0	0	0	0	12	0	0	0	0	0	115	1360
9:25 AM	0	20	53	0	1	45	0	0	3	1	8	0	0	0	0	0	131	1359

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	288	756	0	20	612	0	0	24	0	164	0	0	0	0	0	1864
Heavy Trucks	0	16	8		12	64	0		8	0	8		0	0	0		116
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 6/20/2022 2:45 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

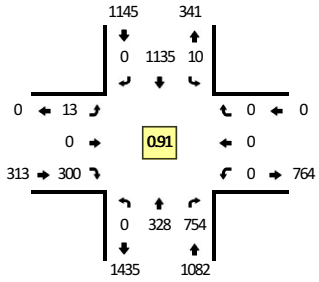
Type of peak hour being reported: Intersection Peak

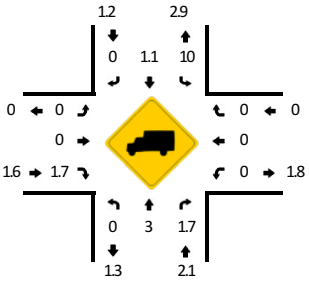
Method for determining peak hour: Total Entering Volume

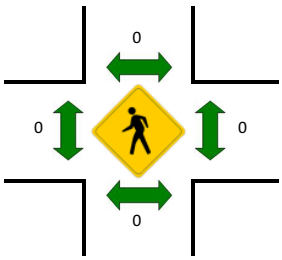
LOCATION: Kualakai Pkwy -- H1 Eastbound Ramps
CITY/STATE: Makakilo, HI

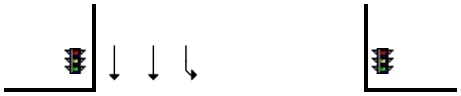
QC JOB #: 15845104
DATE: Thu, Jun 2 2022

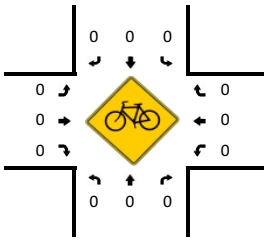
Peak-Hour: 3:25 PM -- 4:25 PM
Peak 15-Min: 3:40 PM -- 3:55 PM

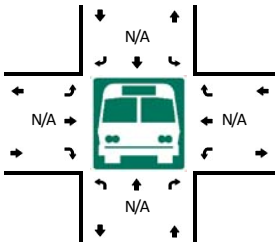


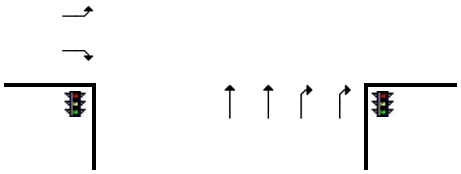


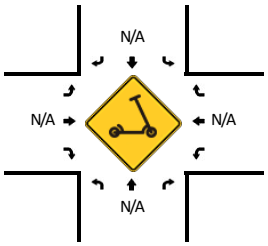












5-Min Count Period Beginning At	Kualakai Pkwy (Northbound)				Kualakai Pkwy (Southbound)				H1 Eastbound Ramps (Eastbound)				H1 Eastbound Ramps (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	0	29	54	0	2	70	0	0	4	0	19	0	0	0	0	0	178	
3:05 PM	0	18	58	0	3	79	0	0	1	0	16	0	0	0	0	0	175	
3:10 PM	0	29	50	0	1	77	0	0	1	0	19	0	0	0	0	0	177	
3:15 PM	0	20	40	0	5	88	0	0	1	1	24	0	0	0	0	0	179	
3:20 PM	0	32	53	0	0	76	0	0	0	0	16	0	0	0	0	0	177	
3:25 PM	0	24	60	0	1	94	0	0	0	0	12	0	0	0	0	0	191	
3:30 PM	0	39	90	0	1	81	0	0	0	0	23	0	0	0	0	0	234	
3:35 PM	0	27	74	0	1	86	0	0	0	0	19	0	0	0	0	0	207	
3:40 PM	0	33	84	0	3	100	0	0	1	0	31	0	0	0	0	0	252	
3:45 PM	0	20	77	0	1	117	0	0	1	0	20	0	0	0	0	0	236	
3:50 PM	0	24	56	0	0	96	0	0	1	0	32	0	0	0	0	0	209	
3:55 PM	0	26	57	0	0	75	0	0	4	0	17	0	0	0	0	0	179	2394
4:00 PM	0	24	54	0	0	111	0	0	1	0	25	0	0	0	0	0	215	2431
4:05 PM	0	25	50	0	0	79	0	0	0	0	26	0	0	0	0	0	180	2436
4:10 PM	0	30	53	0	1	86	0	0	2	0	26	0	0	0	0	0	198	2457
4:15 PM	0	25	37	0	2	103	0	0	1	0	39	0	0	0	0	0	207	2485
4:20 PM	0	31	62	0	0	107	0	0	2	0	30	0	0	0	0	0	232	2540
4:25 PM	0	23	26	0	0	96	0	0	0	0	32	0	0	0	0	0	177	2526
4:30 PM	0	21	53	0	0	124	0	0	0	2	29	0	0	0	0	0	229	2521
4:35 PM	0	30	47	0	4	92	0	0	0	0	24	0	0	0	0	0	197	2511
4:40 PM	0	22	44	0	2	93	0	0	2	0	30	0	0	0	0	0	193	2452
4:45 PM	0	27	46	0	1	78	0	0	0	0	18	0	0	0	0	0	170	2386
4:50 PM	0	21	39	0	1	124	0	0	0	0	21	0	0	0	0	0	206	2383
4:55 PM	0	27	33	0	1	96	0	0	0	0	29	0	0	0	0	0	186	2390
5:00 PM	0	19	50	0	0	90	0	0	2	0	15	0	0	0	0	0	176	2351
5:05 PM	0	27	33	0	0	99	0	0	2	0	20	0	0	0	0	0	181	2352
5:10 PM	0	27	51	0	0	92	0	0	0	1	28	0	0	0	0	0	199	2353
5:15 PM	0	27	41	0	0	102	0	1	0	0	20	0	0	0	0	0	191	2337
5:20 PM	0	14	55	0	0	95	0	0	3	0	21	0	0	0	0	0	188	2293
5:25 PM	0	14	50	0	0	102	0	0	2	0	18	0	0	0	0	0	186	2302
5:30 PM	0	22	41	0	1	90	0	0	2	1	17	0	0	0	0	0	174	2247
5:35 PM	0	29	50	0	0	95	0	0	1	1	20	0	0	0	0	0	196	2246
5:40 PM	0	21	42	0	1	81	0	0	1	0	18	0	0	0	0	0	164	2217
5:45 PM	0	20	46	0	0	104	0	0	0	0	21	0	0	0	0	0	191	2238
5:50 PM	0	18	29	0	1	95	0	0	0	0	12	0	0	0	0	0	155	2187
5:55 PM	0	18	39	0	0	113	0	0	1	0	12	0	0	0	0	0	183	2184

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	308	868	0	16	1252	0	0	12	0	332	0	0	0	0	0	2788
Heavy Trucks	0	12	12		4	24	0		0	0	8		0	0	0		60
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 6/20/2022 2:45 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of report: Tube Count - Vehicle Classification Data

LOCATION: Pueonani St north of H1 **QC JOB #:** 15845105
SPECIFIC LOCATION: **DIRECTION:** NB
CITY/STATE: Makakilo, HI **DATE:** Jun 2 2022

Start Time	Motorcycles	Cars & Trailer	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Not Classified	Total
12:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
12:15 AM	1	0	0	0	0	0	0	0	0	0	0	0	0		1
12:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
12:45 AM	1	0	0	0	0	0	0	0	0	0	0	0	0		1
01:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
01:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
01:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
01:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
02:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
02:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
02:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
02:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
03:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
03:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
03:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
03:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
04:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
04:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
04:30 AM	1	0	0	0	0	0	0	0	0	0	0	0	0		1
04:45 AM	1	0	0	0	0	0	0	0	0	0	0	0	0		1
05:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	0		1
05:15 AM	2	0	0	0	0	0	0	0	0	0	0	0	0		2
05:30 AM	6	0	1	0	0	0	0	0	0	0	0	0	0		7
05:45 AM	**12**	3	0	0	0	0	0	0	0	0	0	0	0		**15**
Day Total															
Percent															
ADT															
323															
AM Peak 15-min Vol															
PM Peak 15-min Vol															

Comments:

Report generated on 6/22/2022 9:45 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Note:Issues with the tube count resulted in heavy vehicle counts being taken from video coverage. A 4-bin classing was provided, and the headings are incorrect above: Motorcycles should be FHWA classes 1-3. Cars & trailers should be FHWA classes 4-7. 2 Axle Long should be FHWA classes 8-10. Buses should be FHWA classes 11-13.

Type of report: Tube Count - Vehicle Classification Data

LOCATION: Pueonani St north of H1 **QC JOB #:** 15845105
SPECIFIC LOCATION: **DIRECTION:** NB
CITY/STATE: Makakilo, HI **DATE:** Jun 2 2022

Start Time	Motorcycles	Cars & Trailer	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Not Classified	Total
06:00 AM	9	3	0	0	0	0	0	0	0	0	0	0	0		12
06:15 AM	8	7	0	0	0	0	0	0	0	0	0	0	0		15
06:30 AM	5	2	0	0	0	0	0	0	0	0	0	0	0		7
06:45 AM	2	4	1	0	0	0	0	0	0	0	0	0	0		7
07:00 AM	6	4	1	0	0	0	0	0	0	0	0	0	0		11
07:15 AM	6	5	1	0	0	0	0	0	0	0	0	0	0		12
07:30 AM	6	2	1	0	0	0	0	0	0	0	0	0	0		9
07:45 AM	7	5	1	0	0	0	0	0	0	0	0	0	0		13
08:00 AM	2	5	1	0	0	0	0	0	0	0	0	0	0		8
08:15 AM	2	6	2	0	0	0	0	0	0	0	0	0	0		10
08:30 AM	2	5	2	0	0	0	0	0	0	0	0	0	0		9
08:45 AM	3	4	1	0	0	0	0	0	0	0	0	0	0		8
09:00 AM	2	7	1	0	0	0	0	0	0	0	0	0	0		10
09:15 AM	4	5	1	0	0	0	0	0	0	0	0	0	0		10
09:30 AM	3	6	0	0	0	0	0	0	0	0	0	0	0		9
09:45 AM	3	1	1	0	0	0	0	0	0	0	0	0	0		5
10:00 AM	1	2	1	0	0	0	0	0	0	0	0	0	0		4
10:15 AM	4	5	2	0	0	0	0	0	0	0	0	0	0		11
10:30 AM	0	5	1	0	0	0	0	0	0	0	0	0	0		6
10:45 AM	1	7	0	0	0	0	0	0	0	0	0	0	0		8
11:00 AM	2	5	0	0	0	0	0	0	0	0	0	0	0		7
11:15 AM	1	6	1	0	0	0	0	0	0	0	0	0	0		8
11:30 AM	1	4	2	0	0	0	0	0	0	0	0	0	0		7
11:45 AM	3	3	2	0	0	0	0	0	0	0	0	0	0		8
Day Total															
Percent															
ADT 323															
AM Peak 15-min Vol															
PM Peak 15-min Vol															

Comments:

Report generated on 6/22/2022 9:45 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Note:Issues with the tube count resulted in heavy vehicle counts being taken from video coverage. A 4-bin classing was provided, and the headings are incorrect above: Motorcycles should be FHWA classes 1-3. Cars & trailers should be FHWA classes 4-7. 2 Axle Long should be FHWA classes 8-10. Buses should be FHWA classes 11-13.

Type of report: Tube Count - Vehicle Classification Data

LOCATION: Pueonani St north of H1 **QC JOB #:** 15845105
SPECIFIC LOCATION: **DIRECTION:** NB
CITY/STATE: Makakilo, HI **DATE:** Jun 2 2022

Start Time	Motorcycles	Cars & Trailer	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Not Classified	Total
12:00 PM	2	1	0	0	0	0	0	0	0	0	0	0	0		3
12:15 PM	2	**10**	0	0	0	0	0	0	0	0	0	0	0		**12**
12:30 PM	3	3	2	0	0	0	0	0	0	0	0	0	0		8
12:45 PM	2	3	**3**	0	0	0	0	0	0	0	0	0	0		8
01:00 PM	0	1	0	0	0	0	0	0	0	0	0	0	0		1
01:15 PM	1	4	0	0	0	0	0	0	0	0	0	0	0		5
01:30 PM	1	5	1	0	0	0	0	0	0	0	0	0	0		7
01:45 PM	1	0	1	0	0	0	0	0	0	0	0	0	0		2
02:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
02:15 PM	4	2	1	0	0	0	0	0	0	0	0	0	0		7
02:30 PM	0	1	0	0	0	0	0	0	0	0	0	0	0		1
02:45 PM	1	1	0	0	0	0	0	0	0	0	0	0	0		2
03:00 PM	2	1	0	0	0	0	0	0	0	0	0	0	0		3
03:15 PM	1	1	0	0	0	0	0	0	0	0	0	0	0		2
03:30 PM	2	0	0	0	0	0	0	0	0	0	0	0	0		2
03:45 PM	2	0	0	0	0	0	0	0	0	0	0	0	0		2
04:00 PM	1	0	0	0	0	0	0	0	0	0	0	0	0		1
04:15 PM	3	1	0	0	0	0	0	0	0	0	0	0	0		4
04:30 PM	2	0	1	0	0	0	0	0	0	0	0	0	0		3
04:45 PM	**5**	0	0	0	0	0	0	0	0	0	0	0	0		5
05:00 PM	1	0	0	0	0	0	0	0	0	0	0	0	0		1
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
Day Total															
Percent															
ADT 323															
AM Peak 15-min Vol															
PM Peak 15-min Vol															

Comments:

Report generated on 6/22/2022 9:45 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Note:Issues with the tube count resulted in heavy vehicle counts being taken from video coverage. A 4-bin classing was provided, and the headings are incorrect above: Motorcycles should be FHWA classes 1-3. Cars & trailers should be FHWA classes 4-7. 2 Axle Long should be FHWA classes 8-10. Buses should be FHWA classes 11-13.

Type of report: Tube Count - Vehicle Classification Data

LOCATION: Pueonani St north of H1 **QC JOB #:** 15845105
SPECIFIC LOCATION: **DIRECTION:** NB
CITY/STATE: Makakilo, HI **DATE:** Jun 2 2022

Start Time	Motorcycles	Cars & Trailer	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Not Classified	Total
06:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
06:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
06:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
06:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
07:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
07:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
07:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
07:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
08:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
08:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
08:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
08:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
09:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
09:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
09:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
09:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
10:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
10:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
10:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
10:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
11:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
11:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
11:30 PM	1	0	0	0	0	0	0	0	0	0	0	0	0		1
11:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
Day Total	144	146	33	0	0	0	0	0	0	0	0	0	0		323
Percent	44.6%	45.2%	10.2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		
ADT 323															
AM Peak	5:45 AM	6:15 AM	8:15 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM		5:45 AM
15-min Vol	12	7	2	0	0	0	0	0	0	0	0	0	0		15
PM Peak	4:45 PM	12:15 PM	12:45 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM		12:15 PM
15-min Vol	5	10	3	0	0	0	0	0	0	0	0	0	0		12

Comments:

Report generated on 6/22/2022 9:45 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Note:Issues with the tube count resulted in heavy vehicle counts being taken from video coverage. A 4-bin classing was provided, and the headings are incorrect above: Motorcycles should be FHWA classes 1-3. Cars & trailers should be FHWA classes 4-7. 2 Axle Long should be FHWA classes 8-10. Buses should be FHWA classes 11-13.

Type of report: Tube Count - Vehicle Classification Data

SUMMARY - Tube Count - Vehicle Classification Data

LOCATION: Pueonani St north of H1
SPECIFIC LOCATION:
CITY/STATE: Makakilo, HI

QC JOB #: 15845105
DIRECTION: NB
DATE: Jun 2 2022

	Motorcycles	Cars & Trailer	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Not Classified	Total
Grand Total	144	146	33	0	0	0	0	0	0	0	0	0	0		323
Percent	44.6%	45.2%	10.2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		
ADT 323															

Comments:

Report generated on 6/22/2022 9:45 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Note:Issues with the tube count resulted in heavy vehicle counts being taken from video coverage. A 4-bin classing was provided, and the headings are incorrect above: Motorcycles should be FHWA classes 1-3. Cars & trailers should be FHWA classes 4-7. 2 Axle Long should be FHWA classes 8-10. Buses should be FHWA classes 11-13.

Type of report: Tube Count - Volume Data

LOCATION: Pueonani St north of H1 **QC JOB #:** 15845105

SPECIFIC LOCATION: **DIRECTION:** NB

CITY/STATE: Makakilo, HI **DATE:** Jun 2 2022 - Jun 2 2022

Start Time	Mon	Tue	Wed	Thu 2 Jun 22	Fri	Average Weekday 15-min Traffic	Sat	Sun	Average Week 15-min Traffic	Average Week Profile
12:00 AM				0		0			0	
12:15 AM				1		1			1	
12:30 AM				0		0			0	
12:45 AM				1		1			1	
01:00 AM				0		0			0	
01:15 AM				0		0			0	
01:30 AM				0		0			0	
01:45 AM				0		0			0	
02:00 AM				0		0			0	
02:15 AM				0		0			0	
02:30 AM				0		0			0	
02:45 AM				0		0			0	
03:00 AM				0		0			0	
03:15 AM				0		0			0	
03:30 AM				0		0			0	
03:45 AM				0		0			0	
04:00 AM				0		0			0	
04:15 AM				0		0			0	
04:30 AM				1		1			1	
04:45 AM				1		1			1	
05:00 AM				1		1			1	
05:15 AM				2		2			2	
05:30 AM				7		7			7	
05:45 AM				**15**		**15**			**15**	
Day Total										
% Weekday Average										
% Week Average										
AM Peak 15-min Vol										
PM Peak 15-min Vol										

Comments:

Report generated on 6/22/2022 9:45 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of report: Tube Count - Volume Data

LOCATION: Pueonani St north of H1 **QC JOB #:** 15845105

SPECIFIC LOCATION: **DIRECTION:** NB

CITY/STATE: Makakilo, HI **DATE:** Jun 2 2022 - Jun 2 2022

Start Time	Mon	Tue	Wed	Thu 2 Jun 22	Fri	Average Weekday 15-min Traffic	Sat	Sun	Average Week 15-min Traffic	Average Week Profile
06:00 AM				12		12			12	
06:15 AM				15		15			15	
06:30 AM				7		7			7	
06:45 AM				7		7			7	
07:00 AM				11		11			11	
07:15 AM				12		12			12	
07:30 AM				9		9			9	
07:45 AM				13		13			13	
08:00 AM				8		8			8	
08:15 AM				10		10			10	
08:30 AM				9		9			9	
08:45 AM				8		8			8	
09:00 AM				10		10			10	
09:15 AM				10		10			10	
09:30 AM				9		9			9	
09:45 AM				5		5			5	
10:00 AM				4		4			4	
10:15 AM				11		11			11	
10:30 AM				6		6			6	
10:45 AM				8		8			8	
11:00 AM				7		7			7	
11:15 AM				8		8			8	
11:30 AM				7		7			7	
11:45 AM				8		8			8	
Day Total										
% Weekday Average										
% Week Average										
AM Peak 15-min Vol										
PM Peak 15-min Vol										

Comments:

Report generated on 6/22/2022 9:45 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of report: Tube Count - Volume Data

LOCATION: Pueonani St north of H1 **QC JOB #:** 15845105

SPECIFIC LOCATION: **DIRECTION:** NB

CITY/STATE: Makakilo, HI **DATE:** Jun 2 2022 - Jun 2 2022

Start Time	Mon	Tue	Wed	Thu 2 Jun 22	Fri	Average Weekday 15-min Traffic	Sat	Sun	Average Week 15-min Traffic	Average Week Profile
12:00 PM				3		3			3	
12:15 PM				**12**		**12**			**12**	
12:30 PM				8		8			8	
12:45 PM				8		8			8	
01:00 PM				1		1			1	
01:15 PM				5		5			5	
01:30 PM				7		7			7	
01:45 PM				2		2			2	
02:00 PM				0		0			0	
02:15 PM				7		7			7	
02:30 PM				1		1			1	
02:45 PM				2		2			2	
03:00 PM				3		3			3	
03:15 PM				2		2			2	
03:30 PM				2		2			2	
03:45 PM				2		2			2	
04:00 PM				1		1			1	
04:15 PM				4		4			4	
04:30 PM				3		3			3	
04:45 PM				5		5			5	
05:00 PM				1		1			1	
05:15 PM				0		0			0	
05:30 PM				0		0			0	
05:45 PM				0		0			0	
Day Total										
% Weekday Average										
% Week Average										
AM Peak 15-min Vol										
PM Peak 15-min Vol										

Comments:

Report generated on 6/22/2022 9:45 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of report: Tube Count - Volume Data

LOCATION: Pueonani St north of H1 **QC JOB #:** 15845105

SPECIFIC LOCATION: **DIRECTION:** NB

CITY/STATE: Makakilo, HI **DATE:** Jun 2 2022 - Jun 2 2022

Start Time	Mon	Tue	Wed	Thu 2 Jun 22	Fri	Average Weekday 15-min Traffic	Sat	Sun	Average Week 15-min Traffic	Average Week Profile
06:00 PM				0		0			0	
06:15 PM				0		0			0	
06:30 PM				0		0			0	
06:45 PM				0		0			0	
07:00 PM				0		0			0	
07:15 PM				0		0			0	
07:30 PM				0		0			0	
07:45 PM				0		0			0	
08:00 PM				0		0			0	
08:15 PM				0		0			0	
08:30 PM				0		0			0	
08:45 PM				0		0			0	
09:00 PM				0		0			0	
09:15 PM				0		0			0	
09:30 PM				0		0			0	
09:45 PM				0		0			0	
10:00 PM				0		0			0	
10:15 PM				0		0			0	
10:30 PM				0		0			0	
10:45 PM				0		0			0	
11:00 PM				0		0			0	
11:15 PM				0		0			0	
11:30 PM				1		1			1	
11:45 PM				0		0			0	
Day Total				323		323			323	
% Weekday Average				100%						
% Week Average				100%		100%				
AM Peak 15-min Vol				5:45 AM 15		5:45 AM 15			5:45 AM 15	
PM Peak 15-min Vol				12:15 PM 12		12:15 PM 12			12:15 PM 12	

Comments:

Report generated on 6/22/2022 9:45 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of report: Tube Count - Vehicle Classification Data

LOCATION: Pueonani St north of H1 **QC JOB #:** 15845105
SPECIFIC LOCATION: **DIRECTION:** SB
CITY/STATE: Makakilo, HI **DATE:** Jun 2 2022

Start Time	Motorcycles	Cars & Trailer	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Not Classified	Total
12:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
12:15 AM	1	0	0	0	0	0	0	0	0	0	0	0	0		1
12:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
12:45 AM	1	0	0	0	0	0	0	0	0	0	0	0	0		1
01:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
01:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
01:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
01:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
02:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
02:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
02:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
02:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
03:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
03:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
03:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
03:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
04:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
04:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
04:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
04:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
05:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
05:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
05:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
05:45 AM	0	1	0	0	0	0	0	0	0	0	0	0	0		1
Day Total															
Percent															
ADT 327															
AM Peak 15-min Vol															
PM Peak 15-min Vol															

Comments:

Report generated on 6/22/2022 9:45 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Note:Issues with the tube count resulted in heavy vehicle counts being taken from video coverage. A 4-bin classing was provided, and the headings are incorrect above: Motorcycles should be FHWA classes 1-3. Cars & trailers should be FHWA classes 4-7. 2 Axle Long should be FHWA classes 8-10. Buses should be FHWA classes 11-13.

Type of report: Tube Count - Vehicle Classification Data

LOCATION: Pueonani St north of H1 **QC JOB #:** 15845105
SPECIFIC LOCATION: **DIRECTION:** SB
CITY/STATE: Makakilo, HI **DATE:** Jun 2 2022

Start Time	Motorcycles	Cars & Trailer	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Not Classified	Total
06:00 AM	1	0	0	0	0	0	0	0	0	0	0	0	0		1
06:15 AM	3	2	0	0	0	0	0	0	0	0	0	0	0		5
06:30 AM	0	1	0	0	0	0	0	0	0	0	0	0	0		1
06:45 AM	0	**8**	3	0	0	0	0	0	0	0	0	0	0		11
07:00 AM	2	5	0	0	0	0	0	0	0	0	0	0	0		7
07:15 AM	1	5	0	0	0	0	0	0	0	0	0	0	0		6
07:30 AM	2	4	0	0	0	0	0	0	0	0	0	0	0		6
07:45 AM	**7**	6	2	0	0	0	0	0	0	0	0	0	0		**15**
08:00 AM	0	6	0	0	0	0	0	0	0	0	0	0	0		6
08:15 AM	4	4	2	0	0	0	0	0	0	0	0	0	0		10
08:30 AM	0	6	0	0	0	0	0	0	0	0	0	0	0		6
08:45 AM	0	5	**4**	0	0	0	0	0	0	0	0	0	0		9
09:00 AM	1	3	1	0	0	0	0	0	0	0	0	0	0		5
09:15 AM	1	6	1	0	0	0	0	0	0	0	0	0	0		8
09:30 AM	3	4	1	0	0	0	0	0	0	0	0	0	0		8
09:45 AM	1	4	1	0	0	0	0	0	0	0	0	0	0		6
10:00 AM	3	4	0	0	0	0	0	0	0	0	0	0	0		7
10:15 AM	2	2	2	0	0	0	0	0	0	0	0	0	0		6
10:30 AM	3	3	2	0	0	0	0	0	0	0	0	0	0		8
10:45 AM	2	7	0	0	0	0	0	0	0	0	0	0	0		9
11:00 AM	4	5	1	0	0	0	0	0	0	0	0	0	0		10
11:15 AM	5	4	0	0	0	0	0	0	0	0	0	0	0		9
11:30 AM	4	5	0	0	0	0	0	0	0	0	0	0	0		9
11:45 AM	4	4	1	0	0	0	0	0	0	0	0	0	0		9
Day Total															
Percent															
ADT 327															
AM Peak 15-min Vol															
PM Peak 15-min Vol															

Comments:

Report generated on 6/22/2022 9:45 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Note:Issues with the tube count resulted in heavy vehicle counts being taken from video coverage. A 4-bin classing was provided, and the headings are incorrect above: Motorcycles should be FHWA classes 1-3. Cars & trailers should be FHWA classes 4-7. 2 Axle Long should be FHWA classes 8-10. Buses should be FHWA classes 11-13.

Type of report: Tube Count - Vehicle Classification Data

LOCATION: Pueonani St north of H1 **QC JOB #:** 15845105
SPECIFIC LOCATION: **DIRECTION:** SB
CITY/STATE: Makakilo, HI **DATE:** Jun 2 2022

Start Time	Motorcycles	Cars & Trailer	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Not Classified	Total
12:00 PM	3	5	**3**	0	0	0	0	0	0	0	0	0	0		11
12:15 PM	1	5	1	0	0	0	0	0	0	0	0	0	0		7
12:30 PM	4	3	0	0	0	0	0	0	0	0	0	0	0		7
12:45 PM	1	**8**	1	0	0	0	0	0	0	0	0	0	0		10
01:00 PM	0	4	1	0	0	0	0	0	0	0	0	0	0		5
01:15 PM	0	2	0	0	0	0	0	0	0	0	0	0	0		2
01:30 PM	1	0	0	0	0	0	0	0	0	0	0	0	0		1
01:45 PM	3	6	1	0	0	0	0	0	0	0	0	0	0		10
02:00 PM	2	1	1	0	0	0	0	0	0	0	0	0	0		4
02:15 PM	2	1	0	0	0	0	0	0	0	0	0	0	0		3
02:30 PM	**14**	1	2	0	0	0	0	0	0	0	0	0	0		**17**
02:45 PM	10	0	2	0	0	0	0	0	0	0	0	0	0		12
03:00 PM	9	0	0	0	0	0	0	0	0	0	0	0	0		9
03:15 PM	5	1	0	0	0	0	0	0	0	0	0	0	0		6
03:30 PM	3	0	0	0	0	0	0	0	0	0	0	0	0		3
03:45 PM	2	0	0	0	0	0	0	0	0	0	0	0	0		2
04:00 PM	3	0	0	0	0	0	0	0	0	0	0	0	0		3
04:15 PM	8	1	0	0	0	0	0	0	0	0	0	0	0		9
04:30 PM	11	1	0	0	0	0	0	0	0	0	0	0	0		12
04:45 PM	8	0	0	0	0	0	0	0	0	0	0	0	0		8
05:00 PM	1	0	1	0	0	0	0	0	0	0	0	0	0		2
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
05:30 PM	1	0	0	0	0	0	0	0	0	0	0	0	0		1
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
Day Total															
Percent															
ADT															
327															
AM Peak 15-min Vol															
PM Peak 15-min Vol															

Comments:

Report generated on 6/22/2022 9:45 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Note:Issues with the tube count resulted in heavy vehicle counts being taken from video coverage. A 4-bin classing was provided, and the headings are incorrect above: Motorcycles should be FHWA classes 1-3. Cars & trailers should be FHWA classes 4-7. 2 Axle Long should be FHWA classes 8-10. Buses should be FHWA classes 11-13.

