AN ARCHAEOLOGICAL INVENTORY SURVEY REPORT FOR THE SADDLE ROAD EXTENSION PROJECT IN WAIKOLOA AND PU‘U ANAHULU AHUPUA‘A, NORTH KONA AND SOUTH KOHALA DISTRICTS, ISLAND OF HAWAI‘I, HAWAI‘I

[Portions of TMK: (3) 6-8-001:005, 027, 006, 067;
and (3) 6-8-002:013, 014, 015;
and (3) 7-1-003:001]

Volume II of II
APPENDICES

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January 2016
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APPENDIX A: CONSULTATION & PUBLIC NOTICES

Table 1: Individuals and Organizations Consulted in 2001and 2002 for the Current Study.

Name	Title, Organization	Phone call	Letter Sent	Interview
Aloot, Sebastian	OHA*	26 June 01		
Andrade, Punahele	Cultural Specialist, Outrigger Hotel	25 June 01	25 June 01	29 Nov 01
Cole, Heather	Nature Conservancy	29 June 01		
Cook, Patti	Waimea Community Association		28 June 01	
Flores, E. Kalani	Historic Preservation Council, OHA		26 June 01	
Giffin, Jon	DLNR, Division of Forestry and Wildlife	25 June 01		
Irons, Darby	Resident, Parker Ranch	28 June 01	28 June 01	
Keakealani McCarthy, Kuʻulei	Puʻu Anahulu ʻOhana	25 June 01	25 June 01	28 Nov 01
Maly, Kepā	Cultural Specialist, Kumu Pono Associates	3 July 01		
McDonald, Rudy	Kona Cultural Resource Coordinator, OHA		18 July 01	
Oshiro, Rod	DLNR, Division of Forestry, Na Ala Hele		25 June 01	
Saldua, Ben	Puʻukoholā National Historic Park		26 June 01	
Sherlock, Ululani	Hilo Cultural Resource Coordinator, OHA		18 July 01	
Soon, Ray	Department of Hawaiian Home Lands		25 June 01	
Springer, Hannah Kihalani	Historic Preservation Council, OHA		29 June 01	
Tolentino, Mabel	Waimea Hawaiian Civic Club	25 June 01 (Spoke w/ relative)	25 June 01	
Yamaguchi, Jiro	Paniolo, Parker Ranch			15 April 02
Yamaguchi, Mark	Paniolo, Parker Ranch			15 April 02

Table 2: List of Individuals Consulted in 2014 for the Current Study.

Name	Association	Called	Emailed	Meeting
Akau, Julia	Puʻuanahulu ʻOhana			9/10/2014
Bergin, Dr. Billy	Kamuela ʻOhana		7/21/2014 & 8/28/14	9/2/2014
De Silva, Donnie	Parker Ranch Cowboy	9/30/2014		
Harp, Isaac "Paka"	Kona ʻOhana		8/29/2014	
Hind, Robbie III	Puʻuanahulu/Kona ʻOhana	7/7/2014	7/7/2014	
Humble, Marnie	Puʻuanahulu/Kona ʻOhana			9/10/2014
Keakealani, Kuulei	Puʻuanahulu ʻOhana	8/1/2014	7/21/2014 & 8/1/2014	
Keakealani, Sonny	Puʻuanahulu ʻOhana	Kuulei informed Sonny of 9/10/2014 meeting		
Kilte, Merline	Puʻuanahulu ʻOhana			9/10/2014
Lui, Nicole	Kohala/Kona ʻOhana		8/28/2014	8/23/2014
Mitchell, Robert L.	Puʻuanahulu ʻOhana			9/10/2014
Vredenburg, Keawe	Kamuela ʻOhana	7/7/2014		
Wilcox, Clarese "Nana"	Puʻuanahulu ʻOhana			9/10/2014

Table 3: List of Organizations Consulted in 2014 for the Current Study.

Organization, Title	Name	Mailed	Emailed	Called	Spoke in Person
Department of Hawaiian Home Lands, West Hawaiʻi District Supervisor	Du Pont, James	8/18/2014			
OHA, Compliance Manager	Markell, Kai	8/18/2014			
OHA, West Hawaiʻi Office	Nelson, Shane	8/18/2014 & 8/21/2014	8/19/2014	8/20/2014	10/3/2014
National Parks Service - Ala Kahakai National Historic Trail	Gmirkin,Rick	8/18/2014			8/23/2014
SHPD Burial Sites Specialist	Hoʻomanawanui, Kauanoe	8/18/2014			
Waimea Hawaiian Civic Club	Moniz, Sam	8/18/2014			
Waimea Community Association	Warner, Sherm	8/18/2014			
Hawaiʻi Island Burial Council	HIBC Meeting				October HIBC Meeting
Hawaiʻi Island Burial Council, Waimea Representative	Kahaulelio, Mary Maxine	8/18/2014		8/28/2014	
Hawaiʻi Island Burial Council, Kohala Representative	Cachola, Fred		8/25/2014		8/23/2014
Hawaiʻi Island Burial Council, Chairman	Lee, James Kimo Jr.	8/18/2014			8/19/2014
County of Hawaiʻi Planning Department Cultural Resources Commission, Director	Kanuha, Duane	8/18/2014			
Kona Hawaiian Civic Club	Aka A. De Mesa, VP	8/18/2014			
Paniolo Preservation Society, President	Von Holt, Pono	8/18/2014			
Hui Mālama I Na Kūpuna ʻO Hawaiʻi Nei	Ayau, Eddie Halealoha	8/18/2014			

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Suite 380A
Lakewood, CO 80228-2583
Office: 720-963-3647
Fax: 720-963-3596
Michael.will@dot.gov

In Reply Refer To:
HFPM-16

RE: SADDLE ROAD EXTENSION: FROM MĀMALAHOA HIGHWAY TO QUEEN KAʻAHUMANU HIGHWAY, WAIKOLOA AND PUʻUANAHULU AHUPUAʻA, SOUTH KŌHALA AND NORTH KONA DISTRICTS, HAWAIʻI ISLAND, STATE OF HAWAIʻI PROJECT NO. DO-HI-0200(5) TAX MAP KEY: (3) 6-8-001:005, 066, 067; 6-8-002:013, AND 014, 015; 7-1-003:001

Aloha e:
On behalf of the Federal Highway Administration (FHWA), the State of Hawaiʻi Department of Transportation (HDOT) would like to invite you to participate in consultation for the proposed Saddle Road Extension Project.

The project addresses the improvement of cross-island transportation. The proposed Saddle Road Extension will link the newly realigned Saddle Road at the Māmalahoa Highway to the Queen Ka'ahumanu Highway at Waikoloa Beach Drive [Enclosure 1]. The project will improve the efficiency and operational level of traffic movement between East Hawaiʻi and West Hawaiʻi in general, and will support the unique modal needs along this corridor, such as commercial and military transportation uses. Three alternate 250 foot wide corridors were selected for study. The Area of Potential Effect (APE) for the three corridors includes 775 acres. Only one corridor will be selected for construction. The maximum length of the proposed road corridor, which traverses unimproved cattle pasture and open lava flows, is 10.7 miles.

The proposed project will utilize federal funding and will be considered a federal action and undertaking, as defined by the Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended (2006). Therefore, the FHWA will require compliance with the National Environmental Policy Act, NHPA, and other federal requirements. The FHWA has authorized the HDOT and its consultants, Lennie Okano-Kendrick of Okahara and Associates, Inc. and Glenn Escott, M.A., of Scientific Consulting Services, Inc, to act on behalf of the FHWA regarding the NHPA Section 106 notification and consultation. We would like to invite you to participate in the Section 106 consultation for the proposed project in accordance with Title 36 of the *Code of Federal Regulations*, Section 800.3.

Overview of the Undertaking

The project area is located between 60 and 2,500 feet (18 and 762 meters) above mean sea level (amsl). The coastal and near coastal portions of the project area are covered by exposed pāhoehoe and ʻaʻā lava flows. The lava flows in the center of the project area are primarily exposed ʻaʻā lava. The upper portions of the project area have more soil and are open grass and shrublands.

The proposed Saddle Road Extension project involves grubbing, cutting, and grading to create a new road bed, the creation of shoulders, the construction of drainage culverts, widening of existing roadways at either end of the new road bed, and paving. The project will also involve regrassing/reinforcing any newly exposed cut slope to control erosion, providing best management practices during construction, and providing adequate traffic control to ensure motorists can safely pass during construction at either end of the new road.

Cultural and Historical Background

The project area lands are arid, hot, and barren and were not locations known for traditional Hawaiian habitation. The closest villages were along the coast to the west and in the upper *kula* lands of Lālāmilo and Waimea to the northeast. Historical narratives of the Waikoloa area stress its geographical location as a nexus of travel. Trails from Kona to Kohala crossed the lava flats inland of ʻAnaehoʻomalu and Puakō. Trails stretched from the coast to Waimea. Other trails ran from Kona, east of Hualalai, and down to Waimea or the coast. Trails from Hilo crossed the saddle between Mauna Kea and Mauna Loa, and then led downhill to Lālāmilo, where travelers could take trails either east or west. The trails leading to the uplands were often used to access areas where natural resources were collected and hunted.

Large areas of the foothills of southern Waikoloa were covered in *pili* grass (*Heteropogon contortus*) traditionally used for thatching. *Māmane* (*Sophora chrysophylla*), *naio* (*Myoporum sandwicense*), *wauke* or paper mulberry (*Broussonetia papyrifera*), *ʻiliahi* or sandalwood (*Santalum paniculatum*), and *ʻōhiʻa* (*Metrosideros polymorpha*) grew on the plains of Waimea and at upper elevations in the foothills of Mauna Kea and Mauna Loa. Traditional resource extraction from the area included *kapa* cloth made from *wauke*, *māmane* limbs cut for adze handles, and birds trapped for their meat and feathers.

During the early post-Contact era, much of grassy, upland Waikoloa became bullock hunting grounds that were later fenced for cattle ranching. Large portions of the Waikoloa grasslands were first purchased in 1868 by the Waimea Grazing and Agricultural Company (WGAC). The WGAC property was sold to Parker Ranch in 1904. The upper project area lands are now owned by private individuals that still use it for cattle ranching.

The lower barren lava portions of the project area were used traditionally for bird hunting and egg collection. They were also an area for the extraction of pāhoehoe for the manufacture of abraders. There are documented trails, trail markers, and caves used for temporary habitation while travelling through the area.

The lower portion of Waikoloa was leased by the U.S. War Department from 1943 to 1946 as part of the Waikoloa Maneuver Area. The military used portions of the lease land for troop maneuvers and weapons practice, while other areas served as artillery, aerial bombing and naval gun fire ranges.

Summary of Archaeological Sites within the APE

Prior archaeological and cultural studies conducted in the area did not identify any sites listed on the National Register of Historic Places, or on the Hawaiʻi Register of Historic Places. As part of the current proposed project, an archaeological inventory survey of the APE and surrounding lands was conducted. Twenty eight archaeological sites were documented within the APE and twenty four archaeological sites were documented on lands outside of the APE. The sites are potentially significant and will be considered when assessing potential impacts from the proposed project.

Consultations

Consultation with individuals and families in the Waimea community has already been initiated, and Section 106 notice/advertisements will be included in the West Hawaiʻi Today, Hawaiʻi Tribune Herald, Honolulu Star Advertiser, and Ka Wai Ola. Section 106 consultation letters have also been sent to other organizations or individuals (Association of Hawaiian Civic Clubs; *Hui Mālama I Na Kūpuna O Hawaiʻi Nei*; Kona Hawaiian Civic Club; *Laʻi ʻŌpua* 2020; Office of Hawaiian Affairs; and Mr. Isaac Harp) that might attach significance to this area, inviting them to participate in the process.

Native Hawaiian Organizations and Native Hawaiian descendants with ancestral lineal or cultural ties to, cultural knowledge or concerns for, and cultural or religious attachment to the proposed project area are asked to provide a response within 30 days of notification.

We welcome any comments you have on this proposed project. We are particularly interested in information you may have about historic and cultural sites in the broader area, or about the general history of the lands where the proposed project area is located. In addition, if you are acquainted with any persons or organization that is knowledgeable about the proposed project area, or any descendants with ancestral lineal or cultural ties to or cultural knowledge or concerns for, and cultural or religious attachment to the proposed project area, we would appreciate receiving their names and contact information.

We would appreciate a written response within 30 days from date of receipt, to Michael Will, Project Manager, via email at michael.will@dot.gov, or by US Postal Service to 12300 West Dakota Ave., Ste. 380, Lakewood, CO 80228.