Type of report: Tube Count - Vehicle Classification Data

LOCATION: Pueonani St north of H1 **QC JOB #:** 15845105
SPECIFIC LOCATION: **DIRECTION:** SB
CITY/STATE: Makakilo, HI **DATE:** Jun 2 2022

Start Time	Motorcycles	Cars & Trailer	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Not Classified	Total
06:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
06:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
06:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
06:45 PM	1	0	0	0	0	0	0	0	0	0	0	0	0		1
07:00 PM	1	0	0	0	0	0	0	0	0	0	0	0	0		1
07:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
07:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
07:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
08:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
08:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
08:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
08:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
09:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
09:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
09:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
09:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
10:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
10:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
10:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
10:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
11:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
11:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
11:30 PM	1	0	0	0	0	0	0	0	0	0	0	0	0		1
11:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0		0
Day Total	150	143	34	0	0	0	0	0	0	0	0	0	0		327
Percent	45.9%	43.7%	10.4%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		
ADT 327															
AM Peak	7:45 AM	6:45 AM	8:45 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM		7:45 AM
15-min Vol	7	8	4	0	0	0	0	0	0	0	0	0	0		15
PM Peak	2:30 PM	12:45 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM		2:30 PM
15-min Vol	14	8	3	0	0	0	0	0	0	0	0	0	0		17

Comments:

Report generated on 6/22/2022 9:45 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Note:Issues with the tube count resulted in heavy vehicle counts being taken from video coverage. A 4-bin classing was provided, and the headings are incorrect above: Motorcycles should be FHWA classes 1-3. Cars & trailers should be FHWA classes 4-7. 2 Axle Long should be FHWA classes 8-10. Buses should be FHWA classes 11-13.

Type of report: Tube Count - Vehicle Classification Data

SUMMARY - Tube Count - Vehicle Classification Data

LOCATION: Pueonani St north of H1 **QC JOB #:** 15845105
SPECIFIC LOCATION: **DIRECTION:** SB
CITY/STATE: Makakilo, HI **DATE:** Jun 2 2022

	Motorcycles	Cars & Trailer	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Not Classified	Total
Grand Total	150	143	34	0	0	0	0	0	0	0	0	0	0		327
Percent	45.9%	43.7%	10.4%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		
ADT 327															

Comments:

Report generated on 6/22/2022 9:45 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Note:Issues with the tube count resulted in heavy vehicle counts being taken from video coverage. A 4-bin classing was provided, and the headings are incorrect above: Motorcycles should be FHWA classes 1-3. Cars & trailers should be FHWA classes 4-7. 2 Axle Long should be FHWA classes 8-10. Buses should be FHWA classes 11-13.

Type of report: Tube Count - Volume Data

LOCATION: Pueonani St north of H1 **QC JOB #:** 15845105

SPECIFIC LOCATION: **DIRECTION:** SB

CITY/STATE: Makakilo, HI **DATE:** Jun 2 2022 - Jun 2 2022

Start Time	Mon	Tue	Wed	Thu 2 Jun 22	Fri	Average Weekday 15-min Traffic	Sat	Sun	Average Week 15-min Traffic	Average Week Profile
12:00 AM				0		0			0	
12:15 AM				1		1			1	
12:30 AM				0		0			0	
12:45 AM				1		1			1	
01:00 AM				0		0			0	
01:15 AM				0		0			0	
01:30 AM				0		0			0	
01:45 AM				0		0			0	
02:00 AM				0		0			0	
02:15 AM				0		0			0	
02:30 AM				0		0			0	
02:45 AM				0		0			0	
03:00 AM				0		0			0	
03:15 AM				0		0			0	
03:30 AM				0		0			0	
03:45 AM				0		0			0	
04:00 AM				0		0			0	
04:15 AM				0		0			0	
04:30 AM				0		0			0	
04:45 AM				0		0			0	
05:00 AM				0		0			0	
05:15 AM				0		0			0	
05:30 AM				0		0			0	
05:45 AM				1		1			1	
Day Total										
% Weekday Average										
% Week Average										
AM Peak 15-min Vol										
PM Peak 15-min Vol										

Comments:

Report generated on 6/22/2022 9:45 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of report: Tube Count - Volume Data

LOCATION: Pueonani St north of H1 **QC JOB #:** 15845105

SPECIFIC LOCATION: **DIRECTION:** SB

CITY/STATE: Makakilo, HI **DATE:** Jun 2 2022 - Jun 2 2022

Start Time	Mon	Tue	Wed	Thu 2 Jun 22	Fri	Average Weekday 15-min Traffic	Sat	Sun	Average Week 15-min Traffic	Average Week Profile
06:00 AM				1		1			1	
06:15 AM				5		5			5	
06:30 AM				1		1			1	
06:45 AM				11		11			11	
07:00 AM				7		7			7	
07:15 AM				6		6			6	
07:30 AM				6		6			6	
07:45 AM				**15**		**15**			**15**	
08:00 AM				6		6			6	
08:15 AM				10		10			10	
08:30 AM				6		6			6	
08:45 AM				9		9			9	
09:00 AM				5		5			5	
09:15 AM				8		8			8	
09:30 AM				8		8			8	
09:45 AM				6		6			6	
10:00 AM				7		7			7	
10:15 AM				6		6			6	
10:30 AM				8		8			8	
10:45 AM				9		9			9	
11:00 AM				10		10			10	
11:15 AM				9		9			9	
11:30 AM				9		9			9	
11:45 AM				9		9			9	
Day Total										
% Weekday Average										
% Week Average										
AM Peak 15-min Vol										
PM Peak 15-min Vol										

Comments:

Report generated on 6/22/2022 9:45 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of report: Tube Count - Volume Data

LOCATION: Pueonani St north of H1 **QC JOB #:** 15845105

SPECIFIC LOCATION: **DIRECTION:** SB

CITY/STATE: Makakilo, HI **DATE:** Jun 2 2022 - Jun 2 2022

Start Time	Mon	Tue	Wed	Thu 2 Jun 22	Fri	Average Weekday 15-min Traffic	Sat	Sun	Average Week 15-min Traffic	Average Week Profile
12:00 PM				11		11			11	
12:15 PM				7		7			7	
12:30 PM				7		7			7	
12:45 PM				10		10			10	
01:00 PM				5		5			5	
01:15 PM				2		2			2	
01:30 PM				1		1			1	
01:45 PM				10		10			10	
02:00 PM				4		4			4	
02:15 PM				3		3			3	
02:30 PM				**17**		**17**			**17**	
02:45 PM				12		12			12	
03:00 PM				9		9			9	
03:15 PM				6		6			6	
03:30 PM				3		3			3	
03:45 PM				2		2			2	
04:00 PM				3		3			3	
04:15 PM				9		9			9	
04:30 PM				12		12			12	
04:45 PM				8		8			8	
05:00 PM				2		2			2	
05:15 PM				0		0			0	
05:30 PM				1		1			1	
05:45 PM				0		0			0	
Day Total										
% Weekday Average										
% Week Average										
AM Peak 15-min Vol										
PM Peak 15-min Vol										

Comments:

Report generated on 6/22/2022 9:45 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of report: Tube Count - Volume Data

LOCATION: Pueonani St north of H1 **QC JOB #:** 15845105

SPECIFIC LOCATION: **DIRECTION:** SB

CITY/STATE: Makakilo, HI **DATE:** Jun 2 2022 - Jun 2 2022

Start Time	Mon	Tue	Wed	Thu 2 Jun 22	Fri	Average Weekday 15-min Traffic	Sat	Sun	Average Week 15-min Traffic	Average Week Profile
06:00 PM				0		0			0	
06:15 PM				0		0			0	
06:30 PM				0		0			0	
06:45 PM				1		1			1	
07:00 PM				1		1			1	
07:15 PM				0		0			0	
07:30 PM				0		0			0	
07:45 PM				0		0			0	
08:00 PM				0		0			0	
08:15 PM				0		0			0	
08:30 PM				0		0			0	
08:45 PM				0		0			0	
09:00 PM				0		0			0	
09:15 PM				0		0			0	
09:30 PM				0		0			0	
09:45 PM				0		0			0	
10:00 PM				0		0			0	
10:15 PM				0		0			0	
10:30 PM				0		0			0	
10:45 PM				0		0			0	
11:00 PM				0		0			0	
11:15 PM				0		0			0	
11:30 PM				1		1			1	
11:45 PM				0		0			0	
Day Total				327		327			327	
% Weekday Average				100%						
% Week Average				100%		100%				
AM Peak 15-min Vol				7:45 AM 15		7:45 AM 15			7:45 AM 15	
PM Peak 15-min Vol				2:30 PM 17		2:30 PM 17			2:30 PM 17	

Comments:

Report generated on 6/22/2022 9:45 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of report: Tube Count - Vehicle Classification Data

LOCATION: Pueonani St north of H1 **QC JOB #:** 15845105
SPECIFIC LOCATION: **DIRECTION:** NB, SB
CITY/STATE: Makakilo, HI **DATE:** Jun 2 2022

Start Time	Motorcycles	Cars & Trailer	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Not Classified	Total
12:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 AM	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
12:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 AM	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
01:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 AM	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
04:45 AM	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
05:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
05:15 AM	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
05:30 AM	6	0	1	0	0	0	0	0	0	0	0	0	0	0	7
05:45 AM	12	4	0	0	0	0	0	0	0	0	0	0	0	0	16
Day Total															
Percent															
ADT 650															
AM Peak 15-min Vol															
PM Peak 15-min Vol															

Comments:

Report generated on 6/22/2022 9:45 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Note:Issues with the tube count resulted in heavy vehicle counts being taken from video coverage. A 4-bin classing was provided, and the headings are incorrect above: Motorcycles should be FHWA classes 1-3. Cars & trailers should be FHWA classes 4-7. 2 Axle Long should be FHWA classes 8-10. Buses should be FHWA classes 11-13.

Type of report: Tube Count - Vehicle Classification Data

LOCATION: Pueonani St north of H1 **QC JOB #:** 15845105
SPECIFIC LOCATION: **DIRECTION:** NB, SB
CITY/STATE: Makakilo, HI **DATE:** Jun 2 2022

Start Time	Motorcycles	Cars & Trailer	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Not Classified	Total
06:00 AM	10	3	0	0	0	0	0	0	0	0	0	0	0	0	13
06:15 AM	11	9	0	0	0	0	0	0	0	0	0	0	0	0	20
06:30 AM	5	3	0	0	0	0	0	0	0	0	0	0	0	0	8
06:45 AM	2	12	4	0	0	0	0	0	0	0	0	0	0	0	18
07:00 AM	8	9	1	0	0	0	0	0	0	0	0	0	0	0	18
07:15 AM	7	10	1	0	0	0	0	0	0	0	0	0	0	0	18
07:30 AM	8	6	1	0	0	0	0	0	0	0	0	0	0	0	15
07:45 AM	**14**	11	3	0	0	0	0	0	0	0	0	0	0	0	**28**
08:00 AM	2	11	1	0	0	0	0	0	0	0	0	0	0	0	14
08:15 AM	6	10	4	0	0	0	0	0	0	0	0	0	0	0	20
08:30 AM	2	11	2	0	0	0	0	0	0	0	0	0	0	0	15
08:45 AM	3	9	**5**	0	0	0	0	0	0	0	0	0	0	0	17
09:00 AM	3	10	2	0	0	0	0	0	0	0	0	0	0	0	15
09:15 AM	5	11	2	0	0	0	0	0	0	0	0	0	0	0	18
09:30 AM	6	10	1	0	0	0	0	0	0	0	0	0	0	0	17
09:45 AM	4	5	2	0	0	0	0	0	0	0	0	0	0	0	11
10:00 AM	4	6	1	0	0	0	0	0	0	0	0	0	0	0	11
10:15 AM	6	7	4	0	0	0	0	0	0	0	0	0	0	0	17
10:30 AM	3	8	3	0	0	0	0	0	0	0	0	0	0	0	14
10:45 AM	3	**14**	0	0	0	0	0	0	0	0	0	0	0	0	17
11:00 AM	6	10	1	0	0	0	0	0	0	0	0	0	0	0	17
11:15 AM	6	10	1	0	0	0	0	0	0	0	0	0	0	0	17
11:30 AM	5	9	2	0	0	0	0	0	0	0	0	0	0	0	16
11:45 AM	7	7	3	0	0	0	0	0	0	0	0	0	0	0	17
Day Total															
Percent															
ADT 650															
AM Peak 15-min Vol															
PM Peak 15-min Vol															

Comments:

Report generated on 6/22/2022 9:45 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Note:Issues with the tube count resulted in heavy vehicle counts being taken from video coverage. A 4-bin classing was provided, and the headings are incorrect above: Motorcycles should be FHWA classes 1-3. Cars & trailers should be FHWA classes 4-7. 2 Axle Long should be FHWA classes 8-10. Buses should be FHWA classes 11-13.

Type of report: Tube Count - Vehicle Classification Data

LOCATION: Pueonani St north of H1 **QC JOB #:** 15845105
SPECIFIC LOCATION: **DIRECTION:** NB, SB
CITY/STATE: Makakilo, HI **DATE:** Jun 2 2022

Start Time	Motorcycles	Cars & Trailer	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Not Classified	Total
12:00 PM	5	6	3	0	0	0	0	0	0	0	0	0	0	0	14
12:15 PM	3	**15**	1	0	0	0	0	0	0	0	0	0	0	0	**19**
12:30 PM	7	6	2	0	0	0	0	0	0	0	0	0	0	0	15
12:45 PM	3	11	**4**	0	0	0	0	0	0	0	0	0	0	0	18
01:00 PM	0	5	1	0	0	0	0	0	0	0	0	0	0	0	6
01:15 PM	1	6	0	0	0	0	0	0	0	0	0	0	0	0	7
01:30 PM	2	5	1	0	0	0	0	0	0	0	0	0	0	0	8
01:45 PM	4	6	2	0	0	0	0	0	0	0	0	0	0	0	12
02:00 PM	2	1	1	0	0	0	0	0	0	0	0	0	0	0	4
02:15 PM	6	3	1	0	0	0	0	0	0	0	0	0	0	0	10
02:30 PM	**14**	2	2	0	0	0	0	0	0	0	0	0	0	0	18
02:45 PM	11	1	2	0	0	0	0	0	0	0	0	0	0	0	14
03:00 PM	11	1	0	0	0	0	0	0	0	0	0	0	0	0	12
03:15 PM	6	2	0	0	0	0	0	0	0	0	0	0	0	0	8
03:30 PM	5	0	0	0	0	0	0	0	0	0	0	0	0	0	5
03:45 PM	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4
04:00 PM	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4
04:15 PM	11	2	0	0	0	0	0	0	0	0	0	0	0	0	13
04:30 PM	13	1	1	0	0	0	0	0	0	0	0	0	0	0	15
04:45 PM	13	0	0	0	0	0	0	0	0	0	0	0	0	0	13
05:00 PM	2	0	1	0	0	0	0	0	0	0	0	0	0	0	3
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Day Total															
Percent															
ADT 650															
AM Peak 15-min Vol															
PM Peak 15-min Vol															

Comments:

Report generated on 6/22/2022 9:45 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Note:Issues with the tube count resulted in heavy vehicle counts being taken from video coverage. A 4-bin classing was provided, and the headings are incorrect above: Motorcycles should be FHWA classes 1-3. Cars & trailers should be FHWA classes 4-7. 2 Axle Long should be FHWA classes 8-10. Buses should be FHWA classes 11-13.

Type of report: Tube Count - Vehicle Classification Data

LOCATION: Pueonani St north of H1 **QC JOB #:** 15845105
SPECIFIC LOCATION: **DIRECTION:** NB, SB
CITY/STATE: Makakilo, HI **DATE:** Jun 2 2022

Start Time	Motorcycles	Cars & Trailer	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Not Classified	Total
06:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:45 PM	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
07:00 PM	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
07:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 PM	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
11:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Day Total	294	289	67	0	0	0	0	0	0	0	0	0	0	0	650
Percent	45.2%	44.5%	10.3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
ADT 650															
AM Peak	7:45 AM	10:45 AM	8:45 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	7:45 AM
15-min Vol	14	14	5	0	0	0	0	0	0	0	0	0	0	0	28
PM Peak	2:30 PM	12:15 PM	12:45 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:15 PM
15-min Vol	14	15	4	0	0	0	0	0	0	0	0	0	0	0	19

Comments:

Report generated on 6/22/2022 9:45 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Note:Issues with the tube count resulted in heavy vehicle counts being taken from video coverage. A 4-bin classing was provided, and the headings are incorrect above: Motorcycles should be FHWA classes 1-3. Cars & trailers should be FHWA classes 4-7. 2 Axle Long should be FHWA classes 8-10. Buses should be FHWA classes 11-13.

Type of report: Tube Count - Vehicle Classification Data

SUMMARY - Tube Count - Vehicle Classification Data

LOCATION: Pueonani St north of H1
SPECIFIC LOCATION:
CITY/STATE: Makakilo, HI

QC JOB #: 15845105
DIRECTION: NB, SB
DATE: Jun 2 2022

	Motorcycles	Cars & Trailer	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Not Classified	Total
Grand Total	294	289	67	0	0	0	0	0	0	0	0	0	0	0	650
Percent	45.2%	44.5%	10.3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	

ADT
650

Comments:

Report generated on 6/22/2022 9:45 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Note:Issues with the tube count resulted in heavy vehicle counts being taken from video coverage. A 4-bin classing was provided, and the headings are incorrect above: Motorcycles should be FHWA classes 1-3. Cars & trailers should be FHWA classes 4-7. 2 Axle Long should be FHWA classes 8-10. Buses should be FHWA classes 11-13.

Type of report: Tube Count - Volume Data

LOCATION: Pueonani St north of H1 **QC JOB #:** 15845105

SPECIFIC LOCATION: **DIRECTION:** NB, SB

CITY/STATE: Makakilo, HI **DATE:** Jun 2 2022 - Jun 2 2022

Start Time	Mon	Tue	Wed	Thu 2 Jun 22	Fri	Average Weekday 15-min Traffic	Sat	Sun	Average Week 15-min Traffic	Average Week Profile
12:00 AM				0		0			0	
12:15 AM				2		2			2	
12:30 AM				0		0			0	
12:45 AM				2		2			2	
01:00 AM				0		0			0	
01:15 AM				0		0			0	
01:30 AM				0		0			0	
01:45 AM				0		0			0	
02:00 AM				0		0			0	
02:15 AM				0		0			0	
02:30 AM				0		0			0	
02:45 AM				0		0			0	
03:00 AM				0		0			0	
03:15 AM				0		0			0	
03:30 AM				0		0			0	
03:45 AM				0		0			0	
04:00 AM				0		0			0	
04:15 AM				0		0			0	
04:30 AM				1		1			1	
04:45 AM				1		1			1	
05:00 AM				1		1			1	
05:15 AM				2		2			2	
05:30 AM				7		7			7	
05:45 AM				16		16			16	
Day Total										
% Weekday Average										
% Week Average										
AM Peak 15-min Vol										
PM Peak 15-min Vol										

Comments:

Type of report: Tube Count - Volume Data

LOCATION: Pueonani St north of H1 **QC JOB #:** 15845105

SPECIFIC LOCATION: **DIRECTION:** NB, SB

CITY/STATE: Makakilo, HI **DATE:** Jun 2 2022 - Jun 2 2022

Start Time	Mon	Tue	Wed	Thu 2 Jun 22	Fri	Average Weekday 15-min Traffic	Sat	Sun	Average Week 15-min Traffic	Average Week Profile
06:00 AM				13		13			13	
06:15 AM				20		20			20	
06:30 AM				8		8			8	
06:45 AM				18		18			18	
07:00 AM				18		18			18	
07:15 AM				18		18			18	
07:30 AM				15		15			15	
07:45 AM				**28**		**28**			**28**	
08:00 AM				14		14			14	
08:15 AM				20		20			20	
08:30 AM				15		15			15	
08:45 AM				17		17			17	
09:00 AM				15		15			15	
09:15 AM				18		18			18	
09:30 AM				17		17			17	
09:45 AM				11		11			11	
10:00 AM				11		11			11	
10:15 AM				17		17			17	
10:30 AM				14		14			14	
10:45 AM				17		17			17	
11:00 AM				17		17			17	
11:15 AM				17		17			17	
11:30 AM				16		16			16	
11:45 AM				17		17			17	
Day Total										
% Weekday Average										
% Week Average										
AM Peak 15-min Vol										
PM Peak 15-min Vol										

Comments:

Type of report: Tube Count - Volume Data

LOCATION: Pueonani St north of H1 **QC JOB #:** 15845105

SPECIFIC LOCATION: **DIRECTION:** NB, SB

CITY/STATE: Makakilo, HI **DATE:** Jun 2 2022 - Jun 2 2022

Start Time	Mon	Tue	Wed	Thu 2 Jun 22	Fri	Average Weekday 15-min Traffic	Sat	Sun	Average Week 15-min Traffic	Average Week Profile
12:00 PM				14		14			14	
12:15 PM				**19**		**19**			**19**	
12:30 PM				15		15			15	
12:45 PM				18		18			18	
01:00 PM				6		6			6	
01:15 PM				7		7			7	
01:30 PM				8		8			8	
01:45 PM				12		12			12	
02:00 PM				4		4			4	
02:15 PM				10		10			10	
02:30 PM				18		18			18	
02:45 PM				14		14			14	
03:00 PM				12		12			12	
03:15 PM				8		8			8	
03:30 PM				5		5			5	
03:45 PM				4		4			4	
04:00 PM				4		4			4	
04:15 PM				13		13			13	
04:30 PM				15		15			15	
04:45 PM				13		13			13	
05:00 PM				3		3			3	
05:15 PM				0		0			0	
05:30 PM				1		1			1	
05:45 PM				0		0			0	
Day Total										
% Weekday Average										
% Week Average										
AM Peak 15-min Vol										
PM Peak 15-min Vol										

Comments:

Type of report: Tube Count - Volume Data

LOCATION: Pueonani St north of H1 **QC JOB #:** 15845105

SPECIFIC LOCATION: **DIRECTION:** NB, SB

CITY/STATE: Makakilo, HI **DATE:** Jun 2 2022 - Jun 2 2022

Start Time	Mon	Tue	Wed	Thu 2 Jun 22	Fri	Average Weekday 15-min Traffic	Sat	Sun	Average Week 15-min Traffic	Average Week Profile
06:00 PM				0		0			0	
06:15 PM				0		0			0	
06:30 PM				0		0			0	
06:45 PM				1		1			1	
07:00 PM				1		1			1	
07:15 PM				0		0			0	
07:30 PM				0		0			0	
07:45 PM				0		0			0	
08:00 PM				0		0			0	
08:15 PM				0		0			0	
08:30 PM				0		0			0	
08:45 PM				0		0			0	
09:00 PM				0		0			0	
09:15 PM				0		0			0	
09:30 PM				0		0			0	
09:45 PM				0		0			0	
10:00 PM				0		0			0	
10:15 PM				0		0			0	
10:30 PM				0		0			0	
10:45 PM				0		0			0	
11:00 PM				0		0			0	
11:15 PM				0		0			0	
11:30 PM				2		2			2	
11:45 PM				0		0			0	
Day Total				650		650			650	
% Weekday Average				100%						
% Week Average				100%		100%				
AM Peak 15-min Vol				7:45 AM 28		7:45 AM 28			7:45 AM 28	
PM Peak 15-min Vol				12:15 PM 19		12:15 PM 19			12:15 PM 19	

Comments:

Report generated on 6/22/2022 9:45 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Appendix B: Trip Generation Calculations

Yearly Traffic Volume Estimate (Provided by Grace Pacific)

Quarry Traffic (Current)

655,601	Tons (Material sales and Incoming recycled material) 1/1/19 - 9/30/19
72,845	Average tons per month
874,135	Projected tonnage 2019
38,850	Customer Trucks per year (based on average 22.5 tons per Truck)
9600	Employee Vehicles (40*240) per year
48,450	**Total**

HMA Plant

205,759	(HMA Sales, Aggregate Sales, Incoming recycle material) 1/1/19 - 9/30/19
22,862	Average tons per month
274,345	Projected tonnage 2019
12,193	Customer Trucks per year (based on average 22.5 tons per Truck)
1,680	Employee Vehicles (7*240) per year
13,873	**Total**

Concrete Plant

50,000	tons of coarse aggregates (based on 25-30k annual use with potential to increase to 75k in 6 to 24 months) per Wade email
33,333	Fine aggregate (based on 60/40 coarse to fine aggregate ratio)
83,333	Total Tons of aggregate
41,667	Cubic Yards (based on 2 tons per cubic yard)
4,167	Concrete Trucks per year (based on 10 Cubic Yards per concrete truck)
1,481	Truck loads (Import of fine aggregate into Makakilo Quarry) per wade email
960	Employee Vehicles (4*240) per year
6,608	**Total**
68,932	**Grand Total**

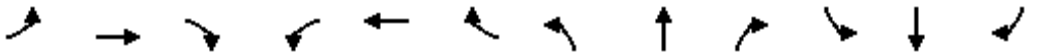
Peak Hour Trip Generation Calculation

	Inbound Trip Generation				Outbound Trip Generation			
	Current[1]	HMA Plant	Concrete Plant	Total New	Current	HMA Plant	Concrete Plant	Total New
Yearly Traffic Estimate	48,450	13,873	6,608	20,481	48,450	13,873	6,608	20,481
Percent Increase of Current Traffic		28%	14%	42%		28%	14%	42%
Average Daily Traffic	323	93	44	137	323	93	44	137
AM Peak Hour Percent of Daily Traffic	14%				11%			
AM Peak Hour Trips Generated	45	13	6	19	37	11	5	16
PM Peak Hour Percent of Daily Traffic	4%				10%			
AM Peak Hour Trips Generated	13	3	2	5	32	10	4	14

[1] Driveway counts for average daily traffic and peak hour trips were taken on Palehua Road June 2, 2022

Source: Fehr & Peers, 2022

Appendix C: LOS Results



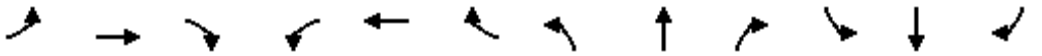
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	461	0	15	217	24	0	0	19	12
Future Volume (veh/h)	0	0	0	461	0	15	217	24	0	0	19	12
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1796	0	1411	1856	981	0	0	655	1040
Adj Flow Rate, veh/h				576	0	0	271	30	0	0	24	0
Peak Hour Factor				0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %				7	0	33	3	62	0	0	84	58
Cap, veh/h				927	0		395	413	0	0	31	
Arrive On Green				0.28	0.00	0.00	0.22	0.42	0.00	0.00	0.05	0.00
Sat Flow, veh/h				3319	0	1196	1767	981	0	0	655	882
Grp Volume(v), veh/h				576	0	0	271	30	0	0	24	0
Grp Sat Flow(s),veh/h/ln				1659	0	1196	1767	981	0	0	655	882
Q Serve(g_s), s				5.0	0.0	0.0	4.7	0.6	0.0	0.0	1.2	0.0
Cycle Q Clear(g_c), s				5.0	0.0	0.0	4.7	0.6	0.0	0.0	1.2	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				927	0		395	413	0	0	31	
V/C Ratio(X)				0.62	0.00		0.69	0.07	0.00	0.00	0.78	
Avail Cap(c_a), veh/h				4380	0		1590	1354	0	0	216	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				10.5	0.0	0.0	11.9	5.8	0.0	0.0	15.7	0.0
Incr Delay (d2), s/veh				0.7	0.0	0.0	2.1	0.1	0.0	0.0	32.8	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				1.4	0.0	0.0	1.5	0.1	0.0	0.0	0.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				11.2	0.0	0.0	14.0	5.8	0.0	0.0	48.5	0.0
LnGrp LOS				B	A		B	A	A	A	D	
Approach Vol, veh/h					576	A		301			24	A
Approach Delay, s/veh					11.2			13.2			48.5	
Approach LOS					B			B			D	

Timer - Assigned Phs		3	4		6		8					
Phs Duration (G+Y+Rc), s		12.5	6.6		14.3		19.0					
Change Period (Y+Rc), s		5.0	5.0		5.0		5.0					
Max Green Setting (Gmax), s		30.0	11.0		44.0		46.0					
Max Q Clear Time (g_c+I1), s		6.7	3.2		7.0		2.6					
Green Ext Time (p_c), s		0.8	0.0		2.3		0.1					

Intersection Summary	
HCM 6th Ctrl Delay	12.8
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



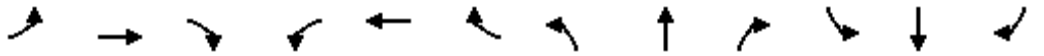
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	25	0	144	0	0	0	0	209	739	15	460	0
Future Volume (veh/h)	25	0	144	0	0	0	0	209	739	15	460	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1248	0	1767				0	1796	1870	1011	1767	0
Adj Flow Rate, veh/h	29	0	0				0	243	0	17	535	0
Peak Hour Factor	0.86	0.86	0.86				0.86	0.86	0.86	0.86	0.86	0.86
Percent Heavy Veh, %	44	0	9				0	7	2	60	9	0
Cap, veh/h	35	0					0	771		17	1631	0
Arrive On Green	0.03	0.00	0.00				0.00	0.23	0.00	0.02	0.49	0.00
Sat Flow, veh/h	1188	0	1497				0	3503	2790	963	3445	0
Grp Volume(v), veh/h	29	0	0				0	243	0	17	535	0
Grp Sat Flow(s),veh/h/ln	1188	0	1497				0	1706	1395	963	1678	0
Q Serve(g_s), s	0.5	0.0	0.0				0.0	1.2	0.0	0.4	2.0	0.0
Cycle Q Clear(g_c), s	0.5	0.0	0.0				0.0	1.2	0.0	0.4	2.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	35	0					0	771		17	1631	0
V/C Ratio(X)	0.82	0.00					0.00	0.32		0.98	0.33	0.00
Avail Cap(c_a), veh/h	691	0					0	4298		326	6178	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	10.0	0.0	0.0				0.0	6.7	0.0	10.1	3.2	0.0
Incr Delay (d2), s/veh	35.3	0.0	0.0				0.0	0.2	0.0	95.4	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	0.0				0.0	0.2	0.0	0.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	45.3	0.0	0.0				0.0	6.9	0.0	105.6	3.4	0.0
LnGrp LOS	D	A					A	A		F	A	A
Approach Vol, veh/h		29	A					243	A		552	
Approach Delay, s/veh		45.3						6.9			6.5	
Approach LOS		D						A			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	5.4	9.7		5.6		15.0
Change Period (Y+Rc), s	5.0	5.0		5.0		5.0
Max Green Setting (Gmax), s	7.0	26.0		12.0		38.0
Max Q Clear Time (g_c+I1), s	2.4	3.2		2.5		4.0
Green Ext Time (p_c), s	0.0	1.4		0.0		3.9

Intersection Summary	
HCM 6th Ctrl Delay	8.0
HCM 6th LOS	A

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.



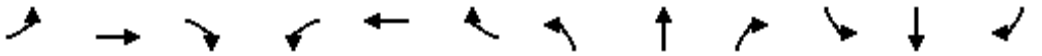
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	1185	0	3	322	3	0	0	16	7
Future Volume (veh/h)	0	0	0	1185	0	3	322	3	0	0	16	7
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1870	0	1411	1856	1870	0	0	1811	1870
Adj Flow Rate, veh/h				1261	0	0	343	3	0	0	17	0
Peak Hour Factor				0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %				2	0	33	3	2	0	0	6	2
Cap, veh/h				1590	0		422	658	0	0	35	
Arrive On Green				0.46	0.00	0.00	0.24	0.35	0.00	0.00	0.02	0.00
Sat Flow, veh/h				3456	0	1196	1767	1870	0	0	1811	1585
Grp Volume(v), veh/h				1261	0	0	343	3	0	0	17	0
Grp Sat Flow(s),veh/h/ln				1728	0	1196	1767	1870	0	0	1811	1585
Q Serve(g_s), s				16.5	0.0	0.0	9.8	0.1	0.0	0.0	0.5	0.0
Cycle Q Clear(g_c), s				16.5	0.0	0.0	9.8	0.1	0.0	0.0	0.5	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				1590	0		422	658	0	0	35	
V/C Ratio(X)				0.79	0.00		0.81	0.00	0.00	0.00	0.49	
Avail Cap(c_a), veh/h				2856	0		996	1616	0	0	374	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				12.2	0.0	0.0	19.1	11.2	0.0	0.0	25.8	0.0
Incr Delay (d2), s/veh				0.9	0.0	0.0	3.8	0.0	0.0	0.0	10.2	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				5.5	0.0	0.0	3.9	0.0	0.0	0.0	0.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				13.1	0.0	0.0	23.0	11.2	0.0	0.0	36.0	0.0
LnGrp LOS				B	A		C	B	A	A	D	
Approach Vol, veh/h					1261	A		346			17	A
Approach Delay, s/veh					13.1			22.9			36.0	
Approach LOS					B			C			D	

Timer - Assigned Phs	3	4		6		8						
Phs Duration (G+Y+Rc), s	17.7	6.0		29.5		23.7						
Change Period (Y+Rc), s	5.0	5.0		5.0		5.0						
Max Green Setting (Gmax), s	30.0	11.0		44.0		46.0						
Max Q Clear Time (g_c+I1), s	11.8	2.5		18.5		2.1						
Green Ext Time (p_c), s	1.0	0.0		6.0		0.0						

Intersection Summary	
HCM 6th Ctrl Delay	15.5
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



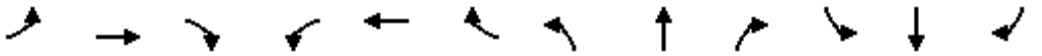
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	0	300	0	0	0	0	328	754	10	1135	0
Future Volume (veh/h)	13	0	300	0	0	0	0	328	754	10	1135	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1870	0	1870				0	1856	1870	1752	1870	0
Adj Flow Rate, veh/h	14	0	0				0	360	0	11	1247	0
Peak Hour Factor	0.91	0.91	0.91				0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	0	2				0	3	2	10	2	0
Cap, veh/h	26	0					0	1734		19	2360	0
Arrive On Green	0.01	0.00	0.00				0.00	0.49	0.00	0.01	0.66	0.00
Sat Flow, veh/h	1781	0	1585				0	3618	2790	1668	3647	0
Grp Volume(v), veh/h	14	0	0				0	360	0	11	1247	0
Grp Sat Flow(s),veh/h/ln	1781	0	1585				0	1763	1395	1668	1777	0
Q Serve(g_s), s	0.2	0.0	0.0				0.0	1.8	0.0	0.2	5.7	0.0
Cycle Q Clear(g_c), s	0.2	0.0	0.0				0.0	1.8	0.0	0.2	5.7	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	26	0					0	1734		19	2360	0
V/C Ratio(X)	0.54	0.00					0.00	0.21		0.57	0.53	0.00
Avail Cap(c_a), veh/h	630	0					0	7703		322	9021	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	15.2	0.0	0.0				0.0	4.5	0.0	15.3	2.7	0.0
Incr Delay (d2), s/veh	16.0	0.0	0.0				0.0	0.1	0.0	23.3	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.0				0.0	0.3	0.0	0.2	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	31.2	0.0	0.0				0.0	4.5	0.0	38.6	2.9	0.0
LnGrp LOS	C	A					A	A		D	A	A
Approach Vol, veh/h		14	A					360	A		1258	
Approach Delay, s/veh		31.2						4.5			3.2	
Approach LOS		C						A			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	5.4	20.3		5.5		25.7
Change Period (Y+Rc), s	5.0	5.0		5.0		5.0
Max Green Setting (Gmax), s	6.0	68.0		11.0		79.0
Max Q Clear Time (g_c+I1), s	2.2	3.8		2.2		7.7
Green Ext Time (p_c), s	0.0	2.5		0.0		13.0

Intersection Summary	
HCM 6th Ctrl Delay	3.7
HCM 6th LOS	A

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.



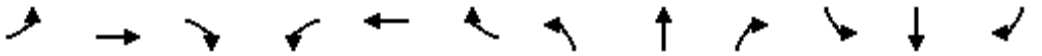
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	521	0	20	255	30	0	0	30	20
Future Volume (veh/h)	0	0	0	521	0	20	255	30	0	0	30	20
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1796	0	1411	1856	981	0	0	655	1040
Adj Flow Rate, veh/h				651	0	0	319	38	0	0	38	0
Peak Hour Factor				0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %				7	0	33	3	62	0	0	84	58
Cap, veh/h				979	0		431	431	0	0	40	
Arrive On Green				0.29	0.00	0.00	0.24	0.44	0.00	0.00	0.06	0.00
Sat Flow, veh/h				3319	0	1196	1767	981	0	0	655	882
Grp Volume(v), veh/h				651	0	0	319	38	0	0	38	0
Grp Sat Flow(s),veh/h/ln				1659	0	1196	1767	981	0	0	655	882
Q Serve(g_s), s				6.5	0.0	0.0	6.3	0.8	0.0	0.0	2.2	0.0
Cycle Q Clear(g_c), s				6.5	0.0	0.0	6.3	0.8	0.0	0.0	2.2	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				979	0		431	431	0	0	40	
V/C Ratio(X)				0.67	0.00		0.74	0.09	0.00	0.00	0.94	
Avail Cap(c_a), veh/h				3890	0		1412	1202	0	0	192	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				11.6	0.0	0.0	13.1	6.2	0.0	0.0	17.6	0.0
Incr Delay (d2), s/veh				0.8	0.0	0.0	2.5	0.1	0.0	0.0	52.5	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				1.9	0.0	0.0	2.2	0.1	0.0	0.0	0.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				12.4	0.0	0.0	15.6	6.2	0.0	0.0	70.1	0.0
LnGrp LOS				B	A		B	A	A	A	E	
Approach Vol, veh/h					651	A		357			38	A
Approach Delay, s/veh					12.4			14.6			70.1	
Approach LOS					B			B			E	

Timer - Assigned Phs		3	4		6		8					
Phs Duration (G+Y+Rc), s		14.2	7.3		16.1		21.5					
Change Period (Y+Rc), s		5.0	5.0		5.0		5.0					
Max Green Setting (Gmax), s		30.0	11.0		44.0		46.0					
Max Q Clear Time (g_c+I1), s		8.3	4.2		8.5		2.8					
Green Ext Time (p_c), s		0.9	0.0		2.6		0.2					

Intersection Summary	
HCM 6th Ctrl Delay	15.2
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



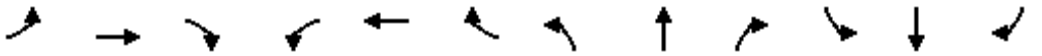
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	0	185	0	0	0	0	245	916	20	521	0
Future Volume (veh/h)	30	0	185	0	0	0	0	245	916	20	521	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1248	0	1767				0	1796	1870	1011	1767	0
Adj Flow Rate, veh/h	35	0	0				0	285	0	23	606	0
Peak Hour Factor	0.86	0.86	0.86				0.86	0.86	0.86	0.86	0.86	0.86
Percent Heavy Veh, %	44	0	9				0	7	2	60	9	0
Cap, veh/h	42	0					0	827		23	1675	0
Arrive On Green	0.04	0.00	0.00				0.00	0.24	0.00	0.02	0.50	0.00
Sat Flow, veh/h	1188	0	1497				0	3503	2790	963	3445	0
Grp Volume(v), veh/h	35	0	0				0	285	0	23	606	0
Grp Sat Flow(s),veh/h/ln	1188	0	1497				0	1706	1395	963	1678	0
Q Serve(g_s), s	0.6	0.0	0.0				0.0	1.5	0.0	0.5	2.4	0.0
Cycle Q Clear(g_c), s	0.6	0.0	0.0				0.0	1.5	0.0	0.5	2.4	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	42	0					0	827		23	1675	0
V/C Ratio(X)	0.84	0.00					0.00	0.34		1.00	0.36	0.00
Avail Cap(c_a), veh/h	664	0					0	4133		314	5942	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	10.3	0.0	0.0				0.0	6.7	0.0	10.5	3.3	0.0
Incr Delay (d2), s/veh	33.3	0.0	0.0				0.0	0.2	0.0	87.4	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	0.0				0.0	0.2	0.0	0.6	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	43.6	0.0	0.0				0.0	7.0	0.0	97.9	3.4	0.0
LnGrp LOS	D	A					A	A		F	A	A
Approach Vol, veh/h		35	A					285	A		629	
Approach Delay, s/veh		43.6						7.0			6.9	
Approach LOS		D						A			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	5.5	10.2		5.8		15.7
Change Period (Y+Rc), s	5.0	5.0		5.0		5.0
Max Green Setting (Gmax), s	7.0	26.0		12.0		38.0
Max Q Clear Time (g_c+I1), s	2.5	3.5		2.6		4.4
Green Ext Time (p_c), s	0.0	1.7		0.0		4.5

Intersection Summary	
HCM 6th Ctrl Delay	8.3
HCM 6th LOS	A

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.



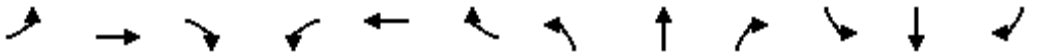
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	1402	0	10	360	10	0	0	20	10
Future Volume (veh/h)	0	0	0	1402	0	10	360	10	0	0	20	10
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1870	0	1411	1856	1870	0	0	1811	1870
Adj Flow Rate, veh/h				1491	0	0	383	11	0	0	21	0
Peak Hour Factor				0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %				2	0	33	3	2	0	0	6	2
Cap, veh/h				1735	0		444	657	0	0	48	
Arrive On Green				0.50	0.00	0.00	0.25	0.35	0.00	0.00	0.03	0.00
Sat Flow, veh/h				3456	0	1196	1767	1870	0	0	1811	1585
Grp Volume(v), veh/h				1491	0	0	383	11	0	0	21	0
Grp Sat Flow(s),veh/h/ln				1728	0	1196	1767	1870	0	0	1811	1585
Q Serve(g_s), s				25.8	0.0	0.0	14.1	0.3	0.0	0.0	0.8	0.0
Cycle Q Clear(g_c), s				25.8	0.0	0.0	14.1	0.3	0.0	0.0	0.8	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				1735	0		444	657	0	0	48	
V/C Ratio(X)				0.86	0.00		0.86	0.02	0.00	0.00	0.43	
Avail Cap(c_a), veh/h				2231	0		778	1262	0	0	292	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				14.9	0.0	0.0	24.4	14.4	0.0	0.0	32.7	0.0
Incr Delay (d2), s/veh				2.9	0.0	0.0	5.1	0.0	0.0	0.0	6.1	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				9.6	0.0	0.0	6.0	0.1	0.0	0.0	0.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				17.8	0.0	0.0	29.5	14.4	0.0	0.0	38.7	0.0
LnGrp LOS				B	A		C	B	A	A	D	
Approach Vol, veh/h					1491	A		394			21	A
Approach Delay, s/veh					17.8			29.0			38.7	
Approach LOS					B			C			D	

Timer - Assigned Phs	3	4		6		8						
Phs Duration (G+Y+Rc), s	22.1	6.8		39.2		28.9						
Change Period (Y+Rc), s	5.0	5.0		5.0		5.0						
Max Green Setting (Gmax), s	30.0	11.0		44.0		46.0						
Max Q Clear Time (g_c+I1), s	16.1	2.8		27.8		2.3						
Green Ext Time (p_c), s	1.0	0.0		6.5		0.0						

Intersection Summary	
HCM 6th Ctrl Delay	20.3
HCM 6th LOS	C

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



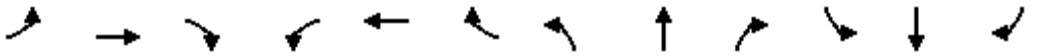
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	0	338	0	0	0	0	360	845	20	1352	0
Future Volume (veh/h)	20	0	338	0	0	0	0	360	845	20	1352	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1870	0	1870				0	1856	1870	1752	1870	0
Adj Flow Rate, veh/h	22	0	0				0	396	0	22	1486	0
Peak Hour Factor	0.91	0.91	0.91				0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	0	2				0	3	2	10	2	0
Cap, veh/h	39	0					0	2003		36	2556	0
Arrive On Green	0.02	0.00	0.00				0.00	0.57	0.00	0.02	0.72	0.00
Sat Flow, veh/h	1781	0	1585				0	3618	2790	1668	3647	0
Grp Volume(v), veh/h	22	0	0				0	396	0	22	1486	0
Grp Sat Flow(s),veh/h/ln	1781	0	1585				0	1763	1395	1668	1777	0
Q Serve(g_s), s	0.5	0.0	0.0				0.0	2.1	0.0	0.5	7.8	0.0
Cycle Q Clear(g_c), s	0.5	0.0	0.0				0.0	2.1	0.0	0.5	7.8	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	39	0					0	2003		36	2556	0
V/C Ratio(X)	0.57	0.00					0.00	0.20		0.61	0.58	0.00
Avail Cap(c_a), veh/h	507	0					0	6208		259	7270	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	18.7	0.0	0.0				0.0	4.1	0.0	18.7	2.6	0.0
Incr Delay (d2), s/veh	12.4	0.0	0.0				0.0	0.0	0.0	15.1	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.0				0.0	0.3	0.0	0.3	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	31.1	0.0	0.0				0.0	4.1	0.0	33.9	2.8	0.0
LnGrp LOS	C	A					A	A		C	A	A
Approach Vol, veh/h		22	A					396	A		1508	
Approach Delay, s/veh		31.1						4.1			3.3	
Approach LOS		C						A			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	5.8	26.9		5.8		32.8
Change Period (Y+Rc), s	5.0	5.0		5.0		5.0
Max Green Setting (Gmax), s	6.0	68.0		11.0		79.0
Max Q Clear Time (g_c+I1), s	2.5	4.1		2.5		9.8
Green Ext Time (p_c), s	0.0	2.8		0.0		18.0

Intersection Summary	
HCM 6th Ctrl Delay	3.8
HCM 6th LOS	A

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.



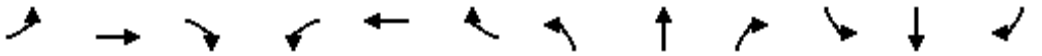
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	521	0	28	255	43	0	0	40	27
Future Volume (veh/h)	0	0	0	521	0	28	255	43	0	0	40	27
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1796	0	1411	1856	981	0	0	655	1040
Adj Flow Rate, veh/h				651	0	0	319	54	0	0	50	0
Peak Hour Factor				0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %				7	0	33	3	62	0	0	84	58
Cap, veh/h				964	0		426	447	0	0	57	
Arrive On Green				0.29	0.00	0.00	0.24	0.46	0.00	0.00	0.09	0.00
Sat Flow, veh/h				3319	0	1196	1767	981	0	0	655	882
Grp Volume(v), veh/h				651	0	0	319	54	0	0	50	0
Grp Sat Flow(s),veh/h/ln				1659	0	1196	1767	981	0	0	655	882
Q Serve(g_s), s				6.8	0.0	0.0	6.6	1.2	0.0	0.0	3.0	0.0
Cycle Q Clear(g_c), s				6.8	0.0	0.0	6.6	1.2	0.0	0.0	3.0	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				964	0		426	447	0	0	57	
V/C Ratio(X)				0.68	0.00		0.75	0.12	0.00	0.00	0.88	
Avail Cap(c_a), veh/h				3714	0		1349	1148	0	0	183	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				12.3	0.0	0.0	13.8	6.2	0.0	0.0	17.7	0.0
Incr Delay (d2), s/veh				0.8	0.0	0.0	2.7	0.1	0.0	0.0	31.3	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				2.1	0.0	0.0	2.3	0.2	0.0	0.0	0.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				13.1	0.0	0.0	16.5	6.3	0.0	0.0	49.1	0.0
LnGrp LOS				B	A		B	A	A	A	D	
Approach Vol, veh/h					651			373			50	
Approach Delay, s/veh					13.1			15.0			49.1	
Approach LOS					B			B			D	

Timer - Assigned Phs	3	4	6	8
Phs Duration (G+Y+Rc), s	14.5	8.4	16.4	22.9
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	30.0	11.0	44.0	46.0
Max Q Clear Time (g_c+I1), s	8.6	5.0	8.8	3.2
Green Ext Time (p_c), s	0.9	0.1	2.6	0.3

Intersection Summary	
HCM 6th Ctrl Delay	15.5
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



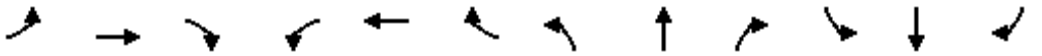
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	39	0	185	0	0	0	0	249	916	27	524	0
Future Volume (veh/h)	39	0	185	0	0	0	0	249	916	27	524	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1248	0	1767				0	1796	1870	1011	1767	0
Adj Flow Rate, veh/h	45	0	0				0	290	0	31	609	0
Peak Hour Factor	0.86	0.86	0.86				0.86	0.86	0.86	0.86	0.86	0.86
Percent Heavy Veh, %	44	0	9				0	7	2	60	9	0
Cap, veh/h	52	0					0	824		30	1680	0
Arrive On Green	0.04	0.00	0.00				0.00	0.24	0.00	0.03	0.50	0.00
Sat Flow, veh/h	1188	0	1497				0	3503	2790	963	3445	0
Grp Volume(v), veh/h	45	0	0				0	290	0	31	609	0
Grp Sat Flow(s),veh/h/ln	1188	0	1497				0	1706	1395	963	1678	0
Q Serve(g_s), s	0.8	0.0	0.0				0.0	1.5	0.0	0.7	2.4	0.0
Cycle Q Clear(g_c), s	0.8	0.0	0.0				0.0	1.5	0.0	0.7	2.4	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	52	0					0	824		30	1680	0
V/C Ratio(X)	0.87	0.00					0.00	0.35		1.03	0.36	0.00
Avail Cap(c_a), veh/h	650	0					0	4043		307	5812	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	10.4	0.0	0.0				0.0	6.9	0.0	10.6	3.3	0.0
Incr Delay (d2), s/veh	31.7	0.0	0.0				0.0	0.3	0.0	83.2	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.0	0.0				0.0	0.3	0.0	0.8	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.1	0.0	0.0				0.0	7.2	0.0	93.8	3.5	0.0
LnGrp LOS	D	A					A	A		F	A	A
Approach Vol, veh/h		45						290			640	
Approach Delay, s/veh		42.1						7.2			7.8	
Approach LOS		D						A			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	5.7	10.3		6.0		16.0
Change Period (Y+Rc), s	5.0	5.0		5.0		5.0
Max Green Setting (Gmax), s	7.0	26.0		12.0		38.0
Max Q Clear Time (g_c+I1), s	2.7	3.5		2.8		4.4
Green Ext Time (p_c), s	0.0	1.8		0.0		4.5

Intersection Summary	
HCM 6th Ctrl Delay	9.2
HCM 6th LOS	A

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.



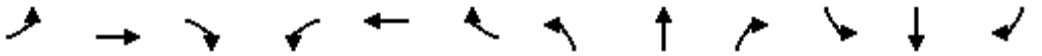
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	1402	0	13	360	14	0	0	29	16
Future Volume (veh/h)	0	0	0	1402	0	13	360	14	0	0	29	16
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1870	0	1411	1856	1870	0	0	1811	1870
Adj Flow Rate, veh/h				1491	0	0	383	15	0	0	31	0
Peak Hour Factor				0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %				2	0	33	3	2	0	0	6	2
Cap, veh/h				1727	0		443	667	0	0	61	
Arrive On Green				0.50	0.00	0.00	0.25	0.36	0.00	0.00	0.03	0.00
Sat Flow, veh/h				3456	0	1196	1767	1870	0	0	1811	1585
Grp Volume(v), veh/h				1491	0	0	383	15	0	0	31	0
Grp Sat Flow(s),veh/h/ln				1728	0	1196	1767	1870	0	0	1811	1585
Q Serve(g_s), s				26.4	0.0	0.0	14.4	0.4	0.0	0.0	1.2	0.0
Cycle Q Clear(g_c), s				26.4	0.0	0.0	14.4	0.4	0.0	0.0	1.2	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				1727	0		443	667	0	0	61	
V/C Ratio(X)				0.86	0.00		0.87	0.02	0.00	0.00	0.51	
Avail Cap(c_a), veh/h				2189	0		763	1238	0	0	287	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				15.3	0.0	0.0	24.9	14.5	0.0	0.0	33.0	0.0
Incr Delay (d2), s/veh				3.1	0.0	0.0	5.3	0.0	0.0	0.0	6.3	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				9.9	0.0	0.0	6.2	0.1	0.0	0.0	0.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				18.4	0.0	0.0	30.2	14.5	0.0	0.0	39.3	0.0
LnGrp LOS				B	A		C	B	A	A	D	
Approach Vol, veh/h					1491			398			31	
Approach Delay, s/veh					18.4			29.6			39.3	
Approach LOS					B			C			D	

Timer - Assigned Phs		3	4		6		8					
Phs Duration (G+Y+Rc), s		22.4	7.4		39.7		29.8					
Change Period (Y+Rc), s		5.0	5.0		5.0		5.0					
Max Green Setting (Gmax), s		30.0	11.0		44.0		46.0					
Max Q Clear Time (g_c+I1), s		16.4	3.2		28.4		2.4					
Green Ext Time (p_c), s		1.0	0.0		6.3		0.0					

Intersection Summary	
HCM 6th Ctrl Delay	21.1
HCM 6th LOS	C

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	0	338	0	0	0	0	361	845	26	1355	0
Future Volume (veh/h)	23	0	338	0	0	0	0	361	845	26	1355	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1870	0	1870				0	1856	1870	1752	1870	0
Adj Flow Rate, veh/h	25	0	0				0	397	0	29	1489	0
Peak Hour Factor	0.91	0.91	0.91				0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	0	2				0	3	2	10	2	0
Cap, veh/h	43	0					0	1982		46	2553	0
Arrive On Green	0.02	0.00	0.00				0.00	0.56	0.00	0.03	0.72	0.00
Sat Flow, veh/h	1781	0	1585				0	3618	2790	1668	3647	0
Grp Volume(v), veh/h	25	0	0				0	397	0	29	1489	0
Grp Sat Flow(s),veh/h/ln	1781	0	1585				0	1763	1395	1668	1777	0
Q Serve(g_s), s	0.5	0.0	0.0				0.0	2.2	0.0	0.7	7.9	0.0
Cycle Q Clear(g_c), s	0.5	0.0	0.0				0.0	2.2	0.0	0.7	7.9	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	43	0					0	1982		46	2553	0
V/C Ratio(X)	0.58	0.00					0.00	0.20		0.63	0.58	0.00
Avail Cap(c_a), veh/h	504	0					0	6164		257	7218	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	18.8	0.0	0.0				0.0	4.2	0.0	18.7	2.7	0.0
Incr Delay (d2), s/veh	11.5	0.0	0.0				0.0	0.0	0.0	13.2	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.0				0.0	0.4	0.0	0.4	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.3	0.0	0.0				0.0	4.2	0.0	31.9	2.9	0.0
LnGrp LOS	C	A					A	A		C	A	A
Approach Vol, veh/h		25						397			1518	
Approach Delay, s/veh		30.3						4.2			3.4	
Approach LOS		C						A			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	6.1	26.9		5.9		32.9
Change Period (Y+Rc), s	5.0	5.0		5.0		5.0
Max Green Setting (Gmax), s	6.0	68.0		11.0		79.0
Max Q Clear Time (g_c+I1), s	2.7	4.2		2.5		9.9
Green Ext Time (p_c), s	0.0	2.8		0.0		18.1