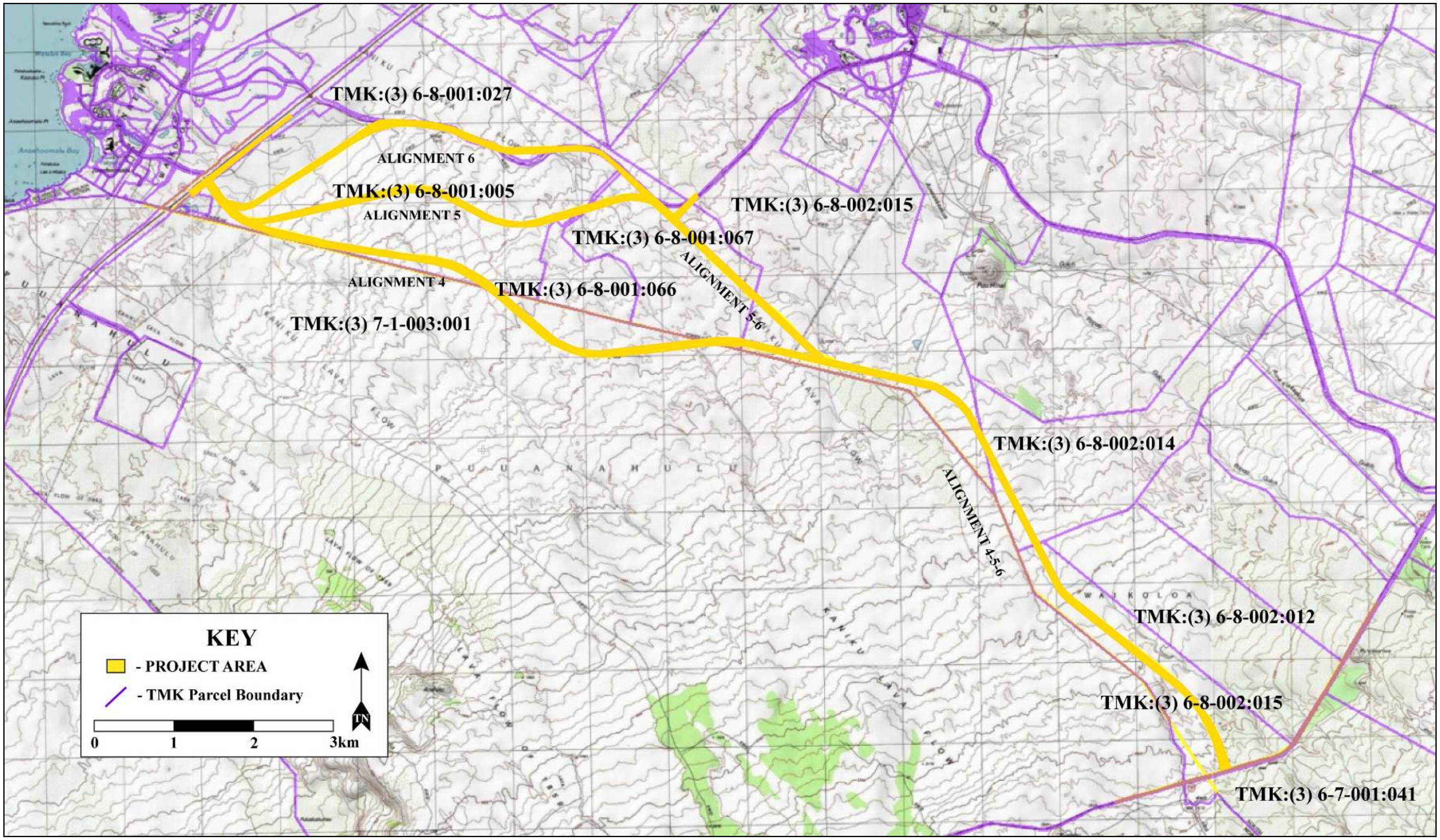
If you have any questions regarding the archaeological or cultural studies in the area, please contact Glenn Escott of Scientific Consulting Services, Inc. at (808) 938-0968 or you may also contact the lead federal agency representative, Nicole Winterton by telephone at (720) 963-3689 or nicole.winterton@dot.gov. We look forward to working with you and the SHPD on these needed improvements.

Sincerely,

Michael Will, P.E.
Project Manager

Enclosure 1: Map of Proposed Project Area of Potential Effect

cc: [Okahara and Associates], FHWA [Nicole Winterton], HDOT [Ken Tatsuguchi]



Enclosure 1: 7.5-Minute Series USGS Topographic Map Showing Location of TMK Parcels and Project Area (Anaehoʻomalu, Puʻu Hīnaʻi, Puʻu Anahulu, and Keʻāmuku Quads) (National Geographic Topo! 2003).

1266

AFFIDAVIT OF PUBLICATION

State of Hawaii)
) SS:
County of Hawaii)

LEILANI K. R. HIGAKI, being first duly sworn, deposes and says:

1. That she is the BUSINESS MANAGER of HAWAII TRIBUNE-HERALD, a newspaper published in the City of HILO, State of Hawaii.

2. That the "NOTICE OF CONSULTATION...STATE OF HAWAI'I Project No. DO-HI-0200(5)...etc.",

of which a clipping from the newspaper as published is attached hereto, was published in said newspaper on the following date(s) August 17, 20, 21, 2014, (etc.).

280418

Leilani K. R. Higaki

Subscribed and sworn to before me

this 2nd day of September, 2014.

Danette K. Koochi

DANETTE K. KOOCHI

Notary Public, Third Circuit, State of Hawaii

My commission expires March 23, 2018

DANETTE K. KOOCHI NOTARY PUBLIC Comm. No. 14-82 STATE OF HAWAII

Page(s): 1

Hawaiʻi Tribune-Herald Public Notice Affidavit of Publication.

Scs 1266 SRX

1266

AFFIDAVIT OF PUBLICATION

State of Hawaii)
) SS:
County of Hawaii)

M. R. Chavez, being first duly sworn, deposes and says:

1. That she is the Classified Accountant of WEST HAWAII TODAY, a newspaper published in the City of Kailua-Kona, State of Hawaii.

2. That "**NOTICE OF CONSULTATION SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT OF 1966 AS AMENDED (2006) SADDLE ROAD EXTENTION**..." of which a clipping from the newspaper is attached hereto, was published in said newspaper on the following date(s) August 17, 20 and 21, 2014 (etc.)

M. R. Chavez

Subscribed and sworn to before me
This 21st day of August, 2014

Notary Public, Third Circuit,
State of Hawaii

HENRIANN P. KAHANANUI
NOTARY
Comm. No. 11-188
PUBLIC
STATE OF HAWAII

Henriann P. Kahananui

My Commission expires: June 6, 2015
Page(s): 1

West Hawaiʻi Today Public Notice Affidavit of Publication.

1266

AFFIDAVIT OF PUBLICATION

IN THE MATTER OF
NOTICE OF CONSULTATION

STATE OF HAWAII }
} SS.
City and County of Honolulu }

Doc. Date: SEP - 3 2014 **# Pages:** 1
Notary Name: Patricia K. Reese First Judicial **Circuit**
Doc. Description: Affidavit of Publication

SEP - 3 2014
Notary Signature Date

PATRICIA K. REESE NOTARY PUBLIC Comm. No. 86-467 STATE OF HAWAII

Rose Rosales being duly sworn, deposes and says that she is a clerk, duly authorized to execute this affidavit of Oahu Publications, Inc. publisher of The Honolulu Star-Advertiser and MidWeek, that said newspapers are newspapers of general circulation in the State of Hawaii, and that the attached notice is true notice as was published in the aforementioned newspapers as follows:

Honolulu Star-Advertiser 1 times on:
09/03/2014

Midweek Wed. 0 times on:

_______ times on:

And that affiant is not a party to or in any way interested in the above entitled matter.