Intersection Summary	
HCM 6th Ctrl Delay	3.9
HCM 6th LOS	A

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	WBL	WBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	651	35	319	54	50	34
v/c Ratio	0.58	0.03	0.59	0.15	0.30	0.03
Control Delay	18.9	0.0	23.6	13.0	31.4	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.9	0.0	23.6	13.0	31.4	0.1
Queue Length 50th (ft)	97	0	95	17	16	0
Queue Length 95th (ft)	156	0	177	26	48	0
Internal Link Dist (ft)				562	313	
Turn Bay Length (ft)						100
Base Capacity (vph)	2613	1214	1104	958	243	1022
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.25	0.03	0.29	0.06	0.21	0.03

Intersection Summary

Lane Group	EBL	EBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	45	215	290	1065	31	609
v/c Ratio	0.17	0.15	0.11	0.38	0.14	0.22
Control Delay	14.9	0.2	5.7	0.4	16.1	3.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.9	0.2	5.7	0.4	16.1	3.1
Queue Length 50th (ft)	5	0	0	0	4	0
Queue Length 95th (ft)	26	0	50	0	22	54
Internal Link Dist (ft)			639			562
Turn Bay Length (ft)						
Base Capacity (vph)	468	1482	2730	2787	245	3169
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.15	0.11	0.38	0.13	0.19

Intersection Summary

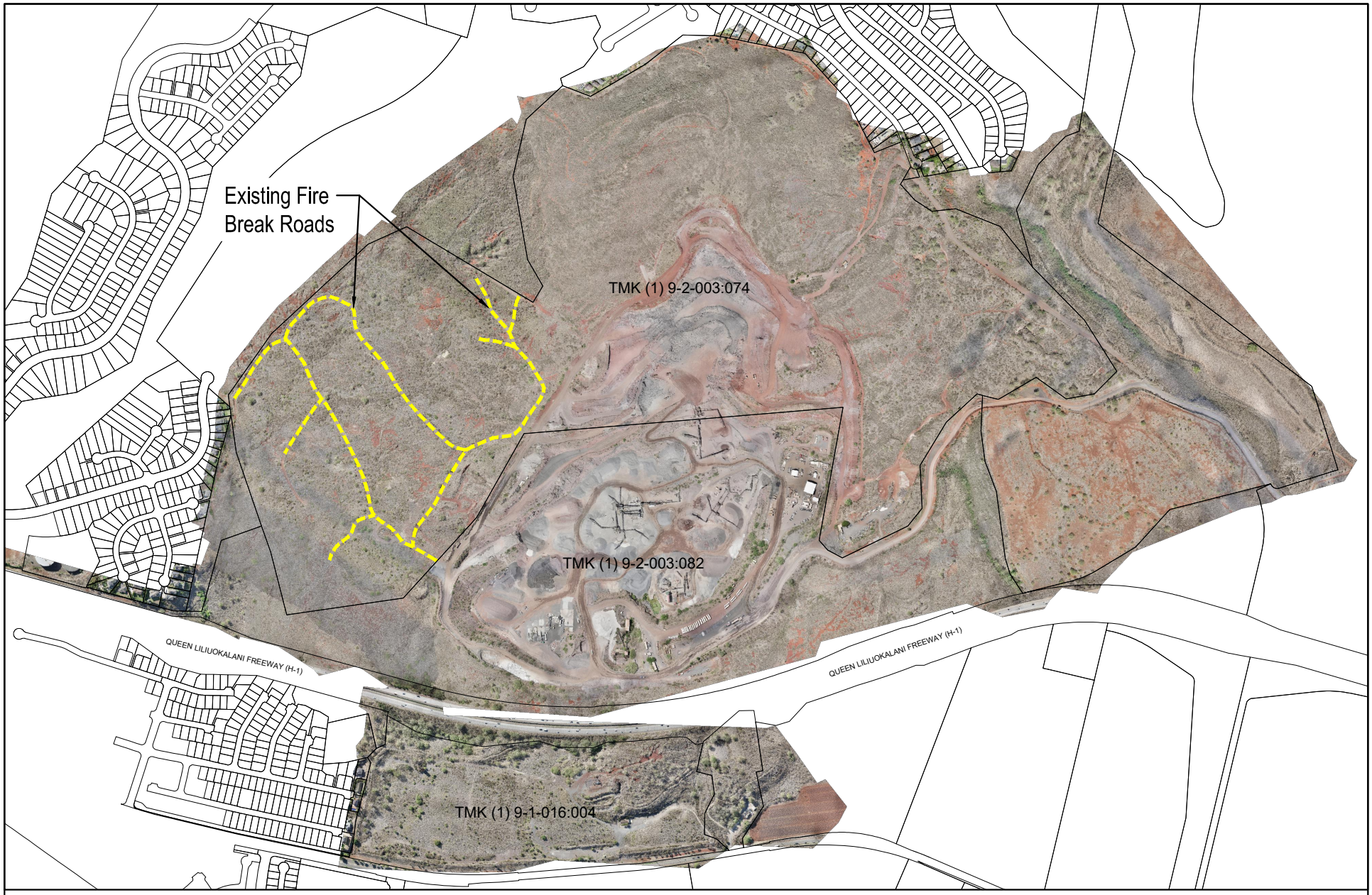
Lane Group	WBL	WBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	1491	14	383	15	31	17
v/c Ratio	0.85	0.01	0.78	0.04	0.20	0.01
Control Delay	26.4	0.0	40.9	19.6	43.3	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.4	0.0	40.9	19.6	43.3	0.0
Queue Length 50th (ft)	385	0	204	8	17	0
Queue Length 95th (ft)	#622	0	321	17	46	0
Internal Link Dist (ft)				562	313	
Turn Bay Length (ft)						100
Base Capacity (vph)	1924	1214	669	1091	251	1583
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.77	0.01	0.57	0.01	0.12	0.01

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	25	371	397	929	29	1489
v/c Ratio	0.10	0.23	0.14	0.33	0.14	0.47
Control Delay	25.0	0.3	4.2	0.3	26.6	2.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.0	0.3	4.2	0.3	26.6	2.7
Queue Length 50th (ft)	5	0	0	0	6	0
Queue Length 95th (ft)	28	0	57	0	33	151
Internal Link Dist (ft)			639			562
Turn Bay Length (ft)						
Base Capacity (vph)	425	1583	3505	2787	215	3539
Starvation Cap Reductn	0	0	0	0	0	12
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.23	0.11	0.33	0.13	0.42

Intersection Summary



Aerial Imagery date: September 29, 2022

NORTH

0 250 500 1000

SCALE IN FEET

Makakilo Quarry
Existing Fire Break Roads

Exhibit "O"

Makakilo Quarry View Planes Analysis

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September 2022
Revised June 2023

GP GracePacific

Exhibit "P"

Table of Contents

Figures

1. Introduction and Methodology

1.1 Introduction

This View Planes Analysis study was prepared by Bowers + Kubota Consulting at the request of Grace Pacific LLC to support the proposed alteration to the boundary and operational life of Makakilo Quarry ("the Project") in Kapolei on the island of Oʻahu, Hawaiʻi. The purpose of this study is to assess the visual impact of the Project from selected locations with lines of sight to the Project area. The Project aims to extend the operating life of the currently active Makakilo Quarry ("the Quarry") until the year 2047 and adjusts a total of 31.2 acres of the Quarry area as shown in Figure 1.1. The adjusted boundary removes 15.6 acres of the current the permitted grading, landscaping, and berming area of the Quarry and adds 15.6 acres mauka (on the upper slopes of Puʻu Makakilo), west of the existing quarry excavation area.

The revised boundaries and operational life of Makakilo Quarry are supported with a new final grading closure plan for the Quarry site, which has been prepared by Bowers + Kubota Consulting. The new final grading closure plan dictates the condition of the topography once quarry operations have ceased at the Quarry site as shown in Figure 1.2. This plan mitigates the visual impact of the site from the surrounding lines of site by simulating the natural topography of Puʻu Makakilo, a regional landmark. The graded slopes will consist of an average rise-run ratio of 1:1.5 and irregular terracing to minimize the "engineered" appearance of the graded area. The plan incorporates berms on the edges of the excavation area to further screen views of the Quarry pit from prominent lines of sight.

This View Planes Analysis assesses the visual impact of the Project on the surrounding environment. This study evaluated the aesthetic effects of the proposed changes to the extent of quarry excavation, berming and operations area. The conditions simulated assess the impact of the implementation of the revised final closure grading plan and renaturalization[1] of the Quarry site. Renaturalization for the Quarry site will consist of planting of native shrubs such as maʻo, ʻiliahi, naio, ʻaʻaliʻi, and pōhinahina as well as a hydroseed mix composed of common bermuda, buffel grass, and annual rye on the finished slopes of the site. Temporary irrigation fixtures may be used to establish the vegetation. This mix of vegetation will allow the site to match the existing appearance of Puʻu Makakilo. The following is a summary of the methods used to conduct the study, a description of the site conditions and regional settings, and discussion of potential impacts to visual aspects from the Project.

[1] Renaturalization describes the process of introducing and establishing plant material within the disturbed areas in order to blend the Quarry site into the surrounding hillside

Aerial Imagery date: September 29, 2022

NORTH

0 250 500 1000

SCALE IN FEET

Figure 1.1
Makakilo Quarry
PROPOSED EXPANSION AREA
January 2023

ACCESS ROAD ALONG GRADING BORDER

CUT-OFF SWALE

ACCESS ROAD ALONG GRADING BORDER

DETENTION POND

DETENTION POND

QUEEN LILIUOKALANI FREEWAY (H-1)

QUEEN LILIUOKALANI FREEWAY (H-1)

Figure 1.2

CLOSURE GRADING PLAN

SCALE: 1" = 400'

NORTH

0 400' 800'

1.2 Methodology

Five lines of sight were selected due to their visual relationship with the Quarry and frequency with which it is viewed by the public. The views were used to assess the existing conditions and simulate the appearance of the Quarry site after operations have ceased and renaturalization has occurred.

The aesthetic impact of the Project on nearby lines of sight is an important consideration due to the Quarry's location on Puʻu Makakilo, a regional landmark. The City and County of Honolulu has established the importance of Oʻahu's visual character in section 3 of its General Plan:

> ***Objective B: To preserve and enhance natural landmarks and scenic views of Oʻahu for the benefit of both residents and visitors as well as future generations.***
>
> *Policy 2: Protect Oʻahuʻs scenic views, especially those seen from highly developed and heavily traveled areas.*

The ʻEwa Development Plan further emphasizes the importance of prominant visual resources. In this development plan, Puʻu Makakilo is listed as a visual landmark designated for protection (ʻEwa DP, Section 2.2.9). Puʻu Makakilo is also noted in the ʻEwa Development Plan as being a significant historical landmark in the region. To support a thorough assessment of the visual impact of the Project, this report will compare the existing conditions with the simulated appearance of the closure conditions of the Quarry site presented in the final grading closure plan.

The visual simulations presented in this analysis were created using a 3D model of the proposed final grading closure plan for Makakilo Quarry. The model was oriented to match the orientation of Puʻu Makakilo and the existing quarry from the selected view planes. From these perspectives, the portions of the model that were visible were rendered using the renaturalized conditions of the Quarry pit to match the surrounding slopes of Puʻu Makakilo. The renaturalized appearance of the slopes was rendered from existing portions of the property that Grace Pacific has renaturalized as well as material from the surrounding hillsides.

2. Project Setting

2.1 Visual Character of the Region

The Project site is located near the residential community of Makakilo, in the ʻEwa District northeast of Kapolei on Oʻahu. Makakilo Quarry is on the slopes of Puʻu Makakilo, mauka of Queen Liliʻuokalani (H-1) Freeway. The community of Kapolei as well as the University of Hawaiʻi West Oʻahu Campus are directly opposite the Quarry on the makai side of the H-1 Freeway. The southeast slopes of Puʻu Makakilo remain mostly undeveloped. Much of the land on the southern slopes of Puʻu Makakilo is owned by Grace Pacific and serves as the buffer for the quarry's operational area. The land west of Grace Pacific's property remians mostly undeveloped, and is comprised of natural slopes and agricultural fields. West and south of the Puʻu lies the Makakilo Community, composed primarily of single-family homes and residential development.

0 0.5 1
SCALE IN MILES

Figure 2.1
Makakilo Quarry Location Map

2.2 Makakilo Quarry

2.2.1 Visual Character of the Project Site

Grace Pacific's Makakilo Quarry lies along the south-west shore of O'ahu, within the 'Ewa District. The Quarry is surrounded by the Makakilo Community to the north and west, and Kapolei to the south and east. The Project site is bordered to the south by the H-1 Freeway along the makai side. A berm along the freeway entirely blocks any views of the Quarry from those passing directly alongside the site. The Quarry is located on the southern slopes of Pu'u Makakilo. Grace Pacific's property begins at an elevation of 240 feet above mean sea level, adjacent to the H-1 Freeway, and extends up towards the top of Pu'u Makakilo at an elevation of 972 feet above mean sea level. The slopes on the property range from 11% to 40%, with the exception of the quarry pit (the "excavation area") which has significantly steeper slopes and several vertical faces. Grace Pacific's property is composed of two primary types of land uses: the grading and landscaping area and the buffer area.

The landscaping and grading area encompasses 184.2 acres and is used for excavation, materials processing, sales, and visual screening. The quarry grading and landscaping area is characterized by exposed steep slopes of the Pu'u, the excavation area, mining and processing equipment, maintenance facilities for the operations, and stockpiles of excavated material. Only the upper reaches on the mauka portions of the landscaping and grading area of the quarry are visible from off-site. The primary operational equipment and facilities are located at the floor of the quarry pit, shielding them from public lines of sight. The upper extents of the quarrying operation area consist of exposed faces of the excavated slopes of the Pu'u, disturbed topsoil, and vegetated screening berms.

Excavation, sales, maintenance, rock processing, and blasting occur within the landscaping and grading area at various allowed times throughout the day. Trucks enter and exit the site via Palehua Road off of the H-1 Freeway to load processed material and drop off material for recycling. Processing materials including crushing, sorting, stockpiling, and washing of rock occurs primarily in the quarry pit. Additionally, a concrete plant and hot-mix asphalt plant are located in the quarry pit, naturally shielding all materials processing from views off-site. The excavation and blasting activites occur on the slopes of the Quarry closest to the Pu'u, thus these activites are somewhat visible on the faces of the slope that can be seen off site.

The buffer area surrounding the operational quarry area encompasses 303 acres and is characterized by dry, arid slopes covered in sparse shrubs and groundcover vegetation. Local plant species include Guinea grass, buffel grass, and feather fingergrass as well as 'uhaloa and kiawe. The buffer area includes several portions of the property that have been successfully renaturalized, and currently blend into the surrounding undeveloped hillsides.

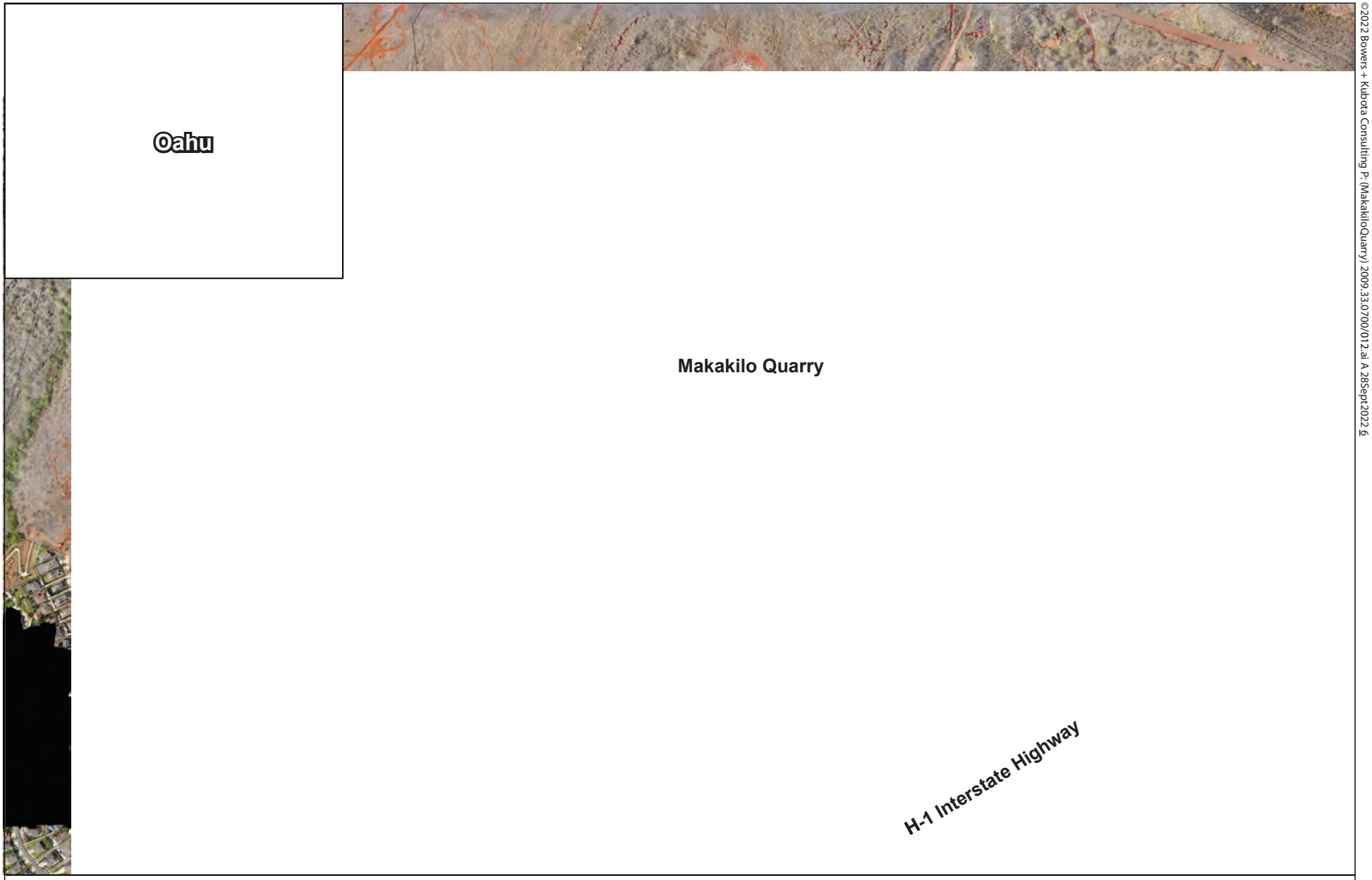

Figure 2.2

Makakilo Quarry Existing Conditions

2.2.2 Lines of Sight

The open pit of the Quarry directly faces Kapolei, making it the prominent feature for most mauka viewsheds in the community. The Quarry is visible from notable locations along Farrington Highway, Kualakai Parkway, and Kapolei Parkway within Kapolei. Locations along these roads with prominent view planes that are analyzed in this report include the Salvation Army Kroc Center, UH West Oʻahu Campus, Kānehili and Kealanani Avenue. Streets in these areas have stretches that maintain consistent views of the Quarry pit, and the analyzed locations represent some of the significant lines of sight to the Quarry.

Makakilo Quarry is visible from the H-1 Freeway for sections beginning near Pearl City, where the altered slopes and east berm of Puʻu Makakilo can be seen in the distance. The grading and excavation of the slopes becomes prominently visible between Exit 5A (Fort Weaver Road/ʻEwa) and Exit 3 (Kualakai Parkway). Beyond Exit 3, the Quarry is no longer visible because the slopes at the base of Puʻu Makakilo directly adjacent to the H-1 Freeway block any mauka views.

Due to the topography of the slopes and the Project's berming, the Quarry pit is not visible from locations that are west of Puʻu Makakilo. Only portions of the west edge of the Quarry's excavation area and several mounds of overburden[2] are visible from the view planes to the west of the Project site. These features are visible along Kealanani Avenue and can be most prominently seen on the segment adjacent to Kapolei Golf Club.

[2] The material (rock and/or soil) overlying the basalt deposits being extracted within the Quarry.

NORTH

SCALE IN FEET

Makakilo Quarry View Plane Locations

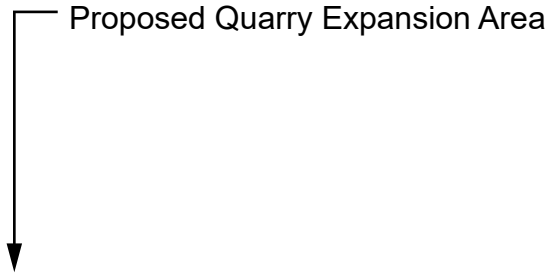

Figure 2.4

Proposed Expansion Area Perspective View from the Salvation Army Kroc Center Hawai'i

3. Visual Impacts of the Project

3.1 Views from the Salvation Army Kroc Center Hawai‘i

3.1.1 Existing Conditions

The Salvation Army Kroc Center Hawai‘i (SAKCH) is a 200,000 square foot community center located along Kualakai Parkway in ‘Ewa Beach, southeast of Makakilo Quarry. The slopes of Pu‘u Makakilo are prominently visible from the SAKCH and the surrounding developments. The Quarry's visual impact is greatest at the intersection of Keahumoa Parkway and Kualakai Parkway (Figure 3.1), where the open face of the Pu‘u is directed at those driving down Keahumoa Parkway. The upper portions of the Quarry excavation area are clearly visible from this intersection with the disturbed topsoil and steep rock faces starkly contrasting the surrounding vegetated slopes.

3.1.2 Anticipated Conditions

Although the Project involves moving the extent of the Quarry excavation further up the slopes of Pu‘u Makakilo, the implementation of the final grading plan will mitigate the adjusted footprint of the quarry operations by simulating the topography adjacent to the site. The visible portions of the excavated hillside and exposed rock faces that make the Quarry so prominent from this location will be extenuated by matching the natural appearance of the surrounding slopes. After renaturalization, the Quarry site will blend in with the slopes of Pu‘u Makakilo and the adjacent hillsides in both form and composition.

Existing conditions view from the Salvation Army Kroc Center

Simulated view after closure and renaturalization from the Salvation Army Kroc Center

Figure 3.1
Existing Conditions and Simulated Conditions After Closure from the Salvation Army Kroc Center

3.2 Views from Kānehili

3.2.1 Existing Conditions

The Kānehili residential project is a 92-acre residential subdivision located in Kapolei along Kualakai and Kapolei parkways. Kānehili is located directly adjacent to the Department of Hawaiian Homelands office and across from Ka Makana Aliʻi Shopping Mall. Puʻu Makakilo is a prominent feature to the northwest from much of the subdivision, and the north and west faces of the Quarry excavation area are clearly visible. As seen in Figure 3.2, the upper portions of the Quarry and the steep walls adjacent to the Quarry maintenance facilities stand out from the surrounding hillsides. The exposed rock and topsoil visible in the open Quarry pit further distinguishes it from the natural slopes of Puʻu Makakilo.

3.2.2 Anticipated Conditions

The implementation of the final grading plan will minimize the visual prominence of the Quarry site from Kānehili by replacing the faces of the quarry excavation area with more gradual slopes, matching those of the surrounding hillside. The expansion of the excavation area mauka into the currently undisturbed slopes above the Quarry may mean that portions of this affected area would become more visible when compared to existing conditions. The edges as well as the upper portion of the Quarry pit will be visible after final closure grading, but should be mitigated due to the relatively even and gentle slopes. After renaturalization, the site will blend in with the sparsely vegetated slopes of Puʻu Makakilo as shown in Figure 3.2. The visual impact of the Quarry site from Kānehili would be minimal after the implementation of the final grading plan and renaturalization has occured.

Existing conditions view from Kānehili

Simulated view after closure and renaturalization from Kānehili

Figure 3.2
Existing Conditions and Simulated Conditions After Closure from Kānehili

3.3 Views from H-1 Freeway

3.3.1 Existing Conditions

The eastern edge of Makakilo Quarry is visible from the H-1 Freeway beginning just east of the Freeway's intersection with Kunea Road through the intersection with Kualakai Parkway as show in Figure 3.3. This side of the Quarry is visible due to the steep cut of the excavated slopes' contrast with the smooth slopes along the east side of Pu'u Makakilo. The existing mound of overburden at the north-east corner of the Quarry is the most prominent feature from this view due to the lack of vegetation and its incongruity with the surrounding topography. The bare topsoil in an unnaturally formed pile starkly contrasts with grassy slopes surrounding the Quarry to the east.

3.3.2 Anticipated Conditions

The implementation of the final closure grading plan will minimize views of the Quarry site via the creation of a berm running along the northeast edge of the Quarry pit. The existing mound of overburden on the eastern edge of the Quarry will be removed prior to the implementation of the final grading plan. The eastern berm will mitigate views of the Quarry site, and would blend in with the surrounding slopes after renaturalization. After renaturalization has occured, the Quarry site will have minimal visual impact to views from the H-1 Freeway.

Figure 3.3
H-1 Highway View

3.4 Views from University of Hawai‘i West O‘ahu Campus

3.4.1 Existing Conditions

The University of Hawai‘i West O‘ahu (UHWO) Campus and the Hawai‘i Tokai International College are located along Farrington Highway, directly east of the Quarry site as shown in Figure 3.4. The mauka face of the Quarry on the northwest side of the site is prominently visible from much of the campus. The exposed rock and topsoil from excavation distinguish these slopes from the surrounding hillside. Additionally, the mounds of overburden present on the north and south edges of the Quarry are noticeable due to their distinct shape and lack of vegetation. The existing berm on the makai side of the Quarry along the H-1 Freeway blocks views of the Quarry pit and much of the lower slopes of the excavation area.

3.4.2 Anticipated Conditions

The implementation of the final grading plan will eliminate the steep faces that currently distinguish the Quarry site from the surrounding slopes of Pu‘u Makakilo. The expansion of the Quarry’s excavation mauka will mean that portions of the currently undisturbed slopes above the quarry will be slightly more steep than existing conditions. After renaturalization, the slopes will be aesthetically integrated into the surrounding hillside due to the general similarity in topography. The existing mounds of overburden will be softened prior to closure of Quarry operations. After implementation of the final grading plan and renaturalization has occurred, the Quarry site will have minimal visual impact to views from UHWO.

Existing conditions view from UH West Oʻahu

Simulated view after closure and renaturalization from UH West Oʻahu

Figure 3.4
Existing Conditions and Simulated Conditions After Closure from UH West Oʻahu

3.5 Views from Kealanani Avenue

3.5.1 Existing Conditions

Although the Quarry pit is not visible from locations west of Puʻu Makakilo, portions of the excavated hillside along the west edge of the Quarry as well as several mounds of overburden are visible from the west. These visible portions of the Quarry site contrast with the gradual topography of the hillside. Although these features are not prominent from view planes from the west, they are noticeable due to their incongruence with the smooth profile and vegetation of the surrounding slopes of Puʻu Makakilo. The mounds of overburden and excavation areas are most visible looking north from Kealanani Avenue in Kapolei.

3.5.2 Anticipated Conditions

The implementation of the final grading plan will eliminate many of the features that cause the Quarry to stand out from the surrounding hillsides, including the mounds of overburden and the cut faces of the hillside. The profile of the upper slopes of the puʻu will be altered as the excavation is expanding mauka, affecting undisturbed slopes that are currently above the existing Quarry. After the implementation of the final grading plan, these currently undisturbed slopes will be steeper than existing conditions in some areas, but still blend into the surrounding topography. The existing excavated faces of the hillside will be replaced with more gradual slopes matching those of Puʻu Makakilo. Overall, the profile of the Quarry site that is visible from the west will have a more consistent appearance. After renaturalization has occured, the Quarry site will blend into the surrounding undeveloped hillside.

Existing conditions view from Kealanani Avenue

Simulated view after closure and renaturalization from Kealanani Avenue

Figure 3.5
Existing Conditions and Simulated Conditions After Closure from Kealanani Avenue

Biological Survey Report for the Proposed Makakilo Quarry Expansion ʻEwa District, Oʻahu, Hawaiʻi
TMK (1) 9-2-003:074 Por.