Rose Rosales

Subscribed to and sworn before me this 3rd day of Sept A.D. 2014

Patricia K. Reese, Notary Public of the First Judicial Circuit, State of Hawaii
My commission expires: Oct 07 2014

Ad # 0000659743

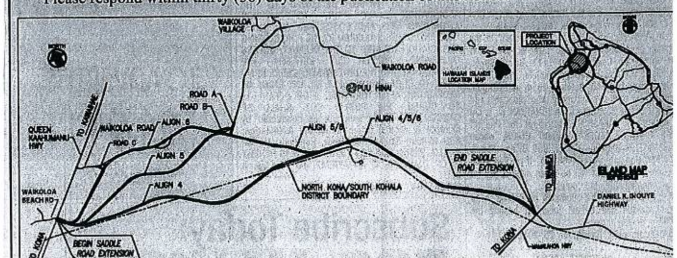
PATRICIA K. REESE NOTARY PUBLIC Comm. No. 86-467 STATE OF HAWAII

NOTICE OF CONSULTATION
SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT OF 1966
AS AMENDED (2006)
SADDLE ROAD EXTENSION: FROM MĀMALAHOA HIGHWAY TO QUEEN KA'AHUMANU HIGHWAY, WAIKOLOA AND PU'UANAHULU AHUPUA'A, SOUTH KŌHALA AND NORTH KONA DISTRICTS, HAWAI'I ISLAND,
STATE OF HAWAI'I PROJECT NO. DO-HI-0200(5)
TAX MAP KEY: (3) 6-8-001:005, 066, 067;
6-8-002:013, AND 014, 015; 7-1-003:001

Notice is hereby given that the Federal Highway Administration and the State of Hawai'i Department of Transportation, Highways Division propose the construction of a road to improve cross-island transportation. The proposed Saddle Road Extension will link the newly realigned Saddle Road at the Māmalahoa Highway to the Queen Ka'ahumanu Highway at Waikoloa Beach Drive. The project will improve the efficiency and operational level of traffic movement between East Hawai'i and West Hawai'i in general, and will support the unique modal needs along this corridor, such as commercial and military transportation uses. The project involves grubbing, cutting, and grading to create a new road bed, the creation of shoulders, the construction of drainage culverts, widening of existing roadways at either end of the new road bed, and paving. The project will also involve regrassing/reinforcing any newly exposed cut slope to control erosion, providing best management practices during construction, and providing adequate traffic control to ensure motorists can safely pass during construction at either end of the new road. Three alternate 250-foot wide corridors were selected for study. The Area of Potential Effect (APE) for the three corridors includes 775 acres. Only one corridor will be selected for construction. The maximum length of the proposed road corridor, which traverses unimproved cattle pasture and open lava flows, is 10.7 miles.

The proposed project will utilize federal funding and will be considered a federal action and undertaking, as defined by Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended (2006). Therefore, the FHWA will require compliance with the NHPA and other federal requirements. We would like to invite you to participate in the Section 106 consultation for the proposed project in accordance with Title 36 of the Code of Federal Regulations, Section 800.3. Pursuant to Section 106 of the NHPA of 1966, as amended (2006), Native Hawaiian organizations and Native Hawaiian descendants with ancestral lineal or cultural ties to, cultural knowledge or concerns for, and cultural or religious attachment to the proposed project area are requested to contact Michael Will, Project Manager, via email at michael.will@dot.gov, or by US Postal Service to 12300 West Dakota Ave., Ste. 380, Lakewood, CO 80228.

Please respond within thirty (30) days of the publication of this notice.



SP.NO.: ____________________ L.N.

Honolulu Star-Advertiser Public Notice Affidavit of Publication.

Hawai'i Island,
STATE OF HAWAI'I
Project No. DO-HI-0200(5)
Tax Map Key: (3) 6-8-001:005, 066, 067;
6-8-002:013, AND 014, 015; 7-1-003:001

Notice is hereby given that the Federal Highway Administration and the State of Hawai'i Department of Transportation, Highways Division propose the construction of a road to improve cross-island transportation. The proposed Saddle Road Extension will link the newly realigned Saddle Road at the Māmalahoa Highway to the Queen Ka'ahumanu Highway at Waikoloa Beach Drive. The project will improve the efficiency and operational level of traffic movement between East Hawai'i and West Hawai'i in general, and will support the unique modal needs along this corridor, such as commercial and military transportation uses. The project involves grubbing, cutting, and grading to create a new road bed, the creation of shoulders, the construction of drainage culverts, widening of existing roadways at either end of the new road bed, and paving. The project will also involve regrassing/reinforcing any newly exposed cut slope to control erosion, providing best management practices during construction, and providing adequate traffic control to ensure motorists can safely pass during construction at either end of the new road. Three alternate 250-foot wide corridors were selected for study. The Area of Potential Effect (APE) for the three corridors includes 775 acres. Only one corridor will be selected for construction. The maximum length of the proposed road corridor, which traverses unimproved cattle pasture and open lava flows, is 10.7 miles.

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Please respond within thirty (30) days of the publication of this notice.

OHA Ka Wai Ola Public Notice (September 2014 Issue).

<u>APPENDIX B: CAVES LOCATED OUTSIDE OF PROJECT AREA</u>

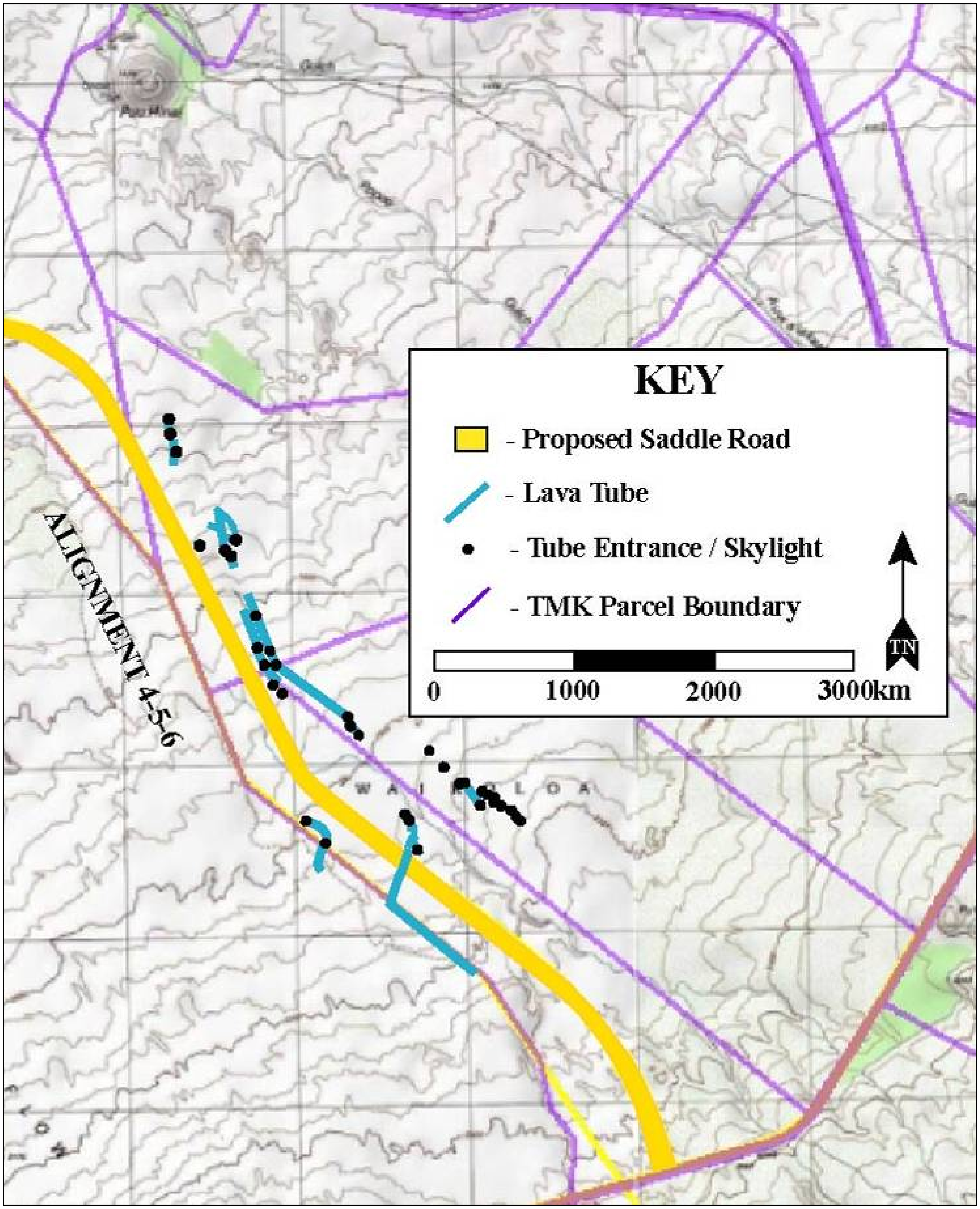


Figure 1: 7.5-Minute Series USGS Topographic Map Showing Location of TMK Parcels and Project Area (Anaehoʻomalu, Puʻu Hīnaʻi, Puʻu Anahulu, and Keʻāmuku Quads) (National Geographic Topo! 2003).

<u>APPENDIX C: RADIOCARBON DATES</u>

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-26.2:lab. mult=1)

Laboratory number: Beta-177296

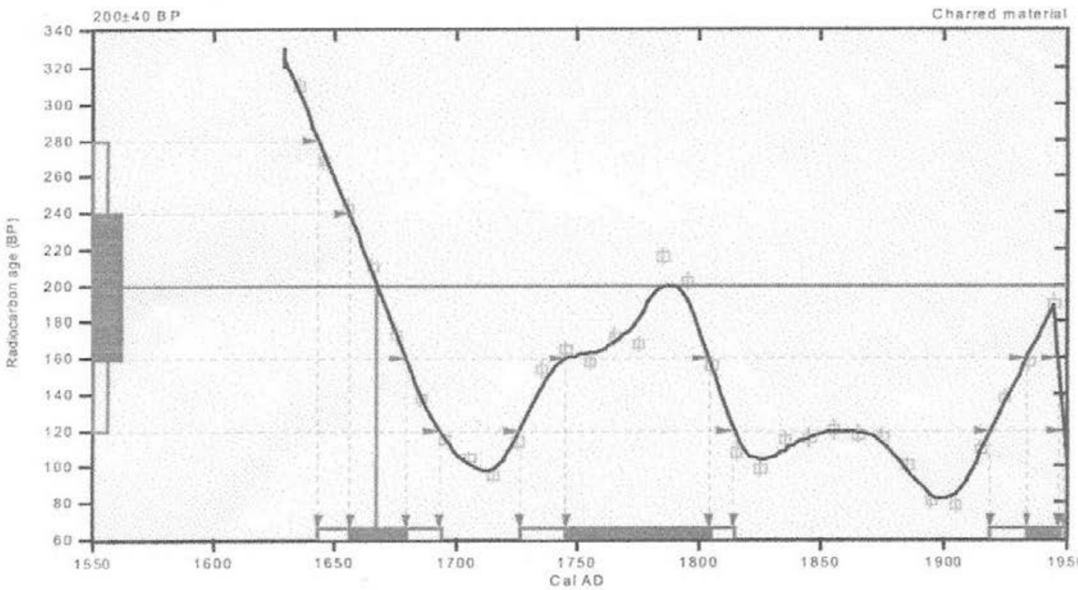
Conventional radiocarbon age: 200±40 BP

2 Sigma calibrated results: (95% probability) Cal AD 1640 to 1690 (Cal BP 310 to 260) and
Cal AD 1730 to 1810 (Cal BP 220 to 140) and
Cal AD 1920 to 1950 (Cal BP 30 to 0)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1670 (Cal BP 280)

1 Sigma calibrated results: (68% probability) Cal AD 1660 to 1680 (Cal BP 290 to 270) and
Cal AD 1740 to 1800 (Cal BP 200 to 150) and
Cal AD 1930 to 1950 (Cal BP 20 to 0)



References:

Database used

Calibration Database
Editorial Comment
Stuiver, M., van der Plicht, H., 1998, Radiocarbon 40(3), pxii-xiii
INTCAL98 Radiocarbon Age Calibration
Stuiver, M., et. al., 1998, Radiocarbon 40(3), p1041-1083
Mathematics
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Beta Analytic Inc.

4985 SW 74 Court, Miami, Florida 33155 USA • Tel: (305) 667 5167 • Fax: (305) 663 0964 • E-Mail: beta@radiocarbon.com

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.3:lab. mult=1)

Laboratory number: Beta-177297

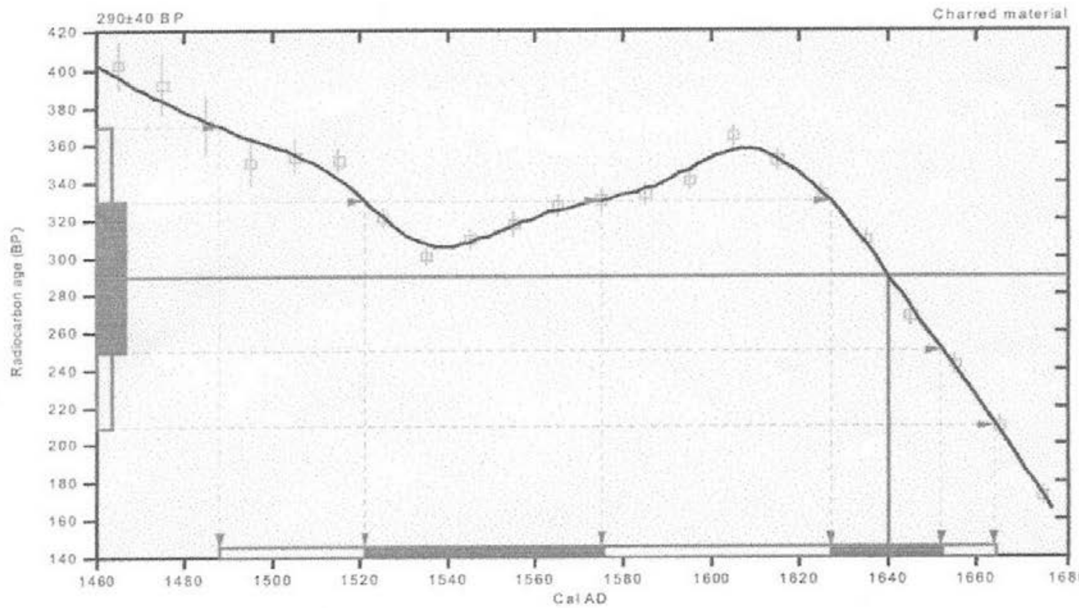
Conventional radiocarbon age: 290±40 BP

2 Sigma calibrated result: (95% probability) Cal AD 1490 to 1660 (Cal BP 460 to 290)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1640 (Cal BP 310)