Prepared For:

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15 June 2023

Exhibit "Q"

CONTENTS

FIGURES

TABLES

1.0 INTRODUCTION

At the request of Grace Pacific, Koʻolau Ecological Services conducted a biological survey of the proposed Makakilo Quarry Expansion (project), Makakilo, ʻEwa District, Island of Oʻahu. This report summarizes the results of a biological survey for plants and wildlife listed under the Endangered Species Act (50 CFR 17.11 and 50 CFR 17.12), the Migratory Bird Treaty Act (MBTA, 50 CFR 10.13), and the state list of threatened or endangered wildlife (Exhibit 2 and 3, HAR 13-124). The main objective of the investigation was to document the biological resources of the newly added expansion area, including habitat conditions, to support the environmental planning.

1.1 Project Description

The Grace Pacific Makakilo Quarry has been in continuous operation since 1972 (Cerny 1972). The Facility's primary function is to quarry and process rock into useable aggregate that is then distributed to customers. Rock is initially quarried from the Quarry Excavation Area. It is then crushed in the Primary and Secondary Plant and then processed through the Finishing Plants and Wash Plant to create aggregate which is then available for sale.

The proposed action consists of a boundary modification and permit time extension for Grace Pacific's existing quarry at the base of Pu'u Makakilo. The modification will entail the inclusion of a 15.6-acre area mauka and ʻewa of the existing permit boundary (project area) and the removal of two previously permitted areas - this study addresses the expansion area (Figure1).

Proposed activities within the project area will include the removal of vegetation, soil, and overburden, and the excavation of rock. The project area will be included within the quarry excavation area. It will be mined by blasting and excavating the quarry face and benches, then heavy equipment will move the overburden and rock to the processing area.

1.2 Project Area

The project area is located on the east and south-facing slopes of Puʻu Makakilo, adjacent to the existing Makakilo Quarry (Figure 1). The elevation ranges from approximately 500 feet at the southern end of the project area to over 800 feet along the western boundary. Landcover was classified as shrub and rangeland according to the *Land Use Land Cover of main Hawaiian Islands as of 1976* (Hawaii Statewide GIS Program 2022) and was used for seasonal grazing prior to the operation of the quarry (Cerny 1972).

The project area is on the leeward of the island and receives approximately 27 inches of rain annually (Giambelluca et al. 2013). No federally designated critical habitats or aquatic habitats are in close proximity to the survey area (USFWS 2022a and 2022b) (Figure 2).

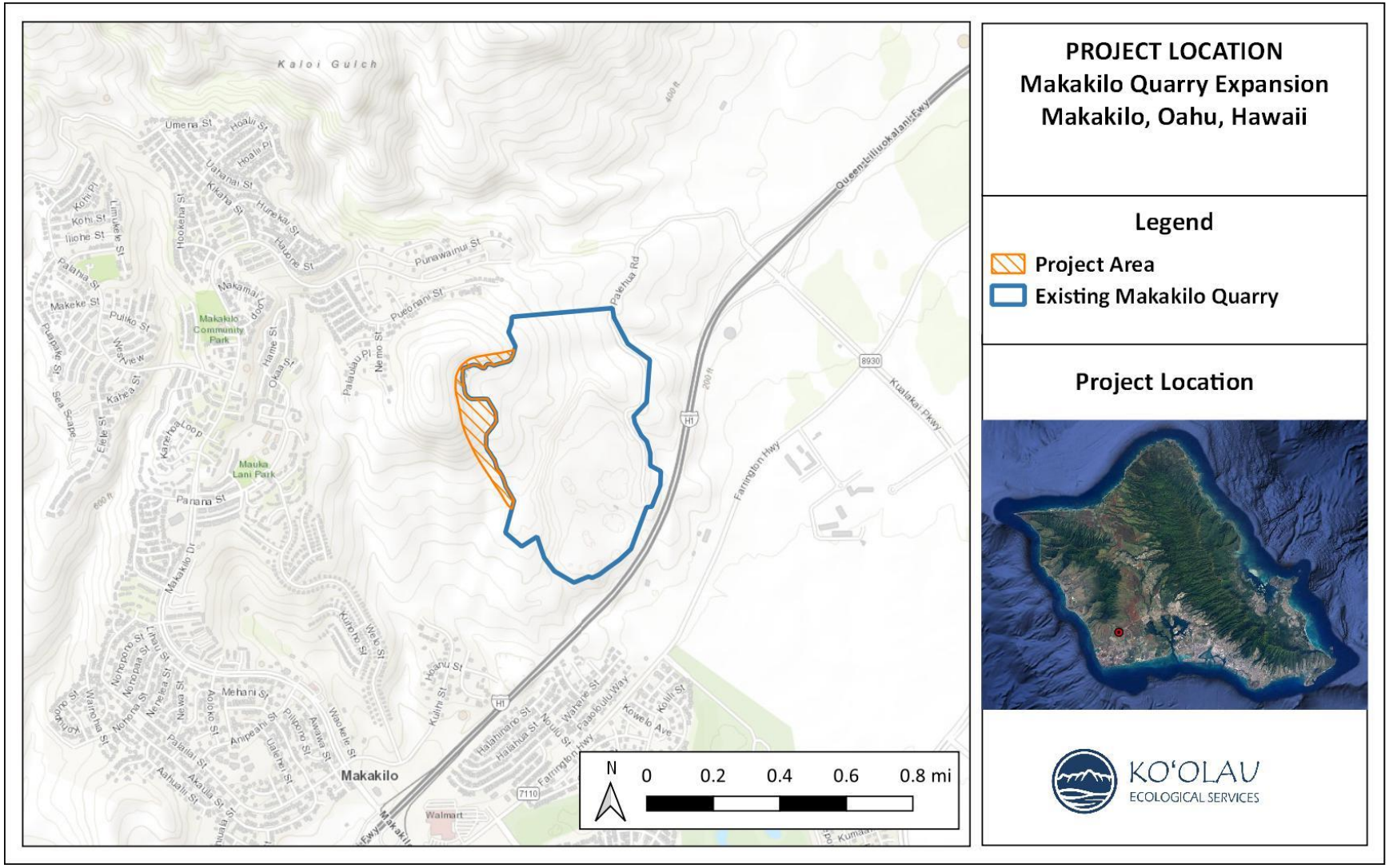

Figure 1. Project location.

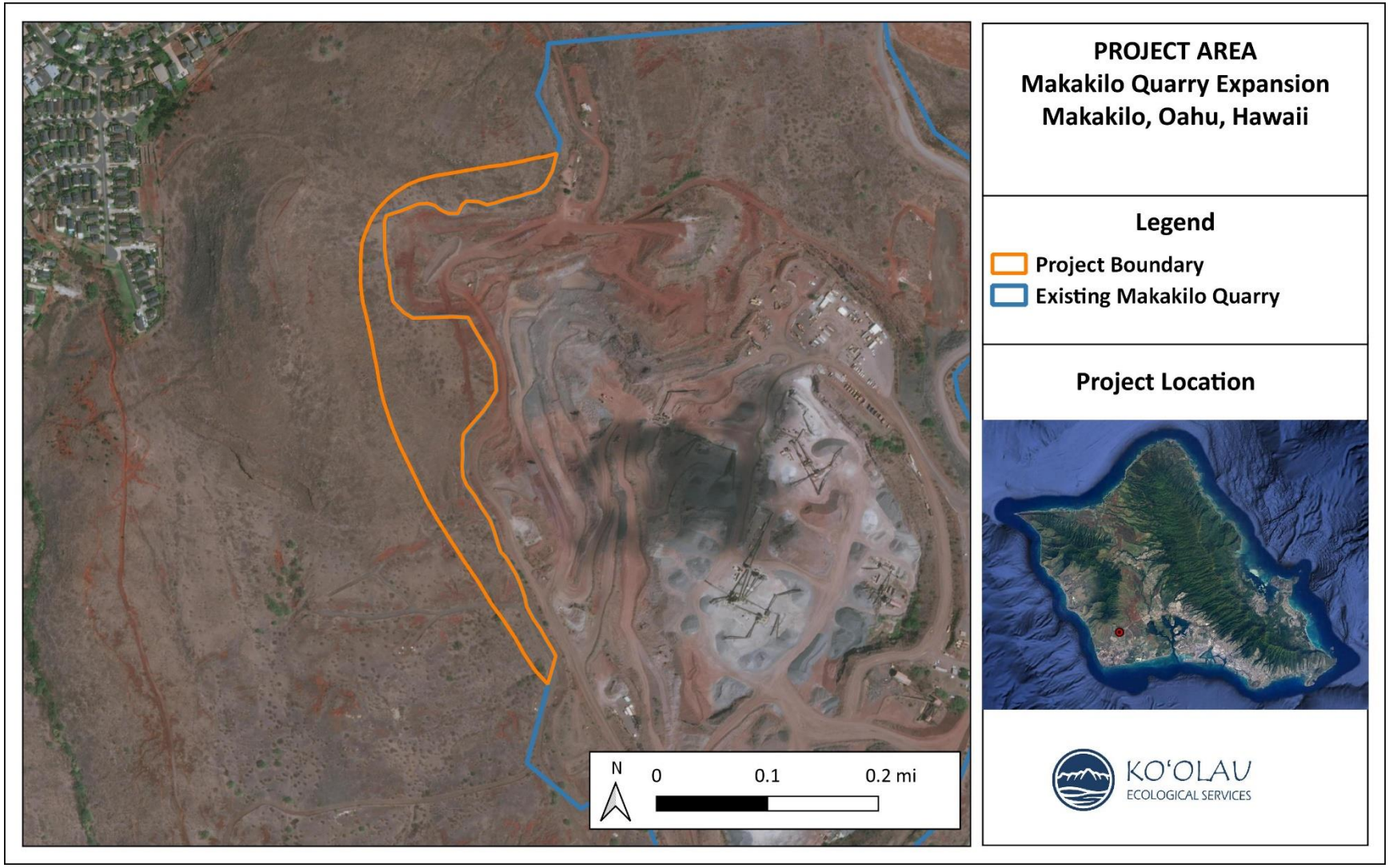

Figure 2. Project Area of the Proposed Makakilo Quarry Expansion.

2.0 METHODS

The field investigation was conducted on May 31st and June 1st, 2022. The field investigation consisted of a pedestrian transect survey for floral and terrestrial faunal resources and point-count surveys for avian resources.

The botanical survey involved identifying the vegetational communities and compiling a list of vascular plants that were present in the project area. The botanical survey was performed by walking transects spaced at 15-meter intervals to provide sufficient visual coverage of the survey area. Transects were narrowed in areas of higher quality habitats or denser vegetation (i.e. the intuitive controlled survey method). The botanical survey was floristic; all plants encountered were identified to the species level, whenever possible.

The faunal survey involved a pedestrian transect survey for terrestrial fauna and point-count surveys for avian fauna. The pedestrian survey involved visual detection during the line transect survey with an emphasis on high quality habitats. Avian resources in the project area were surveyed using a timed point-count method in the early morning (before 10:00 am). Point-count stations were selected in locations that provided sufficient visual coverage of the survey area. Both visual and audio detection methods were employed. Each count station was surveyed for eight minutes.

3.0 RESULTS

3.1 Vegetation

Vegetation of the project area consisted of Lowland Dry and Lowland Mesic Communities according to Gagne and Cuddihy's classification (Gagne and Cuddihy 1990). The vegetation was dominated by introduced species. Only a handful of native plants were observed. The following describes the plant communities identified in the project area.

1) Koa Haole Woodland: This was the most prevalent plant community found in the Project Area. The introduced plant community was composed mostly of open-canopied koa haole (*Leucaena leucocephala*) with Guinea grass (*Megathyrsus maximus*) understory. Both species are highly invasive in Hawaii and can form monospecific stands. The proportion of the Koa Haole and Guinea grass changed from over 50 percent tree coverage in the north part of the project area (Figure 3) to under 10 percent in the lower part of the project area (Figure 4). Signs of recent wildland fires were observed in the area dominated by Guinea grass, which explained the sparse tree coverage.

2) Pili Grassland (Figure 5): This plant community was found on the steep slope below the summit of the Puʻu Makakilo. The area was characterized by rocky substrates with minimal soil development. The vegetation was dominated by pili grasses (*Heteropogon contortus*) and natal redtop (*Melinis repens*), with sparse shrubs and herbs in between. The native shrubs, ʻilima (*Sida fallax*) and uhaloa (*Waltheria indica*) were relatively common in this plant community.

3) Ruderal Vegetation (Figure 6): This vegetation type resulted from recent disturbance and consisted of a variety of non-native grasses and herbs that dotted the barren grounds. It was found mostly along roadsides and eroded steep slopes. The composition of this vegetation varied wildly from location to location but usually consisted of weedy species that colonized the disturbed areas rapidly.

Figure 3. Lowland Mesic Shrubland dominated by koa haole (*Leucaena leucocephala*) and Guinea grass (*Megathyrsus maximus*).

Figure 4. Shrubland dominated by Guinea grass after fire. View to the southwest.

Figure 5. Grassland dominated by pili (*Heteropogon contortus*) and natal redtop (*Melinis repens*). View to the west towards Pu‘u Makakilo summit.

Figure 6. Ruderal vegetation found along roadside consisted of weedy species. View to the southwest.

3.2 Flora

The vascular plants identified in the survey area consisted of 54 species in 18 families, including 46 dicots and 8 monocots. Legumes (Fabaceae), daisies (Asteraceae), and grasses (Poaceae) were found to be the most species rich families. Of the 54 vascular plants identified, only four species (7%) were native. A list of the observed vascular plants is provided in Table A-1 (Appendix A). No federal or state listed threatened or endangered plants were observed during the field investigation.

3.3 Fauna

No federal or state listed threatened or endangered animals were observed during the field investigation. A list of the observed species is provided in Table B-1 (Appendix B).

3.3.1 Mammals

Two mammals were observed in the project area, including a small Indian mongoose (*Herpestes auropunctatus*) and a feral cat (*Felis catus*). Even though not detected, small rodents, including rats (*Ratus spp*.) and mice (*Mus musculus*), likely occurred in the project area.

The endangered Hawaiian hoary bat or ʻōpeapeʻa (*Lasiurus cenereus semotus*) is known to occur on Oahu in low numbers. The bats roost on trees or shrubs 15 feet or taller. During the pupping season, there is a risk that young bats could be harmed or killed if trees for roosting are cleared. To avoid the potential impacts on the bats, it is recommended that trees or shrubs that are greater than 15 feet tall not be trimmed during the bat birthing and pup rearing season (June 1 through September 15). Another threat to the bat is entanglement by barbed wires. To avoid this negative impact, it is recommended that barbed wires not be used for fencing.

3.3.2 Birds

Ten eight-minute point-count avian surveys were conducted on May 31st and June 1st, 2022. Weather conditions were sunny, with 0 to 50 percent cloud coverage. Low winds averaged 1.3 to 3.9 knots. The air temperatures ranged from 24.9 to 28.7 °C.

During the surveys, ten bird species totaling 38 individuals were detected. These included 12 red-vented bulbul (*Pycnonotus cafer*), 11 zebra doves (*Geopelia striata*), five Japanese white-eyes (*Zosterops japonicus*), three grey francolins (*Francolinus pondicerianus*), 2 red-crested cardinals (*Paroaria coronata*), and one individual each for the common myna (*Acridotheres tristis*), red-whiskered bulbul (*Pycnonotus jocosus*), spotted-necked dove (*Streptopelia chinensis*), scaly-breasted munia (*Lonchura punctulata*), and red-whiskered bulbul (*Pycnonotus jocosus*). All the birds observed are introduced species that are not listed as threatened and endangered under the state or federal regulations.

The endangered Hawaiian petrel or ʻuaʻu (*Pterodroma sandwichensis*), the threatened Newell's shearwater or ʻaʻo (*Puffinus newelli*), the endangered Band-rumped storm-petrel or ʻakēʻakē (*Hydrobates castro*), and a number of MBTA protected seabird species may transit through the project area during the breeding seasons. Outdoor lighting could result in seabird disorientation, fallout, injuries, or mortality. Fledglings are especially vulnerable. To avoid the adverse effect, it is recommended to minimize outdoor lighting during the fledging season (September 15 to December 15). If outdoor lighting is unavoidable, seabird friendly options, such as shielded light fixtures or bulbs with low blue light should be used.

The Hawaiian short-eared owl, or pueo (*Asio flammeus sandwichensis)*, is a Hawaii state-listed endangered species on the Island of Oʻahu (DLNR 2015) and is protected under the MBTA. The grassland

in the project area may provide suitable foraging and nesting habits for the owls. Because pueo nests on the ground, vegetation clearing could cause destructions to the nest, eggs, and nestlings, as well as nest abandonment. A nest search prior to vegetation clearing is recommended if the owl is observed in the general area.

3.3.3 Invertebrates

Two indigenous dragonflies, green darner (*Anax junius*) and wandering slider (*Pantala flavescens*), were observed during the surveys. The dragonflies are wide-ranged species that may use the project area for foraging. The project area, however, does not offer aquatic habitats for breeding. Other observed invertebrates included African giant snail (*Lissachatina fulica*), Gulf fritillary butterfly (*Dione vanillae*), and a number of unidentified insect species, such as ants and grasshoppers. None of the invertebrates identified are listed as threatened and endangered.

Although tree tobacco (*Nicotiana glauca*), a host plant of the endangered Blackburn's sphinx moth (*Manduca blackburni*), was present in the project area, the endangered moth is currently extirpated on Oahu. Therefore, the proposed project will not affect the moth.

Several endangered yellow-faced bees (*Hylaeus spp*.) occur in coastal and lowland habitats on Oahu. However, these bees are limited to native plant communities. Therefore, these bees are unlikely to occur in the project area. The proposed project is not expected to affect the bees.

4.0 DISCUSSION

4.1 Protected Species

No threatened or endangered plants or animals were observed during the field investigation. At its current state, the highly degraded habitats in the project area are unlikely to support resident populations of the listed threatened and endangered species. Some wide ranged species, such as birds and bats, may be present intermittently or transit through the project area. The project activities should consider potential negative impacts to these species and incorporate conservation measures in the project planning to address such impacts.

4.2 Noxious Weeds

During the botanical survey, a large number of introduced species, including several state-listed noxious weeds, were identified, mostly found along the existing roads. Because the weeds have the potential to be transported outside of the project area through contaminated materials or vehicles, it is advisable to assess the risks and implement control measures to manage these risks as needed.

5.0 CONCLUSION

A biological survey was conducted for the proposed Makakilo Quarry Expansion. The results indicated that the project area is predominantly occupied by introduced plants and animals. No federal or state listed threatened or endangered species were observed. The proposed realignment of the Makakilo quarry permit area would not pose any notable or additional threat to the listed flora and fauna.

6.0 LITERATURE CITED

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APPENDIX A: LIST OF THE VASCULAR PLANTS IDENTIFIED

Table A-1. List of the Vascular Plants Identified in the Makakilo Quarry Expansion Area

Family	Taxon	Nativity*	Relative Abundance**
	DICOTS		
Aizoaceae	*Tetragonia tetragonioides* (Pall.) Kuntze -- New Zealand spinach	x	U
Apocynaceae	*Calotropis gigantea* (L.) W.T. Aiton -- Crown flower	x	U
Apocynaceae	*Stapelia gigantea* N.E. Br. -- Zulu giant	x	A
Asteraceae	*Bellis perennis* L. -- Lawndaisy	x	U
Asteraceae	*Emilia xfosbergii* Nicolson -- Florida tasselflower	x	C
Asteraceae	*Lactuca serriola* L.. -- Prickly lettuce	x	U
Asteraceae	*Pluchea carolinensis* (Jacq.) G. Don -- Cure for all	x	U
Asteraceae	*Sonchus oleraceus* L. -- Common sowthistle	x	U
Asteraceae	*Sphagneticola trilobata* (L.) Pruski -- Wedelia	x	C
Asteraceae	*Tridax procumbens* L. -- Coatbuttons	x	U
Asteraceae	*Verbesina encelioides* (Cav.) Benth. & Hook. f. ex A. Gray -- Golden crownbeard	x	U
Asteraceae	*Xanthium strumarium* L. -- Rough cocklebur	x	U
Bignoniaceae	*Tecoma stans* (L.) Juss. ex Kunth -- Yellow trumpetbush	x	R
Boraginaceae	*Heliotropium procumbens* Mill. -- Fourspike heliotrope	x	U
Cactaceae	*Opuntia ficus-indica* (L.) Mill. – Prickly pear	x	R
Chenopodiaceae	*Salsola tragus* L. -- Prickly Russian thistle	x, n	U
Convolvulaceae	*Ipomoea cairica* (L.) Sweet -- Mile a minute vine	x	C
Convolvulaceae	*Merremia aegyptia* (L.) Urb. -- Hairy woodrose	x	O
Cucurbitaceae	*Coccinia grandis* (L.) Voigt – Ivy gourd	x, n	O
Euphorbiaceae	*Chamaesyce hirta* (L.) Millsp. -- Pillpod sandmat	x	U
Euphorbiaceae	*Ricinus communis* L. -- Castorbean	x	X
Fabaceae	*Acacia farnesiana* (L.) Willd. -- Sweet acacia	x	C
Fabaceae	*Alysicarpus vaginalis* (L.) DC. -- White moneywort	x	U
Fabaceae	*Chamaecrista nictitans* (L.) Moench -- Sensitive partridge pea	x	C
Fabaceae	*Crotalaria pallida* Aiton -- Smooth rattlebox	x	U
Fabaceae	*Desmanthus pernambucanus* (L.) Thell. -- Pigeon bundleflower	x	U
Fabaceae	*Desmodium tortuosum* (Sw.) DC. -- Dixie ticktrefoil	x	U
Fabaceae	*Indigofera hendecaphylla* Jacq. -- Trailing indigo	x	U
Fabaceae	*Leucaena leucocephala* (Lam.) de Wit -- Koa haole	x	D
Fabaceae	*Macroptilium atropurpureum* (Moc. & Sessé ex DC.) Urb. -- Purple bushbean	x	U

Family	Taxon	Nativity*	Relative Abundance**
Fabaceae	*Pithecellobium dulce* (Roxb.) Benth. -- Manila tamarind	x	R
Fabaceae	*Prosopis pallida* (Humb. & Bonpl. ex Willd.) Kunth -- Kiawe	x	U
Lamiaceae	*Hyptis pectinata* (L.) Poit. -- Comb bushmint	x, n	C
Lamiaceae	*Leonotis nepetifolia* (L.) R. Br. -- Lion's ear	x	U
Malvaceae	*Abutilon incanum* (Link) Sweet -- Hoary abutilon	i	X
Malvaceae	*Sida ciliaris* L. -- Bracted fanpetals	x	U
Malvaceae	*Sida fallax* Walp. -- ʻIlima	i	C
Malvaceae	*Waltheria indica* L. -- Uhaloa	i	C
Passifloraceae	*Passiflora foetida* L. -- Fetid passionflower	x	U
Portulacaceae	*Portulaca pilosa* L. -- Hairy pigweed	x	U
Solanaceae	*Datura stramonium* L. -- Jimsonweed	x	U
Solanaceae	*Nicandra physalodes* (L.) Scop. -- Apple of Peru	x	U
Solanaceae	*Nicotiana glauca* Graham -- Tree tobacco	x	U
Solanaceae	*Solanum lycopersicum* L. -- Garden tomato	x	R
Verbenaceae	*Lantana camara* L. -- Lantana	x	U
Verbenaceae	*Stachytarpheta jamaicensis* (L.) Vahl -- Light-blue snakeweed	x	U
	MONOCOTS		
Commelinaceae	*Commelina benghalensis* L. -- Jio	x	O
Poaceae	*Cenchrus ciliaris* L.-- Buffelgrass	x	D
Poaceae	*Cenchrus echinatus* L. -- Southern sandbur	x	U
Poaceae	*Chloris barbata* Sw. -- Swollen fingergrass	x	U
Poaceae	*Eragrostis pectinacea* (Michx.) Nees ex Steud. -- Tufted lovegrass	x	U
Poaceae	*Heteropogon contortus* (L.) P. Beauv. ex Roem. & Schult. -- Tanglehead	i	C
Poaceae	*Melinis repens* (Willd.) Zizka -- Rose Natal grass	x	A
Poaceae	*Megathyrsus maximus* (Jacq.) B.K.Simon & S.W.L.Jacobs -- Guineagrass	x	D

* i: indigenous; x: naturalized; n: noxious weeds

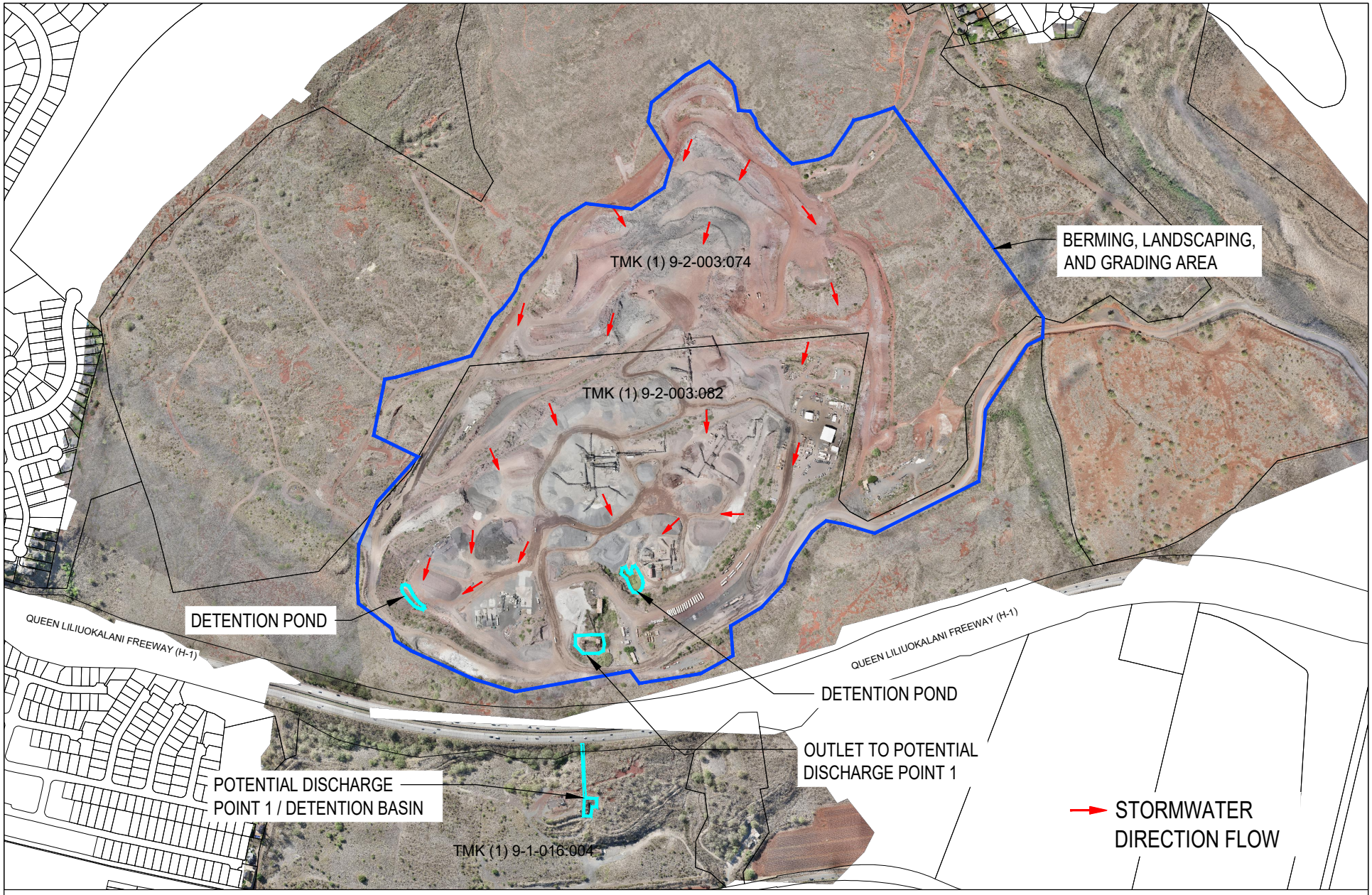
** D (dominant): >20% area of coverage; A (abundant): > 100 individuals per 100m transect surveyed but not dominant; C (common): 5-100 individuals per 100m transect surveyed; U (uncommon): 1-4 individuals per 100m transect surveyed; R (rare): <1 individual per 100m transect surveyed.

APPENDIX B: LIST OF THE FAUNA IDENTIFIED

Table B-2. List of the Fauna Identified in the Makakilo Quarry Expansion Area

Common Name	Taxon	Order: Family	Status
	AVES		
Red-vented Bulbul	*Pycnonotus cafer*	Passeriformes: Pycnonotidae	I
Zebra Dove	*Geopelia striata*	Columbiformes: Columbidae	I
Japanese White-eye	*Zosterops japonicus*	Passeriformes: Zosteropidae	I
Grey Francolin	*Francolinus pondicerianus*	Galliformes: Phasianidae	I
Red-crested Cardinal	*Paroaria coronate*	Passeriformes: Thraupidae	I
Common Myna	*Acridotheres tristis*	Passeriformes: Sturnidae	I
Red-whiskered Bulbul	*Pycnonotus jocosus*	Passeriformes: Pycnonotidae	I
Spotted-necked Dove	*Streptopelia chinensis*	Columbiformes: Columbidae	I
Scaly-breasted Munia	*Lonchura punctulata*	Passeriformes: Estrildidae	I
Red-whiskered Bulbul	*Pycnonotus jocosus*	Passeriformes: Pycnonotidae	I
	GASTROPODA		
African Giant Snail	*Lissachatina fulica*	Stylommatophora: Achatinidae	I
	INSECTA		
Gulf Fritillary	*Dione vanilla*	Lepidoptera: Lycaenidae	I
Green Darner Dragonfly	*Anax junius*	Odonata: Aeshnidae	N
Wandering Slider	*Pantala flavescens*	Odonata: Libellulidae	N
	MAMMALIA		
Small Indian Mongoose	*Herpestes auropunctatus*	Carnivora: Herpestidae	I
Domestic Cat	*Felis catus*	Carnivora: Felidae	I

* I: introduced; N: indigenous (native but not endemic)



Aerial Imagery date: September 29, 2022

NORTH

0 200 400 800

SCALE IN FEET

Makakilo Quarry
DRAINAGE MAP
December 22, 2022

Exhibit "R-1"

10214-02
August 19, 2016

MEMORANDUM

TO: Joseph Shacat (Grace Pacific LLC)

FROM: Jesse J.C. Elliott, P.E.

SUBJECT: GP Makakilo Quarry – Kunia Retention Basin Calculations

Mr. Shacat,

As requested, we are providing calculations to relate the volume of the Kunia retention basin located in the Grace Pacific Makakilo Quarry to various design storms (based on recurrence interval and duration).

PROJECT DESCRIPTION:

The Grace Pacific Makakilo Quarry is located on the west side of the island of Oahu, adjacent the H-1 freeway, within TMK 9-02-003: 74 and 82. Hydrologically, the site consists of two major retention basins in a terraced orientation with the "Kunia" basin located on the higher side of the site. Under existing conditions this "Kunia" basin collects runoff from ~163 acres, fills up then spills into the "Waianae" basin. The "Waianae" basin will then eventually fill up and spill out of the project parcel.

METHODOLOGY:

Basin Volume Calculations: Autodesk Civil 3D 2016 computer modeling software was utilized to calculate the existing volume of the "Kunia" basin. A water surface elevation of 274.60 was determined to be the spillover point to the adjacent retention basin.

Hydrologic Calculations: The Rational Method was used to determine the storm precipitation (i) which was then compared to the NOAA "PDS-based point precipitation frequency estimates with 90% confidence intervals" in inches to determine the relationship of the "Kunia" basin to various storm event data from NOAA via a safety factor.

Exhibit "R-2"

The Rational Method is expressed as:

$$V = C * i * A \quad \rightarrow \quad i = V / (C * A)$$

where:

i = Rainfall Precipitation (ft. then converted to in.)

V = Existing "Kunia" retention basin volume (ft^3)

C = Runoff coefficient

A = Drainage area in (ft^2)

See enclosures for detailed calculations.

CONCLUSIONS:

Based on the above calculations it was determined that the "Kunia" basin has an approximate retention volume of ~10,900,000 ft^2 which, based on conservative estimates, should contain a 1000-year 24-hr storm event with an approximate factor of safety of ~1.19 using the upper bound of the 90% confidence interval.

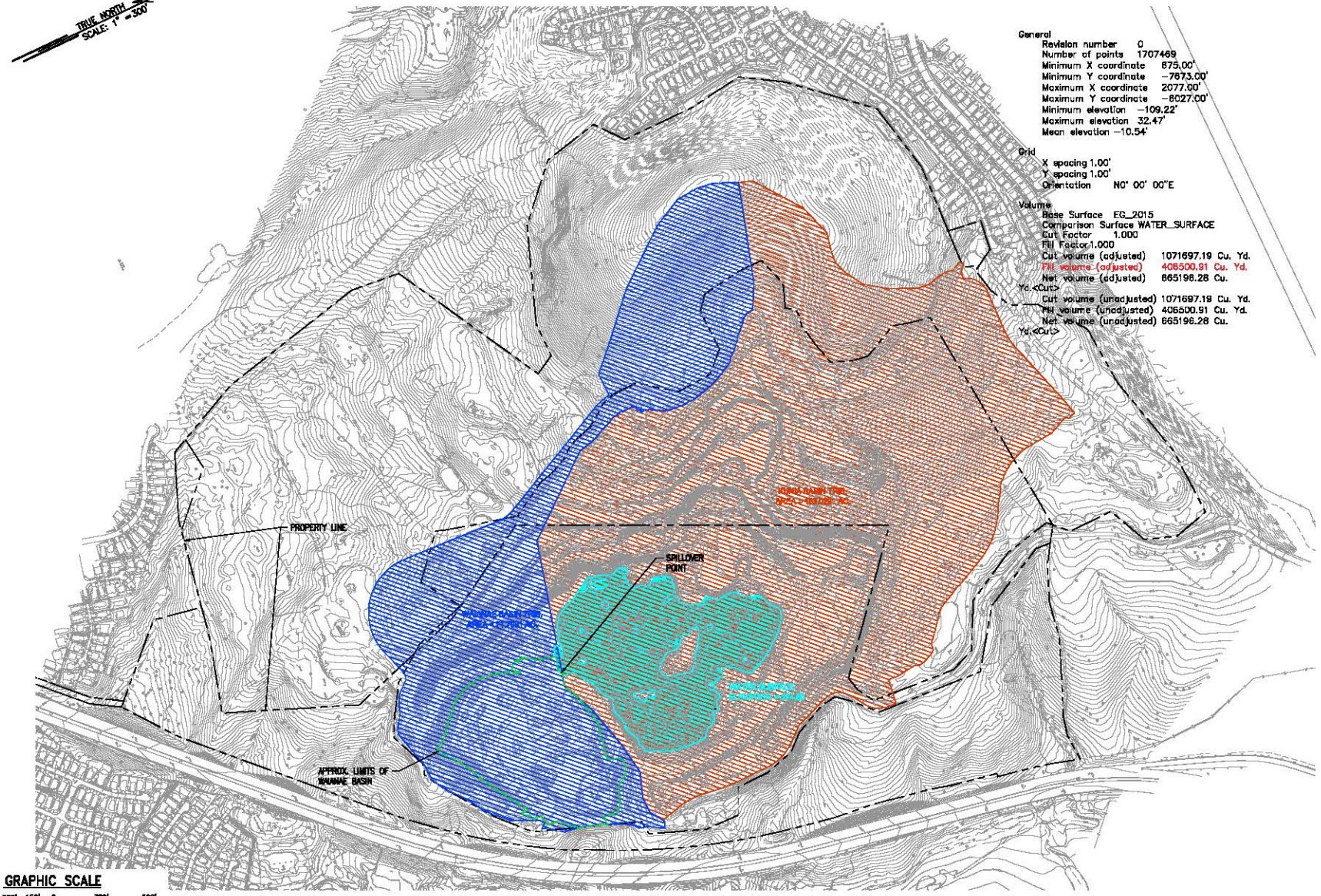
If you have any additional questions feel free to contact me.

Regards,

Jesse J.C. Elliott, P.E.

cc: mkf, ia

Enclosure: calculations (6 pages)



KUNIA BASIN VOLUME

SCALE: 1"=300'

WILSON OKAMOTO CORPORATION
1907 South Beretania Street Suite 400
Honolulu, Hawaii, U.S.A. 96826
PH 808-946-2277 FX 808-946-2253
www.wilsonokamoto.com

PROJECT ID

GRACE PACIFIC MAKAKILO QUARRY

MAKAKILO, O'AHU, HAWAII

T.M.K.: 09-02-003:74
09-02-003:82

DESIGNED BY:	SUPERVISED BY:
XX	XX
DRAWN BY:	CHECKED BY:
XX	XX
CAD FILE:	PROJECT NO.: 10214-02
SCALE: AS NOTED	DATE: JULY 18, 2018

DATE	DESCRIPTION

SHEET TITLE

KUNIA BASIN VOLUME

DRAWING NO.

of 000 sheets

FILE PATH: W:\10214-02\Civil\Documents\Memo\2018-08-18_basinVolCalcs\VOL_kuniaBasin.dwg CAD USER: jallett PLOT DATE: Aug 16, 2018

WILSON OKAMOTO CORPORATION
ENGINEERS PLANNERS CONSULTANTS

MAKAKILO QUARRY - KUNIA BASIN CALCS

CIVIL [X]
STRUCTURAL [ ]
TRAFFIC [ ]
PLANNING [ ]

PROJECT: 10214-02 DATE: 07/21/16

COMPUTED BY: JE CHECKED BY: _____ SHEET NO. _____ OF _____ SHEETS

V_{BASIN} = 406,500.91 yd^3
(SEE ATTACHED)

= 10,975,524.57 ft^3

$V = CiA$

UNITLESS
INCHES (CONVERT TO FT)
FEET

FROM ERIC PICKLE

A_{TMD} = 163.0291 ac. or 7,101,548.99 ft^2

FOR CHECK GUESS C-value OF 0.6

$i = \frac{V}{CA} = \frac{10,975,524.57}{(0.6)(7,101,548.99)}$

(FT)

i = 2.576 ft

i = 30.910 in. (for C=0.6)

(SEE ATTACHED FOR ITERATIVE CALCS)

Kunia Basin Hydrology Calculations (Rational Method)

V_{basin} (yd^3)	V_{basin} (ft^3)
406,500.91	10,975,524.57

$A_{trib\ area\ -\ Kunia}$ (ft^2)	$A_{trib\ area\ -\ Kunia}$ (ac)
7,101,548.99	163.03

C	i (ft)	i (in)
0.1	15.455	185.461
0.2	7.728	92.731
0.3	5.152	61.820
0.4	3.864	46.365
0.5	3.091	37.092
0.6	2.576	30.910
0.7	2.208	26.494
0.8	1.932	23.183
0.9	1.717	20.607
1.0	1.546	18.546

NOAA Atlas 14, Volume 4, Version 3
Location name: Kapolei, Hawaii, US*
Latitude: 21.3571°, Longitude: -158.0687°
Elevation: 398 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

S. Perica, D. Martin, B. Lin, T. Parzybok, D. Riley, M. Yekta, L. Hiner, L.-C. Chen, D. Brewer, F. Yan, K. Maitaria, C. Trypaluk, G. M. Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.302 (0.267-0.347)	0.400 (0.351-0.462)	0.525 (0.458-0.610)	0.623 (0.539-0.726)	0.756 (0.642-0.889)	0.859 (0.717-1.01)	0.963 (0.787-1.15)	1.07 (0.853-1.29)	1.22 (0.929-1.48)	1.33 (0.978-1.64)
10-min	0.448 (0.395-0.514)	0.593 (0.520-0.685)	0.779 (0.680-0.904)	0.923 (0.799-1.08)	1.12 (0.952-1.32)	1.27 (1.06-1.50)	1.43 (1.17-1.70)	1.59 (1.26-1.91)	1.80 (1.38-2.20)	1.97 (1.45-2.43)
15-min	0.563 (0.496-0.646)	0.744 (0.653-0.861)	0.978 (0.854-1.14)	1.16 (1.00-1.35)	1.41 (1.20-1.66)	1.60 (1.33-1.89)	1.79 (1.47-2.14)	2.00 (1.59-2.40)	2.26 (1.73-2.76)	2.47 (1.82-3.05)
30-min	0.792 (0.698-0.909)	1.05 (0.920-1.21)	1.38 (1.20-1.60)	1.63 (1.41-1.90)	1.98 (1.68-2.33)	2.25 (1.88-2.66)	2.52 (2.06-3.01)	2.81 (2.24-3.38)	3.19 (2.43-3.89)	3.48 (2.56-4.30)
60-min	1.04 (0.919-1.20)	1.38 (1.21-1.59)	1.81 (1.58-2.10)	2.15 (1.86-2.50)	2.61 (2.21-3.06)	2.96 (2.47-3.50)	3.32 (2.71-3.96)	3.69 (2.94-4.45)	4.19 (3.20-5.12)	4.58 (3.37-5.66)
2-hr	1.40 (1.22-1.59)	1.83 (1.61-2.12)	2.42 (2.11-2.81)	2.88 (2.48-3.35)	3.49 (2.96-4.10)	3.97 (3.31-4.69)	4.45 (3.63-5.30)	4.94 (3.93-5.95)	5.60 (4.28-6.85)	6.12 (4.50-7.57)
3-hr	1.60 (1.40-1.82)	2.14 (1.88-2.48)	2.84 (2.48-3.30)	3.38 (2.92-3.94)	4.10 (3.47-4.81)	4.66 (3.87-5.50)	5.22 (4.25-6.21)	5.80 (4.59-6.96)	6.57 (4.98-7.99)	7.16 (5.23-8.82)
6-hr	2.07 (1.79-2.37)	2.77 (2.44-3.21)	3.71 (3.23-4.30)	4.42 (3.82-5.15)	5.37 (4.55-6.29)	6.09 (5.07-7.18)	6.82 (5.54-8.10)	7.55 (5.97-9.05)	8.52 (6.46-10.4)	9.26 (6.75-11.4)
12-hr	2.55 (2.21-2.93)	3.45 (3.03-3.99)	4.67 (4.07-5.42)	5.61 (4.84-6.54)	6.88 (5.82-8.05)	7.84 (6.52-9.24)	8.82 (7.16-10.5)	9.81 (7.76-11.8)	11.1 (8.44-13.5)	12.2 (8.87-15.0)
24-hr	3.03 (2.57-3.54)	4.15 (3.53-4.86)	5.70 (4.84-6.69)	6.91 (5.84-8.13)	8.56 (7.18-10.1)	9.85 (8.21-11.7)	11.2 (9.22-13.3)	12.5 (10.3-15.1)	14.4 (11.6-17.5)	15.9 (12.6-19.4)
2-day	3.46 (2.95-4.06)	4.85 (4.13-5.68)	6.82 (5.77-7.99)	8.40 (7.08-9.88)	10.6 (8.90-12.6)	12.4 (10.3-14.8)	14.3 (11.8-17.1)	16.4 (13.3-19.7)	19.2 (15.4-23.4)	21.5 (16.9-26.4)
3-day	3.80 (3.23-4.45)	5.34 (4.54-6.25)	7.51 (6.36-8.82)	9.25 (7.81-10.9)	11.7 (9.81-13.9)	13.7 (11.4-16.3)	15.8 (13.0-18.9)	18.0 (14.6-21.7)	21.1 (16.9-25.7)	23.6 (18.6-29.0)
4-day	4.14 (3.52-4.85)	5.82 (4.95-6.83)	8.20 (6.95-9.64)	10.1 (8.53-11.9)	12.8 (10.7-15.2)	14.9 (12.4-17.8)	17.2 (14.2-20.6)	19.6 (16.0-23.7)	23.0 (18.4-28.1)	25.7 (20.3-31.7)
7-day	4.69 (3.99-5.48)	6.59 (5.61-7.73)	9.27 (7.86-10.9)	11.4 (9.65-13.5)	14.5 (12.1-17.1)	16.9 (14.1-20.1)	19.5 (16.0-23.3)	22.2 (18.1-26.8)	26.0 (20.8-31.7)	29.1 (22.9-35.8)
10-day	5.07 (4.32-5.94)	7.12 (6.06-8.34)	10.0 (8.49-11.8)	12.3 (10.4-14.5)	15.6 (13.1-18.5)	18.2 (15.2-21.7)	21.0 (17.3-25.1)	23.9 (19.5-28.8)	28.1 (22.5-34.2)	31.4 (24.7-38.6)
20-day	5.95 (5.07-6.96)	8.35 (7.10-9.76)	11.7 (9.93-13.7)	14.4 (12.2-16.9)	18.2 (15.2-21.5)	21.2 (17.6-25.2)	24.4 (20.1-29.2)	27.8 (22.6-33.5)	32.6 (26.1-39.7)	36.5 (28.7-44.8)
30-day	6.88 (5.86-8.05)	9.62 (8.18-11.2)	13.4 (11.4-15.7)	16.4 (13.8-19.2)	20.5 (17.1-24.2)	23.7 (19.7-28.2)	27.1 (22.3-32.3)	30.6 (24.9-36.8)	35.4 (28.3-43.0)	39.2 (30.8-48.1)
45-day	8.08 (6.88-9.46)	11.2 (9.55-13.1)	15.5 (13.1-18.1)	18.7 (15.8-22.0)	23.1 (19.4-27.4)	26.5 (22.1-31.5)	29.9 (24.7-35.8)	33.4 (27.2-40.3)	38.1 (30.5-46.4)	41.7 (32.9-51.3)
60-day	9.11 (7.76-10.7)	12.5 (10.7-14.6)	17.1 (14.5-20.0)	20.5 (17.3-24.1)	25.0 (21.0-29.6)	28.5 (23.6-33.8)	31.9 (26.2-38.1)	35.3 (28.7-42.5)	39.9 (31.9-48.5)	43.3 (34.1-53.1)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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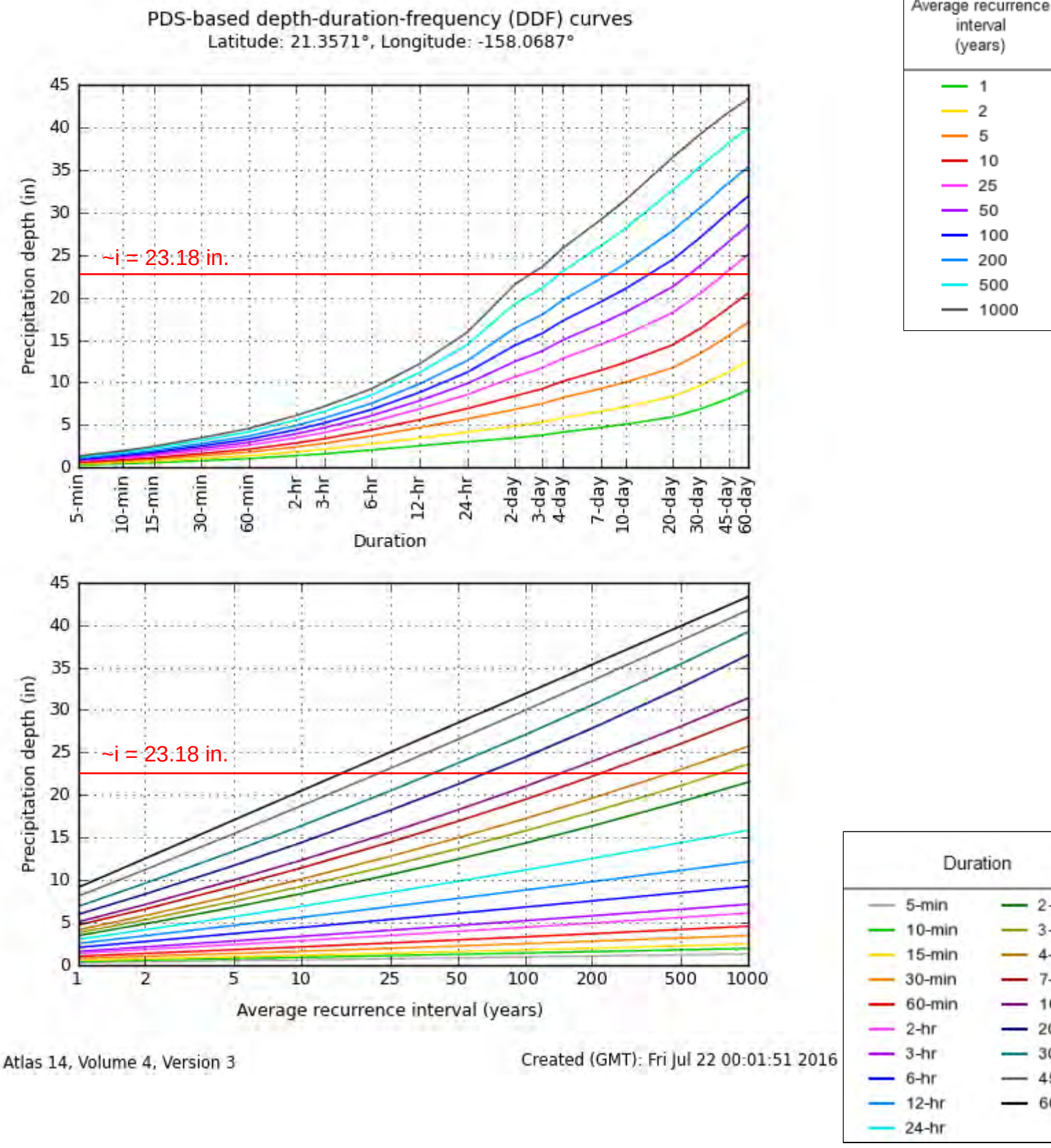
PF graphical

Choose conservative C-value of 0.8 -----> i = 23.183 in.
Other conservative assumptions:
- Rational method used on A > 100 ac.
- Time of concentration not considered
- Infiltration/Evaporation not considered
- Upper bound of 90% confidence interval used

APPROX. SAFETY FACTOR (USING UPPER BOUND OF 90% CONFIDENCE LEVEL)

- S.F > 3
- 2 < S.F. < 3
- 1 < S.F. < 2
- S.F. < 1



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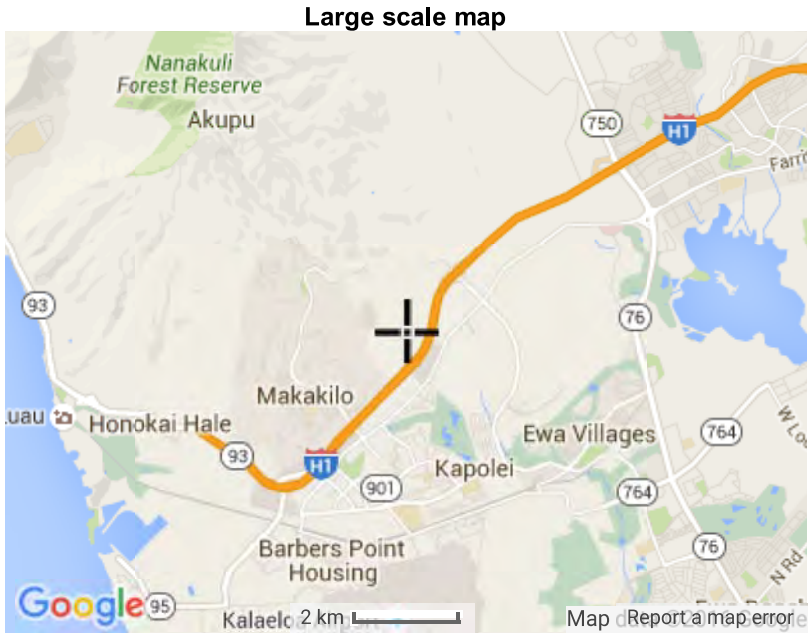
Maps & aerials

Small scale terrain

Large scale terrain

Large scale map



Large scale aerial

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National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Storm Water Pollution Prevention Plan

Grace Pacific LLC
Makakilo Quarry
92-1130 Pueonani Street
Kapolei, Hawaii 96707

TMK No. (1) 9-2-003:082

Environmental Science International
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Kailua, Hawaii 96734
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Exhibit "R-3"

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APPENDICES

LIST OF ACRONYMS AND ABBREVIATIONS

Acronym	Definition
DMR	Discharge Monitoring Report
DOH	Department of Health
EPA	Environmental Protection Agency
HAR	Hawaii Administrative Rules
HC&D	Honolulu Construction & Draying Co., Ltd
NGPC	Notice of General Permit Coverage
NPDES	National Pollutant Discharge Elimination System
QC	Quality Control
RAP	Reclaimed Asphalt Pavement
SOP	Standard Operating Procedures
SPCC	Spill Prevention Control and Countermeasures
SWPPP	Storm Water Pollution Prevention Plan
TSS	Total Suspended Solids

SWPPP CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete, I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Authorized Signatory

Printed Name: Jerrod Schreck

Title: President

Signature: Jerrod Schreck

box SIGN 4KYXR834-4PXY2874

Date: Jul 26, 2022

SECTION 1 INTRODUCTION

1.1 PURPOSE

The purpose of this Storm Water Pollution Prevention Plan [SWPPP] is to describe the selection, design, and installation of control measures used to (1) reduce and prevent pollutants in stormwater discharge at the Grace Pacific Makakilo Quarry (hereinafter referred to as the Facility); and (2) to maintain compliance with the State of Hawaii Department of Health [DOH] National Pollutant Discharge Elimination System [NPDES] General Permit coverage for discharges of stormwater associated with industrial facilities (DOH, 2022). This SWPPP is intended to conform to DOH requirements set forth in Hawaii Administrative Rules [HAR] 11-55 (DOH, 2022). The Facility is currently permitted under Notice of General Permit Coverage [NGPC] File Number HI R32G781.

1.2 STORM WATER POLLUTION PREVENTION TEAM

The Storm Water Pollution Prevention Team consists of qualified Facility personnel responsible for assisting with the development and preparation of amendments to the SWPPP, implementation and maintenance of control measures, and the implementation of corrective actions as needed. The SWPPP is readily available to all team members. The team is summarized below.

Name:	Les Iverson
Position:	Quarry Operations Manager
Phone:	(808) 209-1466
Email:	liverson@gracepacific.com

Name:	Chris Hermosura
Position:	Quarry Materials Manager
Phone:	(808) 306-5429
Email:	chermosura@gracepacific.com

Name:	Jodie Cordero
Position:	Environmental Compliance Manager
Phone:	(808) 561-3368
Email:	jcordero@gracepacific.com

The Quarry Operations Manager is responsible for quarterly inspections and visual assessments, implementing and maintaining control measures, and implementing any corrective actions. The Quarry Operations Manager, with assistance from the Environmental Compliance Manager, is responsible for updating the SWPPP as needed and submission of reports.

1.3 SWPPP AVAILABILITY

The SWPPP and other Facility documentation (i.e., inspection records, training logs, and spill records) are maintained onsite in the Facility office. These records shall be made available to the DOH upon request.

The SWPPP will be amended whenever there is a change in Facility design, operation, construction, or maintenance that affects the potential for pollution of stormwater runoff or if so directed by the DOH. Implementation of these amendments will be made by the Quarry Operations Manager or their designee. Amendments will be incorporated into the SWPPP within 45 days of any such change. Each review or amendment to the SWPPP will be documented on the SWPPP Review and Amendment Form included in Appendix F.

1.4 FACILITY DESCRIPTION

The Facility is located at 92-1130 Pueonani Street, at the end of Palehua Road, and occupies approximately 178 acres of land (Figure 1). The Facility is bounded to the north by agricultural land, to the west by a residential home subdivision; and to the south and east by the Queen Liliuokalani H1 Interstate Highway. A Facility Location Map and Facility Layout and Drainage Map are provided in Figures 2 and 3. The Facility Layout and Drainage Map (Figure 3) includes the locations of buildings, operating areas, and storage areas, as well as stormwater drainage flow directions and potential stormwater discharge points. The nearest surface water body at the Facility is the Kaloi Gulch which is located approximately 0.35 miles east of the Facility (Figure 1).