1 Sigma calibrated results: (68% probability) Cal AD 1520 to 1580 (Cal BP 430 to 380) and Cal AD 1630 to 1650 (Cal BP 320 to 300)



References:

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Mathematics
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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.8:lab. mult=1)

Laboratory number: **Beta-177298**

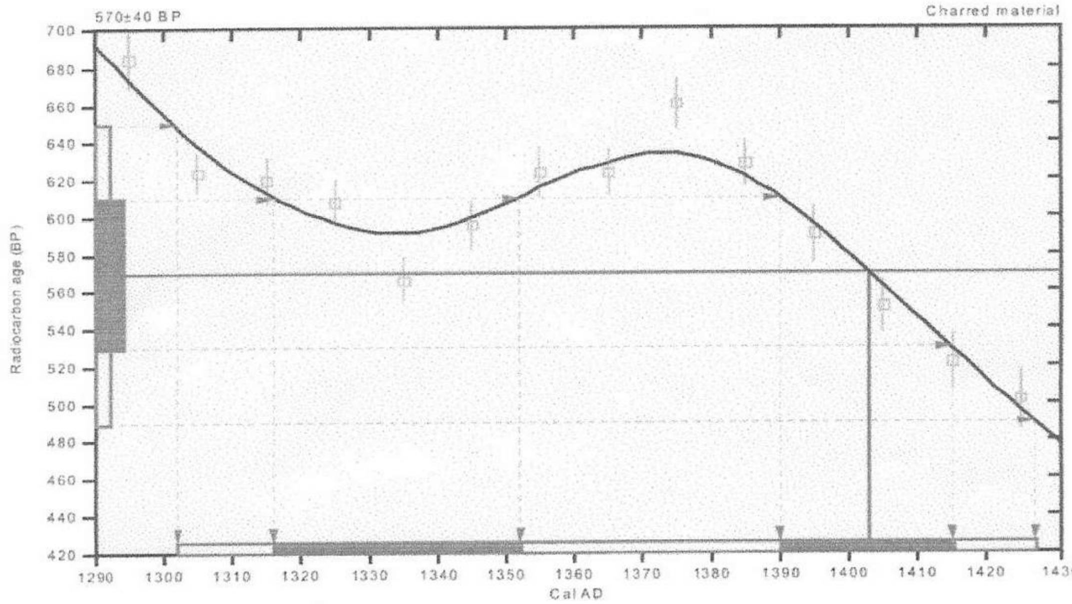
Conventional radiocarbon age: **570±40 BP**

2 Sigma calibrated result: **Cal AD 1300 to 1430 (Cal BP 650 to 520)**
(95% probability)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1400 (Cal BP 550)

1 Sigma calibrated results: Cal AD 1320 to 1350 (Cal BP 630 to 600) and
(68% probability) Cal AD 1390 to 1420 (Cal BP 560 to 540)



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Calibration Database
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APPENDIX D: ADDITIONAL SITE PHOTOGRAPHS

SITE 24467

Figure 2: Photograph of Site 24467 Feature 1 Looking East.

Figure 3: Photograph of Site 24467 Feature 1 Looking West.

Figure 4: Photograph of Site 24467 Feature 2 Looking Northeast.

Figure 5: Photograph of Site 24467 Feature 2 Looking West.

Figure 6: Photograph of Site 24467 Feature 3 Looking West.