The Facility's primary function is to quarry and process rock into useable aggregate that is then distributed to customers. Rock is initially quarried from the Quarry Excavation Area. It is then crushed in the Primary and Secondary Plant and then processed through the Finishing Plants and Wash Plant to create aggregate which is then available for sale. Other support operations and activities at the Facility include a Recycle Plant where concrete and Reclaimed Asphalt Pavement [RAP] are brought into the Facility and processed for reuse and resale, a Maintenance Shop for the service and repair of Facility vehicles and machinery, several Magazine and Equipment Storage Areas for storage of quarrying explosives in secured magazines, quarry trucks and equipment that are not in use, a concrete batch plant operated by HC&D, and two Contaminated Soil Remediation Cell Areas. The Facility's Standard Industrial Classification code is 1429 and it is classified under Sector J2 – Crushed and Broken Stone Quarrying per Chapter 11-55, Appendix B.

The Facility is divided into seven principal areas described below. The ground surface at the Facility is mostly unpaved. Paved areas at the Facility include a portion of the Maintenance Shop Area and the Quarry Access Road up to the Scale House. Water tanker trucks are used throughout the Facility for dust control.

- Area 1 (Office Area) is located at the entrance to the Facility, it includes the Scale House, Main Facility Offices, and Quality Control [QC] Lab.

- Area 2 (Quarry Excavation Area) is located on the north side of the Facility and consists of the active quarry face and future quarry expansion areas.

- Area 3 (Processing Area) is located in the central area of the Facility. It is the main area of the Facility and it includes two Primary and Secondary Plants (one of which remains but is no longer in use), two finishing plants (Plants A and B), the Quarry Wash Plant, the Recycle Plant, the HC&D concrete batch plant, and aggregate stockpiles. The HC&D concrete batch plant operates under a separate SWPPP and has obtained a separate NGPC for this activity.

- Area 4 (Maintenance Shop Area) includes office and storage trailers, some of which store motor oils, lubricating oils, hydraulic oils, grease, and used oils. Located in this area are aboveground storage tanks [ASTs], mobile refueler trucks containing diesel fuel and gasoline, storage sheds containing vehicles, and equipment undergoing maintenance.

- Area 5 (Equipment/Storage Areas) consists of four separate storage areas. One is located immediately adjacent to the secured magazines, the second near the southwest detention pond, the third near the quarry entrance, the fourth near the western Contaminated Soil Remediation Cell Area, and the fifth located south of the Maintenance Shop Area. Quarry trucks, support equipment, and various automobile parts that are not in use are stored in these areas.

- Area 6 (Magazine Storage Areas) consists of two areas located north and east of the Maintenance Shop Area that are used to store explosives for blasting. The explosives are stored in a secure magazine and are not exposed to stormwater.

- Area 7 (Contaminated Soil Remediation Cells Area) consists of two areas, one along the west side of the Facility and the second, at the end of the trailer offices in the Maintenance Shop Area. Petroleum-contaminated soil that is generated as a result of remedial excavation associated with releases at the Facility are stockpiled in remediation cells within this area. Typical releases include hydraulic oil that has impacted surface soil as a result of hydraulic oil line ruptures on heavy equipment. The stockpiles are remediated following standard operating procedures [SOPs]. The Contaminated Soil Remediation Cell Area SOPs is included in Appendix G.

Stormwater discharge from the Facility is not anticipated, however, stormwater drains towards three areas: 1) the detention pond located immediately southwest of the Quarry Wash Plant; 2) the detention pond located on the southeast corner of the Facility next to the wash plant; and 3) the Old Primary and Secondary Plant, where the outlet to Potential Discharge Point 1 is located. The outlet is connected to the former Lower Makakilo Quarry via an underground tunnel leading to a detention basin. The Potential Discharge Point 1 is from the detention basin located in the former Lower Makakilo Quarry. Stormwater flow and drainage areas are shown in Figure 3.

SECTION 2 POTENTIAL POLLUTANT SOURCES

Potential pollutant sources at the Facility include spills and leaks in the following areas.

- Area 1, Office Area
  - Scale House
  - Main Facility Offices
  - QC Lab
- Area 2, Quarry Excavation Area
- Area 3, Processing Area
  - Finish Plant A
  - Finish Plant B
  - Primary and Secondary Plant
  - Old Primary and Secondary Plant (closed)
  - Quarry Wash Plant
  - Recycle Plant
  - Aggregate Stockpiles
- Area 4, Maintenance Shop Area
- Area 5, Equipment/Storage Areas
- Area 7 Contaminated Soil Remediation Cell Area

Area 6, the Magazine Area is not expected to be a source of potential pollutants because the explosives are contained in the magazines and therefore, not exposed to stormwater.

A site map showing potential pollutant sources, stormwater flow, and stormwater discharge points is included in Figure 3. The potential pollutant sources are described below in Tables 1 through 6.

All stormwater discharge locations must be evaluated for the presence of unauthorized non-stormwater discharges. Examples of unauthorized non-stormwater discharges at the Facility include water used to wash aggregate in the Quarry Wash Plant Area within the Processing Area, spray water for dust control, and wash water associated with vehicle and equipment cleaning in the Maintenance Shop Area. The evaluation for non-stormwater discharges shall be documented during each quarterly inspection. The Quarterly Inspection Form is included in Appendix B.

TABLE 1
Area 1 (Office Area) -Potential Pollutant Sources
SWPPP
Grace Pacific Makakilo Quarry

Area	Materials and Activities	Potential Pollutant Sources	Spills in the Last 3 Years	Authorized Non-Stormwater Discharges*
1. Office Area ○ Scale House ○ Main Facility Offices ○ QC Lab	• Weighing dump trucks and contents. • Aggregate testing for quality control.	• Leaks and spills of petroleum products and other hazardous substances associated with equipment and dump trucks. • Accumulated sediment and road dust.	• (2021) 30 gallons diesel fuel at the scale house from customer fuel truck.	Inspected and documented in Quarterly Inspection Form.

*HAR 11-55, Appendix B, Section 1.1.3.1. The non-stormwater discharge evaluations are included in the Quarterly Inspection Form (see Appendix B) and shall be retained onsite in the Facility Office.

TABLE 2
Area 2 (Quarry Excavation Area) - Potential Pollutant Sources
SWPPP
Grace Pacific Makakilo Quarry

Area	Materials and Activities	Potential Pollutant Sources	Spills in the Last 3 Years	Authorized Non-Stormwater Discharges*
2. Quarry Excavation Area	• Overburden removal. • Drilling and blasting of rock. • Hauling shot rock from the active quarry face to the primary/secondary plant.	• Enhanced erosion in areas that have been cleared of vegetation and excavated. • Increased sediment loading of stormwater runoff. • Wind-blown transport of dust to off-site areas. • Leaks and spills of petroleum products and other industrial chemicals.	• (2019) Approximately 160 gallons of hydraulic oil from equipment during quarry operations. • (2019) Approximately 25 gallons of hydraulic oil from equipment during quarry operations. • (2020) 42 gallons hydraulic oil from water truck on quarry haul road. • (2021) Approximately 35 gallons of hydraulic oil from equipment during quarry operations. • (2021) Approximately 65 gallons of hydraulic oil from equipment during quarry operations.	Inspected and documented in Quarterly Inspection Form.

*HAR 11-55, Appendix B, Section 1.1.3.1. The non-stormwater discharge evaluations are included in the Quarterly Inspection Form (see Appendix B) and shall be retained onsite in the Facility Office.

TABLE 3
Area 3 (Processing Area) - Potential Pollutant Sources
SWPPP
Grace Pacific Makakilo Quarry

Area	Materials and Activities	Potential Pollutant Sources	Spills in the Last 3 Years	Authorized Non-Stormwater Discharges*
3. Processing Area ○ Finish Plants A & B ○ Quarry Wash Plant ○ Recycle Plant ○ Primary and Secondary Plants (New and Old) ○ Aggregate Stockpiles	• Crushing, screening, and washing of aggregate products. • Conveying aggregate products. • Maintenance of stationary equipment (i.e., rock crushing plant). • Hauling crushed rock between plants. • Storage and crushing of RAP and concrete brought to the Facility from off-site. • Storage of petroleum products in oil-filled operational equipment. • Loading of aggregate products into dump trucks. • Storage of aggregate products and RAP in stockpiles.	• Increased sediment loading of stormwater runoff. • Wind-blown transport of dust to off-site areas. • Leaks and spills of petroleum products (i.e., diesel fuel, hydraulic oil, transformer oil) and other industrial chemicals associated with oil storage containers and quarry trucks. • Comingling with non-stormwater discharges associated with rock washing operations and dust control.	None	Inspected and documented in Quarterly Inspection Form

*HAR 11-55, Appendix B, Section 1.1.3.1. The non-stormwater discharge evaluations are included in the Quarterly Inspection Form (see Appendix B) and shall be retained onsite in the Facility Office.

TABLE 4
Area 4 (Maintenance Shop Area) - Potential Pollutant Sources
SWPPP
Grace Pacific Makakilo Quarry

Area	Materials and Activities	Potential Pollutant Sources	Spills in the Last 3 Years	Authorized Non-Stormwater Discharges*
4. Maintenance Shop Area	• Bulk storage of gasoline and diesel fuel within ASTs. • Bulk storage of motor oil, lubricating oil, hydraulic oil, grease, used oil, etc. • Welding and other metal work. • Vehicle and equipment repairs. • Vehicle and equipment washing. • Storage of maintenance-related equipment.	• Leaks and spills during fueling, loading/unloading, and transfer operations. • Leaks and spills from parked vehicles and equipment undergoing maintenance. • Leaks and spills from petroleum products and other hazardous substances used for repairs. • Heavy metals associated with welding and metal work. • Overfill or rupture of ASTs and portable containers. • Comingling with non-stormwater discharges associated with vehicle and equipment washing. • Sediment-laden stormwater runoff.	None	Inspected and documented in Quarterly Inspection Form

*HAR 11-55, Appendix B, Section 1.1.3.1. The non-stormwater discharge evaluations are included in the Quarterly Inspection Form (see Appendix B) and shall be retained onsite in the Facility Office.

TABLE 5
Area 5 (Equipment/Storage Area) - Potential Pollutant Sources
SWPPP
Grace Pacific Makakilo Quarry

Area	Materials and Activities	Potential Pollutant Sources	Spills in the Last 3 Years	Authorized Non-Stormwater Discharges*
5. Equipment/Storage Areas	• Storage of materials that are not in use.	• Sediment-laden stormwater runoff. • Leaks and spills from vehicles and equipment. • Excess trash and debris. • Heavy metals from rusting vehicles and equipment.	None	Inspected and documented in Quarterly Inspection Form

*HAR 11-55, Appendix B, Section 1.1.3.1. The non-stormwater discharge evaluations are included in the Quarterly Inspection Form (see Appendix B) and shall be retained onsite in the Facility Office.

TABLE 6
Area 7 (Contaminated Soil Remediation Cells Area) – Potential Pollutant Sources
SWPPP
Grace Pacific Makakilo Quarry

Area	Materials and Activities	Potential Pollutant Sources	Spills in the Last 3 Years	Authorized Non-Stormwater Discharges*
7. Contaminated Soil Remediation Cells Area	• Stockpile of contaminated soil undergoing remediation. • Decontamination of equipment used for remediation cells.	• Contaminated soil-laden runoff from structurally compromised bermed areas. • Deteriorated plastic liners causing stormwater exposure in contaminated soil stockpiles.	None	Inspected and documented in Quarterly Inspection Form

*HAR 11-55, Appendix B, Section 1.1.3.1. The non-storm water discharge evaluations are included in the Quarterly Inspection Form (see Appendix B) and shall be retained onsite in the Facility Office.

SECTION 3 CONTROL MEASURES

This section describes the controls measures that are in place to (1) reduce and prevent pollutants in stormwater discharge, (2) meet the technology-based and water quality-based limits, and (3) maintain compliance with HAR 11-55, Appendix B (DOH, 2022). Control measures specific for each potential pollutant source are described in Tables 7 through 12.

3.1 GENERAL BEST MANAGEMENT PRACTICES

- Employees are trained annually on good housekeeping practices.
- Employees understand proper cleanup procedures in accordance with Spill Prevention Control and Countermeasure [SPCC] Plan (ESI, 2022).
- Materials are stored in appropriate containers as recommended by the manufacturer and properly labeled.
- In the event of a large and uncontrolled release, responsible Facility personnel will make the necessary notifications and spill response arrangements. An emergency notification list containing contact information for agencies and Facility personnel to whom spills must be reported is included in Appendix A.
- Portable drums and containers are stored off the ground, undercover, and inside secondary containment.

3.2 EMPLOYEE TRAINING

Employees will be trained annually for implementing activities necessary to meet the conditions of the NGPC and for implementation of the SWPPP. Facility personnel and the Stormwater Pollution Prevention Team members will be trained in the following:

- Overview of this SWPPP.
- Spill response procedures, housekeeping, maintenance requirements, and materials management practices in accordance with the SPCC (ESI, 2022).
- Location and procedures of all control measures used to prevent stormwater pollution.
- When and how inspections will be conducted, applicable findings recorded, and what the proper corrective actions are.

Employee training will be documented using the Employee Training Log included in Appendix E. Completed employee training logs shall be kept on file in the Facility office.

TABLE 7
Area 1 (Office Area) - Control Measures
SWPPP
Grace Pacific Makakilo Quarry

Area	Minimizing Stormwater Exposure	Housekeeping	Maintenance	Spill Prevention and Response
1. Office Area ○ Scale House ○ Main Facility Offices ○ QC Lab	• No significant materials or equipment (other than vehicles) are stored outside the scale house or office building. • A berm is constructed along the east side of the paved road. Runoff is diverted toward the quarry and infiltrates into the unpaved ground.	• Litter and debris are removed and properly disposed of on a regular basis. • Excess sediment and road dust on paved areas is routinely swept to reduce sediment off tracking. • Trash receptables are not overfilled and kept closed when not in use.	• Inspections for evidence of spills or leaks in scale pads are completed quarterly in accordance with inspection requirements included in Section 4.2. • The spill kit is inspected in accordance with the inspection requirements included in Section 4.2.	• Spills and leaks on scales from quarry trucks will be immediately cleaned up. • A spill kit is readily available at the Scale House to respond to leaks and spills in in the area of the Scale House. • Facility personnel inspect and maintain areas in accordance with the SPCC Plan (ESI, 2022).

TABLE 8
Area 2 (Quarry Excavation Area) - Control Measures
SWPPP
Grace Pacific Makakilo Quarry

Area	Minimizing Stormwater Exposure	Housekeeping	Maintenance	Spill Prevention and Response
2. Quarry Excavation Area	• Water is used in unpaved areas to minimize or reduce the amount of dust. • The water used for dust control is lightly sprayed so it does not lead to runoff.	• Stabilize or recontour stockpiles if necessary. • Clean away any excess trash near stormwater diversion areas and in quarry pit. • Clean any leaks or spills of petroleum products and other industrial chemicals associated with quarry trucks.	• Overburden, topsoil, waste rock, raw material, or final product stockpiles are located away from Drainage Areas. • Maintain berms, dikes, check dams to divert stormwater into quarry pit and drainage areas. • Inspect all stabilization and structural controls in the area and access roads quarterly in accordance with inspection requirements included in Section 4.2.	• Spills and leaks generated from quarry and water trucks are cleaned up immediately. • All possible sources of ignition, explosion, or incompatible materials are immediately removed from the area of the spill. • Facility personnel inspect and maintain areas in accordance with the SPCC Plan (ESI, 2022).

TABLE 9
Area 3 (Processing Area) - Control Measures
SWPPP
Grace Pacific Makakilo Quarry

Area	Minimizing Stormwater Exposure	Housekeeping	Maintenance	Spill Prevention and Response
3. Processing Area ○ Finish Plants A & B ○ Quarry Wash Plant ○ Recycle Plant ○ Primary and Secondary Plants (New and Old) ○ Aggregate Stockpiles	• Water is used in unpaved areas to minimize or reduce the amount of dust. • The water used for dust control is lightly sprayed so it does not lead to runoff. • Storage of petroleum products or other hazardous substances are placed in enclosed containers or not exposed to rain when possible. • Stockpiles are organized and kept away from nearby stormwater runoff.	• Excess sediment and road dust on paved areas is routinely swept to reduce sediment off tracking. • Any spills, leaks, and stains from quarry trucks, plant equipment, and materials are cleaned immediately. • Water trucks frequently come to lightly spray area to reduce sediment loading. • Stabilize or recontour stockpiles if necessary.	• Maintain berms, dikes, check dams to divert stormwater into quarry pit and drainage areas. • Stationary equipment is maintained and ensured it is not leaking. • Inspections for evidence of spills or leaks in equipment are completed quarterly in accordance with inspection requirements included in Section 4.2. • The spill kit is inspected in accordance with the inspection requirements included in Section 4.2.	• Spills and leaks generated from quarry and water trucks are cleaned up immediately. • All possible sources of ignition, explosion, or incompatible materials are immediately removed from the area of the spill. • Facility personnel inspect and maintain areas in accordance with the SPCC Plan (ESI, 2022).

TABLE 10
Area 4 (Maintenance Shop Area) - Control Measures
SWPPP
Grace Pacific Makakilo Quarry

Area	Minimizing Stormwater Exposure	Housekeeping	Maintenance	Spill Prevention and Response
4. Maintenance Shop Area	• Maintenance of vehicles and equipment are conducted under cover or on impervious surfaces such as concrete pads or contained areas, when possible. • Fueling operations (including transfer and loading/unloading of petroleum products) are conducted on an impervious surface or under a canopy where possible.	• Clean up releases of petroleum products from vehicles and equipment immediately. • Place oil and hazardous substances on spill pallets, secondary containment, or enclosed containers. • All containers are closed, securely fastened, stored neatly, and properly labeled. • Drip pans are emptied in designated oil containers before overfilling. • Spills and leaks from vehicles and equipment are cleaned up immediately.	• All bulk oil storage containers and ASTs are inspected in accordance with the SPCC Plan (ESI, 2022). • Inspections for evidence of spills or leaks are completed quarterly in accordance with inspection requirements included in Section 4.2. • The spill kit is inspected in accordance with the inspection requirements included in Section 4.2. • Maintain berms, dikes, check dams to divert stormwater into quarry pit.	• Closely supervise fueling operations to prevent releases of petroleum products from overfilling or spills. Monitor fuel level gauge at all times. • Spills and leaks from vehicles, equipment, portable containers, and ASTs are cleaned up immediately. • Place drip pans under valve-hose fittings and connection and any leaking equipment or vehicles. • A spill kit is readily available to respond to leaks and spills. • Facility personnel inspect and maintain areas in accordance with the SPCC Plan (ESI, 2022).

TABLE 11
Area 5 (Equipment/Storage Areas) - Control Measures
SWPPP
Grace Pacific Makakilo Quarry

Area	Minimizing Stormwater Exposure	Housekeeping	Maintenance	Spill Prevention and Response
5. Equipment/ Storage Areas	• All materials, vehicles and equipment are stored undercover or inside the IMO containers when possible. • Materials are stored in appropriate containers as recommended by the manufacturer.	• Excess sediment or trash is cleaned up at least quarterly to ensure no sediment- or heavy metal-laden runoff occurs. • Material storage containers are kept closed when not in use.	• Inspections for evidence of spills or leaks or signs of corrosion in material storage containers are completed quarterly in accordance with inspection requirements included in Section 4.2. • The spill kit is inspected in accordance with the inspection requirements included in Section 4.2.	• Spills and leaks from materials and equipment are cleaned up immediately. • A spill kit is readily available to respond to leaks and spills. • Facility personnel inspect and maintain areas in accordance with the SPCC Plan (ESI, 2022).

TABLE 12
Area 7 (Contaminated Soil Remediation Cells Area) - Control Measures
SWPPP
Grace Pacific Makakilo Quarry

Area	Minimizing Stormwater Exposure	Housekeeping	Maintenance	Spill Prevention and Response
7. Contaminated Soil Remediation Cells Area	• Contaminated soil stockpiles are contained in an area that has berms to prevent runoff migration. • Contaminated soil stockpiles are covered with plastic liners to prevent stormwater exposure.	• Equipment is thoroughly decontaminated in a designated area. • Deteriorated plastic covers are routinely repaired and replaced. • Decontamination water is maintained in a containment area where it is allowed to evaporate.	• Remediation cells are inspected weekly for signs of erosion, damage to berms/plastic cover, and proper drainage. • Soil in cells is sprayed with water weekly and turned at two-month intervals. • Facility personnel inspect and maintain areas in accordance with the SOP and BMP provided in Appendix G.	• Spills and leaks from materials and equipment are cleaned up immediately. • All possible sources of ignition, explosion, or incompatible materials are immediately removed from the area of the spill. • Facility personnel inspect and maintain areas in accordance with the SPCC Plan (ESI, 2022).

SECTION 4 STORMWATER INSPECTIONS AND MONITORING

This section provides the stormwater inspection and monitoring requirements and procedures. Benchmark monitoring and routine quarterly facility inspections and visual assessments are required as described in HAR 11-55 Appendix B. No annual effluent limitation guidelines requirements in accordance with HAR 11-55 Appendix B part 6.2.2 were identified for the Facility.

Surface runoff within the quarry is intercepted and diverted by control measures such as perimeter berms, check dams, graded surfaces that slope towards the quarry pit and detention areas. Potential discharge points and drainage areas are shown in Figure 3.

4.1 BENCHMARK MONITORING

Total suspended solids [TSS] in stormwater discharges are required to be monitored under the benchmark requirement per HAR 11-55, Appendix B, Subsector J2. Starting within 90 days after receiving the NGPC, stormwater samples shall be collected quarterly (i.e., three months) from each stormwater discharge for the first year of the permit coverage.

- January 1 to March 31
- April 1 to June 30
- July 1 to September 30
- October 1 to December 31

The quarterly benchmark monitoring requires that one sample shall be collected from each discharge point and analyzed for TSS using Environmental Protection Agency Method E160.2. Procedures for collecting samples are similar to quarterly visual assessments (see Section 4.3).

The average of the four quarterly results will be compared to the benchmark limit of 100 milligrams per liter and reported in accordance with HAR 11-55, Appendix B, Part 6 (Section 4.4). Corrective actions shall be implemented as needed for exceedance per HAR 11-55, Appendix B, Part 4. When conditions prevent Facility personnel from obtaining four samples in four consecutive quarters (e.g., there is no stormwater discharge), benchmark monitoring shall continue until four samples are collected.

A Discharge Monitoring Report [DMR] shall be prepared for each monitoring event. The DMR shall be submitted to the DOH no later than the 28th day following the month when the samples were collected. Quarterly benchmark monitoring shall be continued until the benchmark monitoring requirement has been fulfilled. The DMR shall indicate “no data” or “NODI” (No Discharge) for any three-month interval that a sample was not collected.

4.2 QUARTERLY FACILITY INSPECTIONS

Facility-wide inspections will be conducted **once each quarter** during operating hours by qualified Facility personnel, with at least one person from the Stormwater Pollution Prevention Team. At least one of the quarterly inspections must occur when stormwater discharge from the Facility is

occurring. The components to be inspected for each of the identified pollutant source are included in Table 13. The Routine Quarterly Inspection Form is included in Appendix B.

A summary of findings will be included in the inspection report along with the following:

- Inspection date and time
- Name and signature of the inspector(s)
- Weather information
- All observations relating to the control measures listed in Section 3
- Any stormwater and non-stormwater discharges occurring at the time of the inspection
- Any incidents of non-compliance
- Any corrective actions

4.3 QUARTERLY VISUAL ASSESSMENTS

In addition to the Facility-wide quarterly inspections, quarterly visual assessments will be conducted to assess whether stormwater runoff has been adversely impacted by pollutants associated with industrial activities at the Facility. Quarterly visual assessments are to be performed during stormwater discharge and consist of collecting a representative sample of stormwater discharge and visually assess the water quality characteristics. Tasks associated with the quarterly visual assessment are summarized in Table 14. The Quarterly Visual Assessment form is included in Appendix C.

A summary of findings shall be included in the visual assessment form along with the following:

- Sample Location
- Collection date and time
- Name and signature of personnel collecting the sample and performing visual assessment
- Observations relating to the discharge, including possible sources of observed stormwater contamination
- If applicable, why it was not possible to collect samples within the first 30 minutes of discharge
- If applicable, why it was not possible to collect a sample during the three-month period (i.e., no stormwater discharge)
- Any corrective actions taken or required

TABLE 13
Components of Quarterly Facility Inspections
SWPPP
Grace Pacific Makakilo Quarry

Area and Activity	Observations of Control Measure Non-compliance
1. Office Area	• Excess litter, debris, and sediment tracking offsite • Spills and leaks not cleaned up from incoming traffic • Spilled aggregate and road dust build-up
2. Quarry Excavation Area	• Stockpiles are not stabilized or located close to potential discharge points • Spills and leaks on road from incoming vehicular traffic • Dust control not used during quarry operations • Berms and dikes are in disrepair
3. Processing Area • Finish Plants A & B • Quarry Wash Plant • Primary/Secondary Plants (New and Old) • Recycle Plant • Aggregate Stockpiles	• Excess materials and equipment stored in area • Ongoing maintenance activities in area • Sediment and dust build-up • Spent water from concrete or aggregate washing is being discharged into ground • Leaking and spills from industrial equipment are not immediately cleaned up • Sump overflow in wash plant.
4. Maintenance Shop Area	• Staining, spills, and leaking vehicles and equipment with no drip pans • Materials and equipment stored in areas exposed to rain • Excess sediment, trash, and debris • Near-full drip pans and portable oil containers • Maintenance activities being performed outside of cover • Oil and hazardous substances not stored in proper containers or in secondary containment.
5. Equipment/Storage Areas	• Corrosion, chemical deterioration, discoloration in stored materials • Overflow of rusted equipment, trash, and sediment causing sediment- and heavy metal-laden runoff • Materials stored in open or inappropriate containers.
7. Contaminated Soil Remediation Cells Areas	• Plastic liners are deteriorated, and berms are damaged • Equipment not thoroughly decontaminated • Not compliant with SOPs and BMPs (Appendix G).
Drainage Areas, Potential Discharge Points, Outfalls	• Excess sediment and trash in detention ponds • Outlet to Potential Discharge Point 1 is clogged • Poor drainage to Lower Quarry detention basin.
General (Entire Facility)	• Spills and leaks that have occurred in the past three years have not been properly cleaned • Spill kits are not fully stocked • Unauthorized non-stormwater discharges (e.g., spent water from concrete, aggregate, vehicle/equipment washing, and decontamination water in remediation cells).

TABLE 14
Procedures for Quarterly Visual Assessments
SWPPP
Grace Pacific Makakilo Quarry

Step/Schedule	Task
For each quarter, determine if there is a qualifying rain event	• Perform visual assessment per quarter (i.e., once very three months, January 1 to March 31; April 1 to June 30; July 1 to September 30; October 1 to December 31) • **At least four samples shall be collected each year.** If no discharge occurs during a quarter, more than one visual assessment can be performed during the following quarter • Observe weather forecast for heavy rains (https://www.wunderground.com/weather/us/hi/kapolei/KHIKAPOL47) • Observe water levels within detention ponds to determine if a discharge is imminent. • If a discharge previously occurred within the past 72 hours, do not collect sample.
Documentation if no discharge occurs during the quarter	• Documentation and rationale for not performing a visual assessment shall be included in the visual assessment form and a copy kept in the Facility office to include in annual report.
Check weather website to record total rainfall in inches	• **https://www.wunderground.com/weather/us/hi/kapolei/KHIKAPOL47** • Record inches of rainfall for the day on which discharge sample is collected.
Collect sample within 30 minutes from start of discharge	• Collect one sample of stormwater from Potential Discharge Point 1 in Lower Quarry using a clean, colorless glass or plastic container. • Visually inspect for color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and other apparent indicators of stormwater pollution. • Photograph control measures listed in Section 3 for each area.
Immediately after visual assessment	• Discard water sample. • If the visual assessment shows evidence of stormwater pollution, evaluate the potential source(s) of that pollution • Evaluate the control measures for those potential sources and recommend modification immediately, but not more than 60 days after the visual assessment.