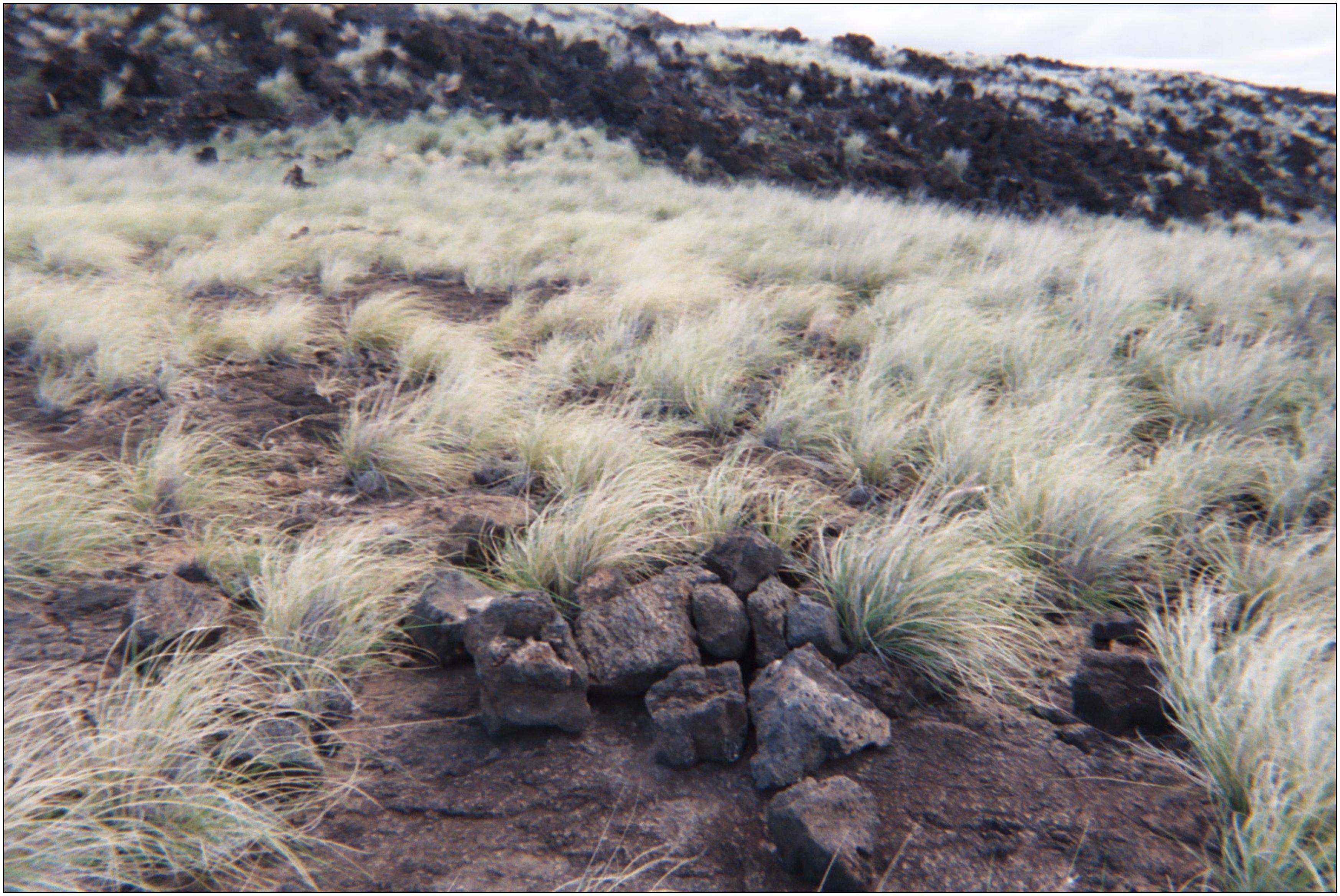

Figure 7: Photograph of Site 24467 Feature 3 Looking South.

SITE 24470

Figure 8: Photograph of Site 24470 Refuge Cave Entrance Looking North.

Figure 9: Photograph of Site 24470 Refuge Cave Entrance Looking North.

Figure 10: Photograph of Site 24470 Refuge Cave Entrance Looking North.

Figure 11: Photograph of Site 24470 Refuge Cave Entrance Showing Rock Steps Into Lava Tube, Looking North Down Into Cave.

Figure 12: Photograph of Site 24470 Interior Floor of Refuge Cave Entrance Looking North.

Figure 13: Photograph of Site 24470 Refuge Cave Western Opening Skylight Looking Northeast.

Figure 14: Photograph of Site 24470 Refuge Cave Western Opening Skylight Looking North.

Figure 15: Photograph of Site 24470 Feature M Looking Northwest.

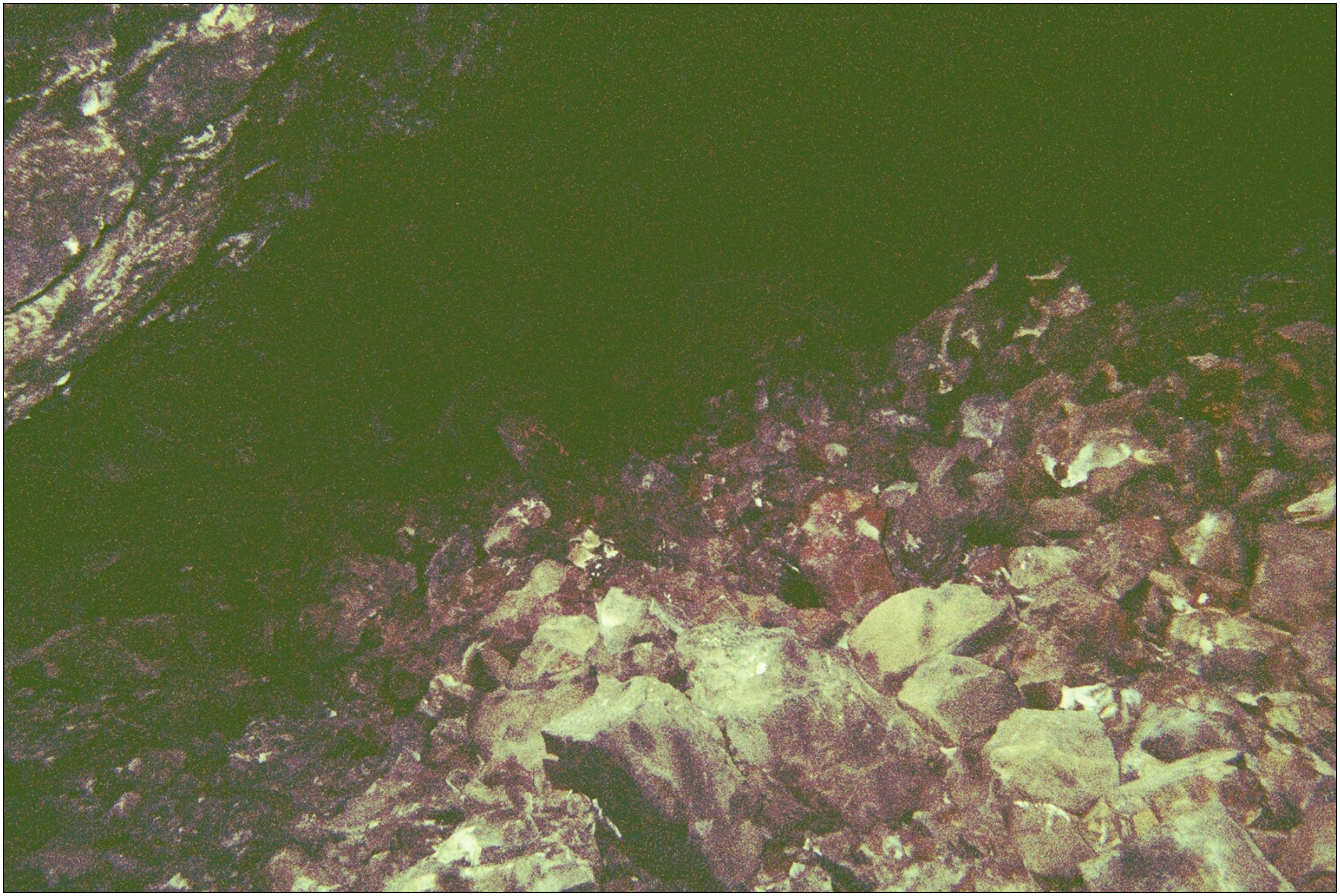

Figure 16: Photograph of Site 24470 Feature N Looking Northwest.

Figure 17: Photograph of Site 24470 Feature O Looking Northwest.

Figure 18: Photograph of Site 24470 Feature P Looking Northeast.