4.4 REPORTING REQUIREMENTS

4.4.1 Annual Report

An Annual Report shall be submitted to the DOH by January 30th for each year of permit coverage. The report shall contain all information pertaining to the past calendar year. At a minimum, the report shall include a summary of the past year's quarterly inspections, quarterly visual assessments, stormwater monitoring, and corrective actions (if any). A summary of reporting requirements is in Table 15. The Annual Report shall include a statement, signed and certified in accordance with HAR 11-55, Appendix A, Subsection 15.

4.4.2 Discharge Monitoring Report

A DMR shall be prepared for each benchmark monitoring event. The DMR shall be submitted to the DOH no later than the 28th day following the month when the samples were collected. Indicate "no data" or "NODI" for any three-month interval that a sample was not collected. A blank copy of the DMR form is included in Appendix D.

4.4.3 Exceedance Report

In the event monitoring values exceed a criteria, the exceedance must be recorded and submitted to the DOH using the "Clean Water Branch Compliance Submittal Form for Individual NPDES and NGPCs" as soon as Facility personnel become aware of the exceedance. The control measures will be reviewed to determine what correction actions shall be implemented in order to meet criteria. Quarterly monitoring will be continued until the numeric effluent limit is met. When follow-up monitoring still exceeds the criteria following corrective actions, an Exceedance Report shall be submitted to the DOH no later than 30 days after receiving the complete laboratory report. Facility personnel shall continue to monitor on a quarterly basis until limitations are met, or unless otherwise informed by the DOH.

4.4.4 Revisions to SWPPP

If corrective actions are required and control measures are revised, the SWPPP shall be revised within two weeks of inspection. Revisions to the SWPPP are logged in Appendix F.

4.5 RECORDKEEPING

The SWPPP with any modifications, documented corrective actions, reports, monitoring data, and records of all data used to complete the Notice of Intent to be covered by the NGPC must be kept for a period of at least three years from the date that coverage under the NGPC expires or is terminated.

TABLE 15
Summary of Reporting Requirements
SWPPP
Grace Pacific Makakilo Quarry

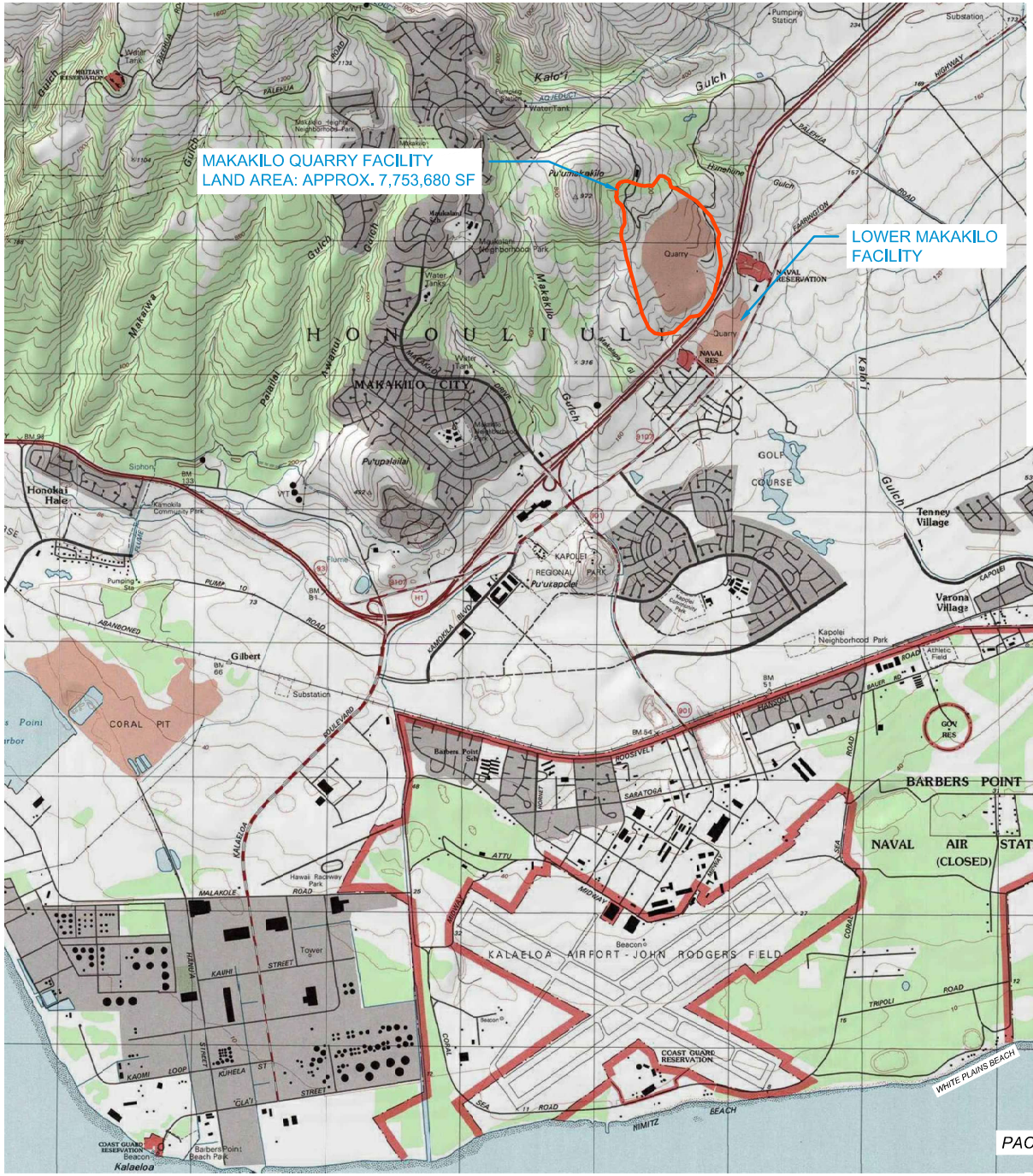
Report/Submittal	Frequency	Due Date(s)	Where to Submit
Routine Inspections	Quarterly	End of each quarter	Keep with SWPPP
Visual Assessments	Quarterly	End of each quarter	Keep with SWPPP
Discharge Monitoring Reports	Quarterly (Benchmark Monitoring)	30 days after receiving full laboratory results	DOH e-Permitting Portal
Exceedance Reports	When laboratory results exceed benchmark limitation	30 days after receiving full laboratory results if follow-up monitoring still exceeds	Follow-up monitoring laboratory results at DOH e-Permitting Portal Exceedance reports to DOH e-Permitting Portal
Annual Report	Annually	January 30th	DOH e-Permitting Portal
SWPPP Revisions	Changes to site conditions, operations, control measures, corrective actions	45 days after the fourth quarter inspection	If requested by the DOH

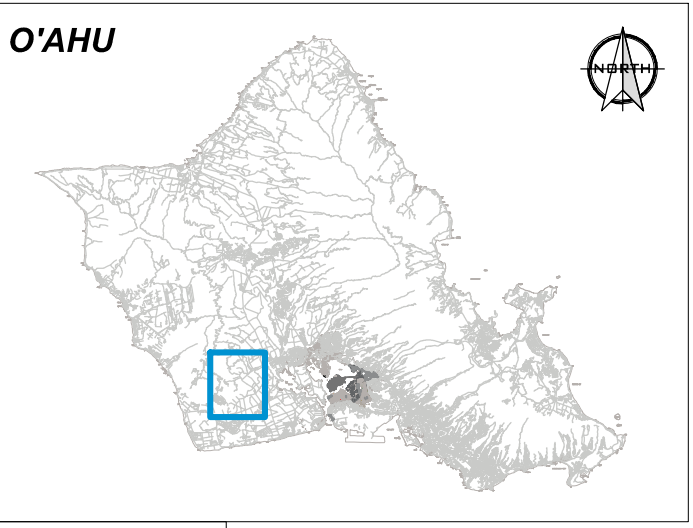
SECTION 5 REFERENCES

DOH, 2022, Water Pollution Control: State of Hawaii Department of Health, Hawaii Administrative Rules, Title 11, Chapter 55. January 15, 2022.

ESI, 2022, Spill Prevention, Control, and Countermeasure Plan, Grace Pacific Makakilo Quarry, 91-920 Farrington Hwy, Kapolei, Hawaii. Draft.

FIGURES





NOTES

The accuracy of this document is limited to the quality and scale of the source information. This document is not a legal representation of an engineered survey.

SOURCES

Island of Oahu GIS, USGS Clearinghouse

Google Maps, 2014

NORTH

GRAPHIC SCALE

7 0 7

1 inch = 7 miles

FIGURE 1

REGIONAL LOCATION AND TOPOGRAPHIC MAP

STORM WATER POLLUTION PREVENTION PLAN
GRACE PACIFIC LLC
MAKAKILO QUARRY
92-1130 PUEONANI STREET
KAPOLEI, HAWAII
TMK NO. (1) 9-2-003:082

ENVIRONMENTAL SCIENCE INTERNATIONAL

LEGEND

SATORM WATER FLOW DIRECTION

MAKAKILO QUARRY BOUNDARY

NOTES

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SOURCES

Island of Oahu GIS, USGS Clearinghouse

TOPO! Software Program

NORTH

GRAPHIC SCALE

4,000 0 4,000

1 inch = 4,000 feet

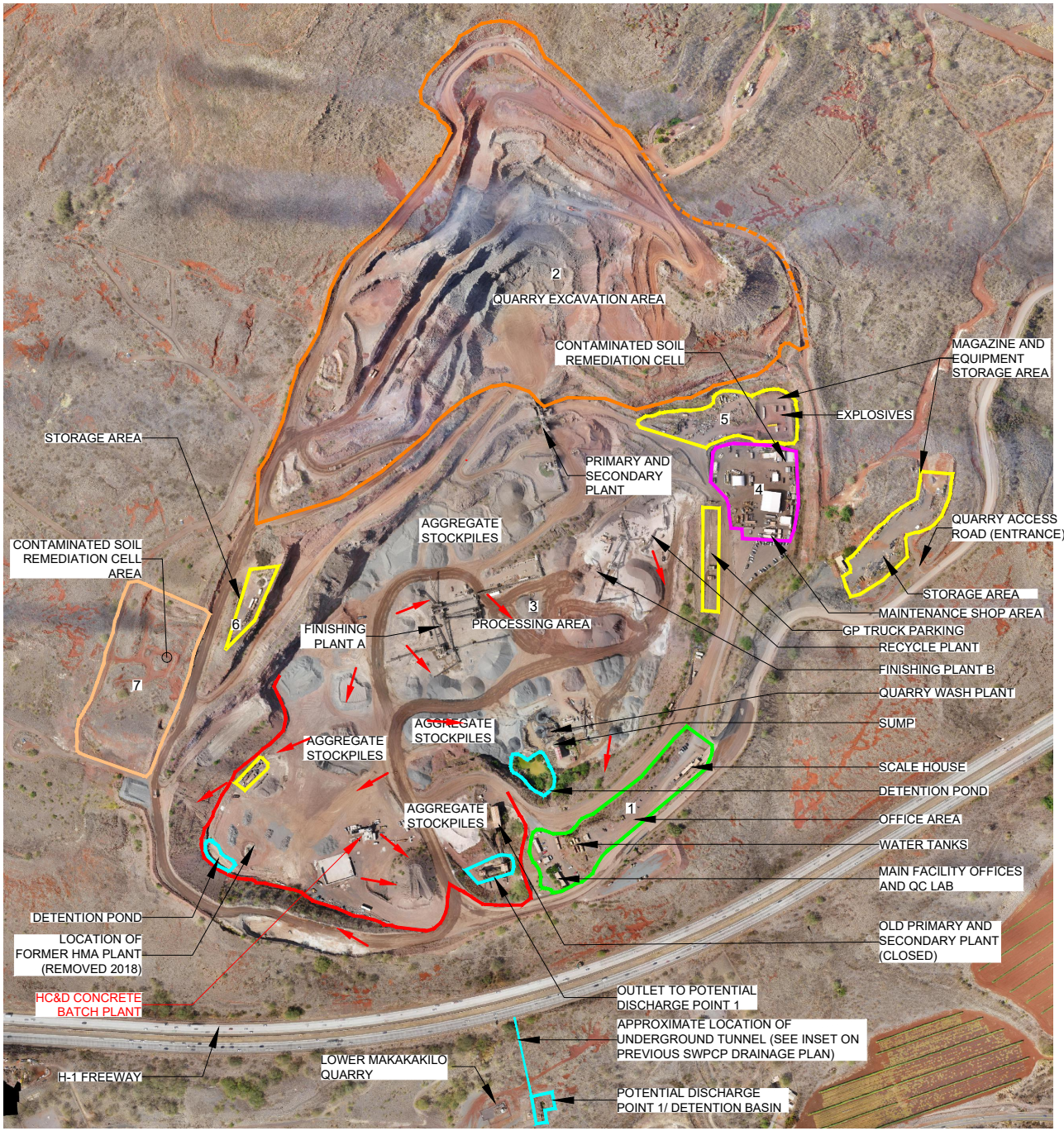
FIGURE 2

FACILITY LOCATION MAP

STORM WATER POLLUTION PREVENTION PLAN
GRACE PACIFIC LLC
MAKAKILO QUARRY
92-1130 PUEONANI STREET
KAPOLEI, HAWAII
TMK NO. (1) 9-2-003:082

ESI

ENVIRONMENTAL SCIENCE INTERNATIONAL



LEGEND

- OFFICE AREA
- QUARRY EXCAVATION AREA
- PROCESSING AREA
- MAINTENANCE SHOP AREA
- MAGAZINE AND EQUIPMENT STORAGE AREAS
- CONTAMINATED SOIL REMEDIATION CELL AREA
- STORMWATER DIRECTION FLOW

NOTES

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SOURCES

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TOPO! Software Program

NORTH

GRAPHIC SCALE

4,000 0 4,000

1 inch = 4,000 feet

FIGURE 3

FACILITY LAYOUT AND DRAINAGE MAP

STORM WATER POLLUTION PREVENTION PLAN
GRACE PACIFIC LLC
MAKAKILO QUARRY
92-1130 PUEONANI STREET
KAPOLEI, HAWAII
TMK NO. (1) 9-2-003:082

ESI
ENVIRONMENTAL SCIENCE INTERNATIONAL

APPENDIX A

Emergency Notification List

Emergency (In case of medical emergency, fire, explosion, or other hazards):	
Medical Assistance, Fire Department, Police Department	911
Responsible Facility Personnel (Spill of any amount):	
Grace Pacific Spill Response Hotline	(808) 913-3809
Quarry Operations Manager, Les Iverson	(808) 209-1466
Quarry Materials Manager, Christopher Hermosura	(808) 306-5429
Environmental Compliance Manager, Jodie Cordero	(808) 561-3368
Emergency Spill Response Contractor (Upon notification by Facility Personnel):	
Pacific Commercial Services [PCS]	(808) 206-9989 (24 hours)
Federal Agencies (Oil spills of any amount that cause a sheen or threaten to reach a surface water body):	
National Response Center	(800) 424-8802 (24 hours)
State Agencies (Oil spills > 25 gallons):	
State of Hawaii, Department of Health [DOH] Hazard Evaluation and Emergency Response [HEER] Office (Oahu)	(808) 586-4249 (working hours) (808) 247-2191 (after hours)
State Civil Defense, Hawaii State Emergency Response Commission	(808) 733-4300 (working hours) (808) 733-2191 (after hours)
DOH Clean Water Branch [CWB] (Oahu)	(808) 586-4309 (working hours)
State Department of Land and Natural Resources	(808) 587-0400 (working hours)
Local Agencies (Oil spills > 25 gallons):	
Honolulu Local Emergency Planning Committee	(808) 723-8960

APPENDIX B

Quarterly Inspection Form

Grace Pacific Makakilo Quarry SWPPP Routine Quarterly Inspection

(Version 1.0/ Apr 2022)

Date:	Time:	Weather:	Inspector(s) *Print and Sign*:
Type of Inspection: ☐ Quarterly ☐Monthly ☐Other:			

RECORDKEEPING:

Compliance Documentation: ☐ SWPPP ☐SPCC Plan ☐NPDES ☐NGPC	Current and Up-To-Date Documentation: ☐ Emergency Contact List ☐Inspection Records ☐ Visual Assessment Records ☐ Training Records
Corrective Actions (if any):	Corrective Actions (if any):

KEY:

OK – In compliant with the 11-55 HAR Appendix B.
NOT OK – Not compliant. Describe deficiency and possible corrective action.
N/A – Not Applicable

1. Office Area (Scale House, Main Facility Offices, and QC Lab)	OK	Deficiency	Corrective Action
No excess material and equipment stored outside the areas.			
Trash receptacles are not overfilling and replaced as needed.			
No leaks or spills.			
Nearby remediation cell area beside QC Lab has a maintained bermed area.			

2. Quarry Excavation Area	OK	Deficiency	Corrective Action
Leaks and spills are cleaned as soon as they occur.			
Berms, dikes, and dams are maintained.			
Dust control used during quarry operations.			
Quarry access roads are free from excess materials or equipment.			
No excess materials and equipment are stored within the excavation area.			
Stockpiles are stabilized and located away from drainage areas and discharge points			
Spill response kits are fully stocked.			

3. Processing Area	OK	Deficiency	Corrective Action
Leaks and spills are cleaned as soon as they occur.			
Berms, dikes, and check dams are maintained.			
Stationary equipment is maintained and ensured it is not leaking.			
Aggregate stockpiles are stabilized and kept orderly.			
Excess sediment and road dust on paved areas is routinely swept.			
Water trucks frequently light spray water for dust control.			
Spent wash water from the Quarry Wash Plant flow towards the retention pond.			
Storage of petroleum products or other hazardous substances are placed in enclosed containers.			

4. Maintenance Shop Area	OK	Deficiency	Corrective Action
No staining, leaks or spills, or leaking equipment with no drip pans.			
Operations being conducted under cover or on impervious surfaces when possible.			
Containers are closed, securely fastened, stored neatly and properly labeled.			
Concrete and rollover berms are not damaged.			
Spill response kits are fully stocked.			
Inspections and maintenance of oil storage containers are in accordance with the SPCC Plan.			

5. Equipment/Storage Areas	OK	Deficiency	Corrective Action
No staining, leaks or spills, or leaking equipment.			
Materials are stored in appropriate containers.			
There are no excess litter or debris in the area.			

7. Contaminated Soil Remediation Cells Area	OK	Deficiency	Corrective Action
Soil stockpiles are contained in bermed areas and covered with plastic liners.			
Berms and plastic liners are in good condition.			
There is proper drainage in the contained decontamination water.			
Equipment within the area is thoroughly decontaminated.			
Soil in remediation cells are sprayed with water weekly and turned at two-month intervals.			

Drainage Areas, Potential Discharge Point 1	OK	Deficiency	Corrective Action
Retention pond near Quarry Wash Plant does not have excess litter or debris.			
Outlet of Potential Discharge Point 1 connected to the Lower Quarry is not clogged.			
Detention basin (Lower Makakilo Quarry) is free of excess sediment, debris, or litter.			

General (Entire Facility)	OK	Deficiency	Corrective Action
Spills and leaks that have occurred in the past three years have been properly cleaned.			
There are no unauthorized non-stormwater discharges (e.g., spent water from concrete, aggregate, or vehicle/equipment washing).			

REMARKS:

APPENDIX C

Quarterly Visual Assessment Form

SWPPP Quarterly Visual Assessment

Field Form (Version 1.0/ May 2022)

This form should be kept as part of your Storm Water Pollution Prevention Plan. It **does not** have to be submitted to the HDOH unless requested. Use one form per outfall/sampling point.

Quarterly visual assessments (Jan-Mar, Apr-Jun, Jul-Sep, and Oct-Dec) at each storm water discharge outfall on your site are required to maintain compliance with the NPDES Permit. The assessment should be performed during a measurable storm event that results in an actual discharge of stormwater that follows the preceding measurable storm event by at least 72 hours. Try to make observations within the first 30 minutes after runoff begins discharging from the potential discharge point, or as soon as practical, but no later than 60 minutes.

Make any necessary changes to your **Storm Water Pollution Prevention Plan** as needed.

Facility Name			
Street Address	City	State	ZIP Code
Personnel Conducting Assessment		Inspection Date and Quarter	
Employer		Telephone Number	
Discharge Point # (make reference to site map)	Description and Type of Discharge Point (e.g., ditch, concrete pipe, grassed swale, sheet flow, etc.)		

Qualifying Rain Event:

□ Date and Time of first rain event (greater than 0.1 inches and actual discharge):

□ Date and Time of second rain event (must be at least 72 hours or 3-days after first event):

Time of Assessment:	Substitute Sample? □ No □ Yes (identify quarter/year when sample was originally scheduled to be collected)

Date & Duration of Rain Event:	Time of Visual Assessment	Rainfall Amount (inches) at the Time of Observation: (https://www.wunderground.com/history/weekly/us/hi/honolulu/PHNL)

Obtain a clean, colorless container to collect a sample of the storm water being discharged from the facility and visually inspect the water. Include any observations not listed below and describe them in further detail.

Color:	☐ Clear	☐ Red	☐ Yellow	☐ Brown	☐Other:
Odor:	☐ Musty	☐ Sewage	☐ Rotten Egg	☐ Petroleum	☐Other:
Clarity:	☐ Clear	☐ Cloudy	☐ Opaque	☐ Suspended Particles	☐Other:
Floating Solids:	☐ Foam	☐ Debris	☐ Oily Film	☐ None:	☐Other:
Settled Solids:	☐ Debris	☐ Sediment	☐ Sludge	☐ None:	☐Other:

List probable sources of observed storm water pollution and any corrective action that could be used to reduce or eliminate the problem:

This assessment could not be evaluated during this quarter due to the following reasons (e.g., adverse weather conditions, irregular storm water runoff, rationale for not taking a sample within the first 30 minutes, no actual measurable discharge):

APPENDIX D

DMR Form

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if Different)
NAME

ADDRESS

FACILITY
LOCATION

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

Form Approved.
OMB No. 2040-0004

PERMIT NUMBER	DISCHARGE NUMBER

	MONITORING PERIOD						
	YEAR	MO	DAY		YEAR	MO	DAY
FROM				TO			

☐ Check here if No Discharge

NOTE: Read Instructions before completing this form

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		VALUE	VALUE	UNITS	VALUE	VALUE	VALUE	UNITS			
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
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	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
	I CERTIFY UNDER PENALTY OF LAW THAT THIS DOCUMENT AND ALL ATTACHMENTS WERE PREPARED UNDER MY DIRECTION OR SUPERVISION IN ACCORDANCE WITH A SYSTEM DESIGNED TO ASSURE THAT QUALIFIED PERSONNEL PROPERLY GATHER AND EVALUATE THE INFORMATION SUBMITTED. BASED ON MY INQUIRY OF THE PERSON OR PERSONS WHO MANAGE THE SYSTEM, OR THOSE PERSONS DIRECTLY RESPONSIBLE FOR GATHERING THE INFORMATION, THE INFORMATION SUBMITTED IS, TO THE BEST OF MY KNOWLEDGE AND BELIEF, TRUE, ACCURATE, AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT FOR KNOWING VIOLATIONS.						
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

APPENDIX E

Training Log

TRAINING LOG

TOPICS COVERED: _____

_____

_____

DATE OF TRAINING: _____ **INSTRUCTOR:** _____

NAME	COMPANY	SIGNATURE

APPENDIX F

SWPPP Review and Amendment Form

SWPPP REVIEW AND AMENDMENT FORM
Grace Pacific Makakilo Quarry

No.	Date	SWPPP Section	Action (Review/Amendment)	Reviewer
1	07/11/2014	N/A	Initial Plan	N/A
2	11/18/2014	Cover Page, Section 1.2 Figures	Revised Facility address to 92-1130 Pueonani St. (instead of 94-1130 Pueonani St.)	ESI
3	12/6/2018	Figure Edits, Old Recycle Plant, no HMA Plant	No more recycle plant, HMA Plant, and the first Primary/Secondary Plant.	ESI/Grace Pacific
4	7/12/22	Entire Plan	Updated SWPCP to SWPPP	ESI/GP

APPENDIX G

SOP for Contaminated Soil Remediation Cells

Standard Operating Procedures

Construction and Maintenance of Soil Remediation Cells

Health and Safety

Facility personnel tasked with constructing and maintaining the remediation cells are equipped with the adequate personal protective equipment (i.e., level D PPE, steel-toed boots, and leather or equivalent work gloves).

Construction of Soil Remediation Cells

Prior to construction of the cell, the ground surface is cleared of rocks or rock fragments larger than half inch in diameter and any other sharp object. A loader or similar equipment is used to construct a bermed holding cell using clean material (e.g., clean soil or aggregate obtained from on-site). The berms are a minimum of two feet high to control surface run-on and run-off. The bermed area is lined with a 10-mil thick plastic liner to prevent contaminant migration to the ground surface and to protect the berms from erosion. A bedding of clean soil or sand (approx. 12 inches) is then placed on the liner to protect it from heavy equipment and machinery used to load, unload, and work the soil. A thin layer (approximately 1 foot thick) of petroleum-contaminated soil will be spread directly on top of the clean material bedding. Microbes housed in a clay bentonite powder are introduced in the soil to biologically remove the petroleum contamination from the soil. The amount of microbe powder used depends upon the amount of contaminated soil and is determined by the Grace Pacific Environmental Compliance Manager or a designated technical consultant prior to construction of the remediation cell; but generally, one 6-ounce shaker is sufficient for most remediation cells.

The microbe powder is sprinkled on the first layer of soil, followed by spraying the soil with water until slightly moist (not damp). A second layer (approximately 1 foot thick) of petroleum-contaminated soil is added on top of the first layer. Another round of microbe powder is sprinkled on top of the second layer of soil. The soil is then turned using a loader or similar equipment to disperse the microbes throughout the soil stockpile.

Following turning of the soil, the loader bucket is briefly rinsed with water over the soil pile as to not saturate the soil with water. Rinse water is not allowed to drain outside the bermed area. Thorough decontamination of equipment will be completed in an area where decontamination water can be collected (See Decontamination Procedure for Equipment below).

A 6-mil thick plastic cover is placed over the soil pile and sealed to the bottom liner in order to isolate the soil stockpile from rainwater and runoff. The cover also serves to limit volatile emissions from the impacted soils and will act as a dust controller.

Note: The dimensions of the remediation cell vary depending on the volume of excavated contaminated soil from a specific spill area. Soil excavated from different spill areas may be placed

in the same remediation cell as long as the material spilled is the same and the spills occur in a relatively close space of time. The determination to combine soil from different spills is made by the Grace Pacific Environmental Compliance Manager or a designated technical consultant. Soil impacted with gasoline, diesel fuel, or hydraulic oil is not combined in the same remediation cell.

Maintenance of Soil Remediation Cells

The remediation cells are inspected weekly for signs of erosion, damage to the berms/plastic cover, and for proper drainage in the area of the cells. Significantly eroded berms are restored to preserve the two feet height specification. Deteriorated plastic covers are repaired or replaced in order to maintain the integrity of the cover.

The soil in the cells is sprayed with water weekly to retain the slightly moist environment that the microbes need to live. In addition, the soil is turned at two-month intervals to keep it aerated.

Decontamination Procedure for Equipment

A containment area is constructed to retain decontamination water originating from washing equipment. A bermed holding cell is constructed in the same manner that the remediation cells are constructed. The following decontamination procedure is followed:

- A solution of water and non-phosphate detergent (e.g. Alconox or equivalent product) is used to wash equipment using a stiff brush or sponge.
- Equipment is scrubbed and rinsed over the containment area.
- Collected water is allowed to evaporate as long as there is no chance for the container to overflow if it rains.
- If there is a potential for overflow, water is transferred into a 55-gallon open-top drum that is placed under cover, where the water is allowed to evaporate.

Monitoring and Closure of Soil Remediation Cells

After an interval predetermined by the Grace Pacific Environmental Compliance Manager or a designated technical consultant, based on the amount of soil, level of contamination, and type of contaminant, samples are collected and analyzed to determine if the remediation has sufficiently complete. Once completion of the remediation is determined by the Grace Pacific Environmental Compliance Manager or a designated technical consultant, a closure assessment report is prepared and submitted to the State of Hawaii Department of Health [DOH], requesting authorization to reuse the soil. Upon authorization from the DOH to reuse the soil, the soil is reused onsite, as determined by the Grace Pacific Environmental Compliance Manager or Quarry Manager.