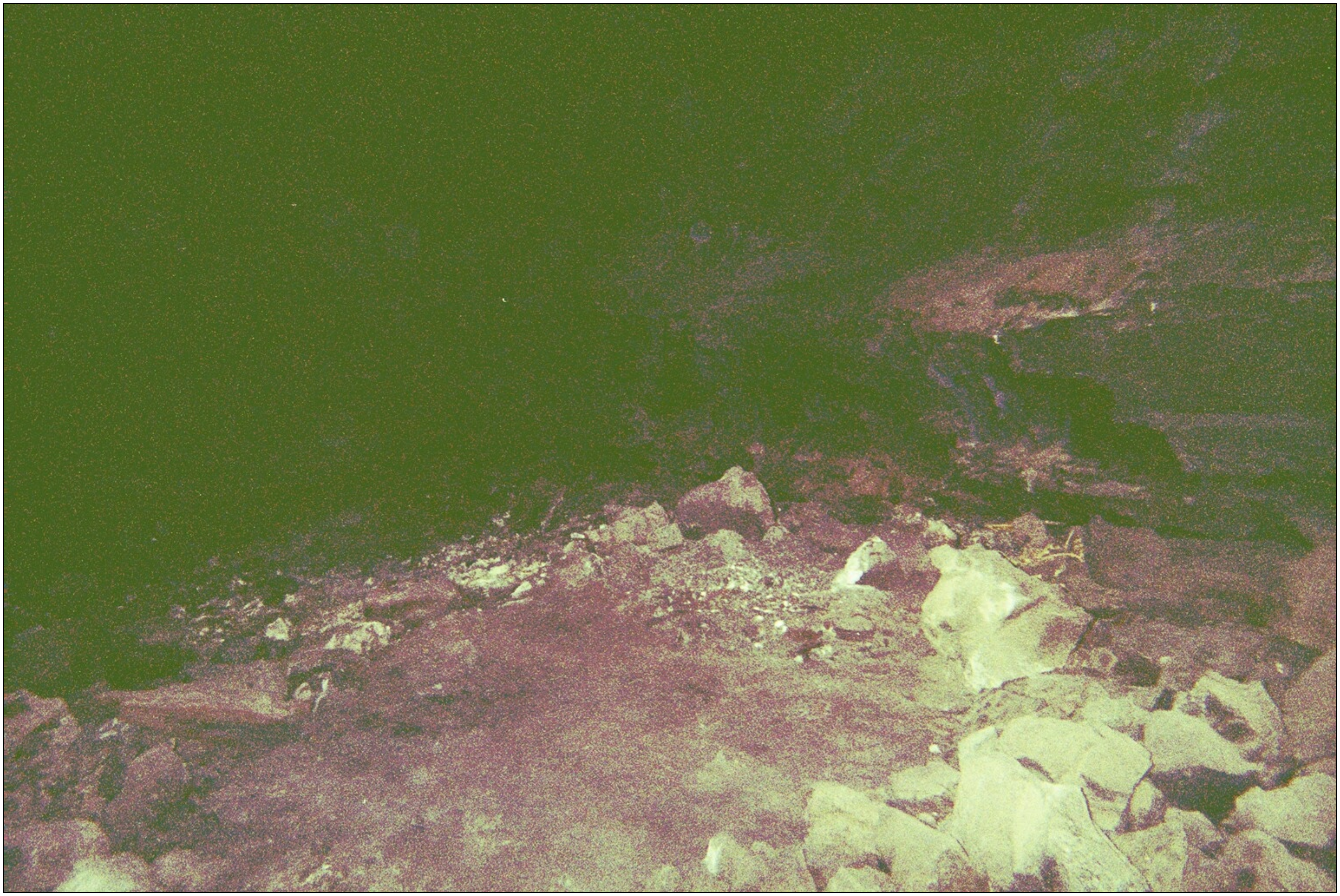

Figure 19: Photograph of Site 24470 Feature S Looking North.

Figure 20: Photograph of Site 24470 Feature T Looking East.

Figure 21: Photograph of Site 24470 Feature T Looking North.

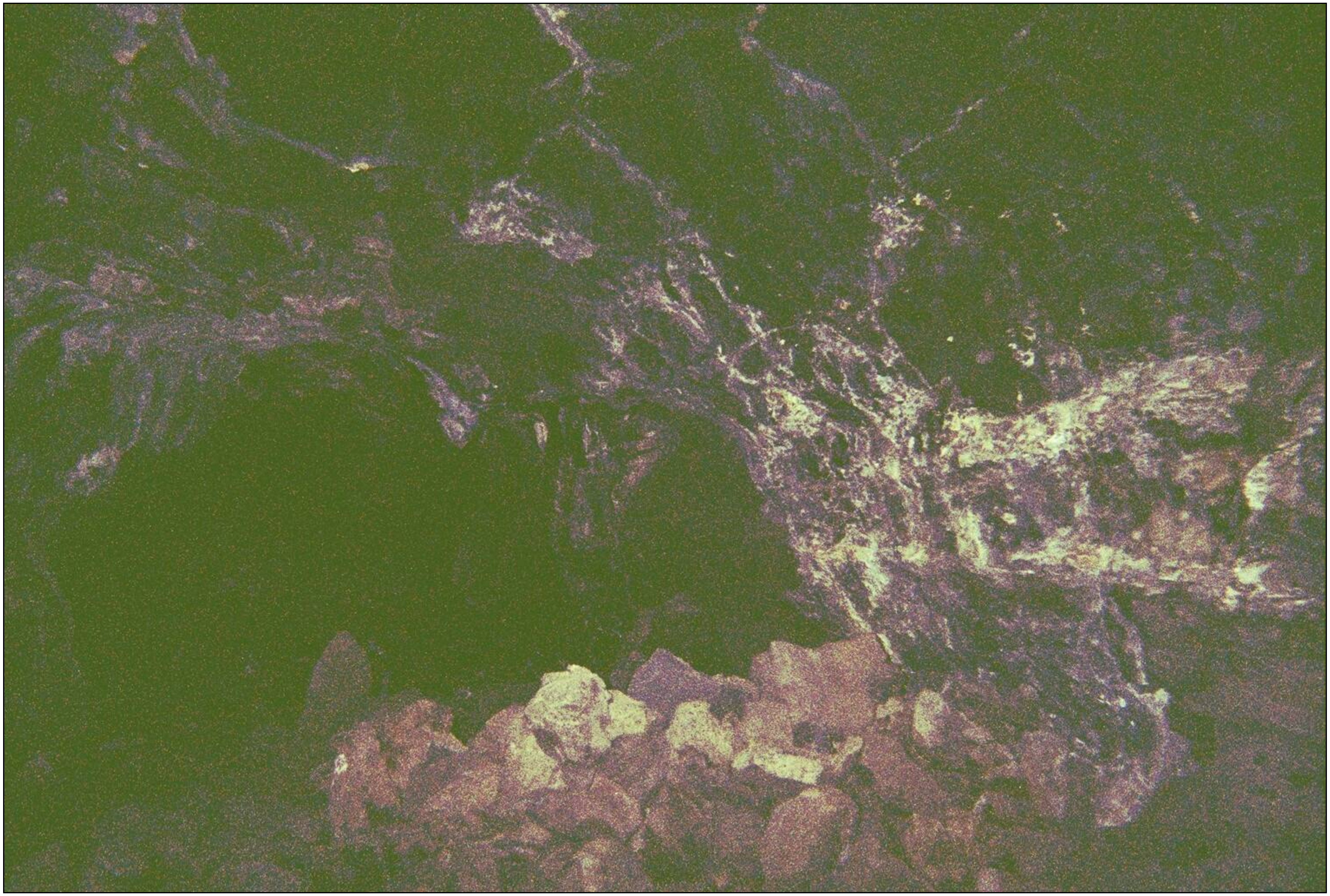

Figure 22: Photograph of Site 24470 Feature T Looking Northwest.

Figure 23: Photograph of Site 24470 Feature U Looking Northeast.

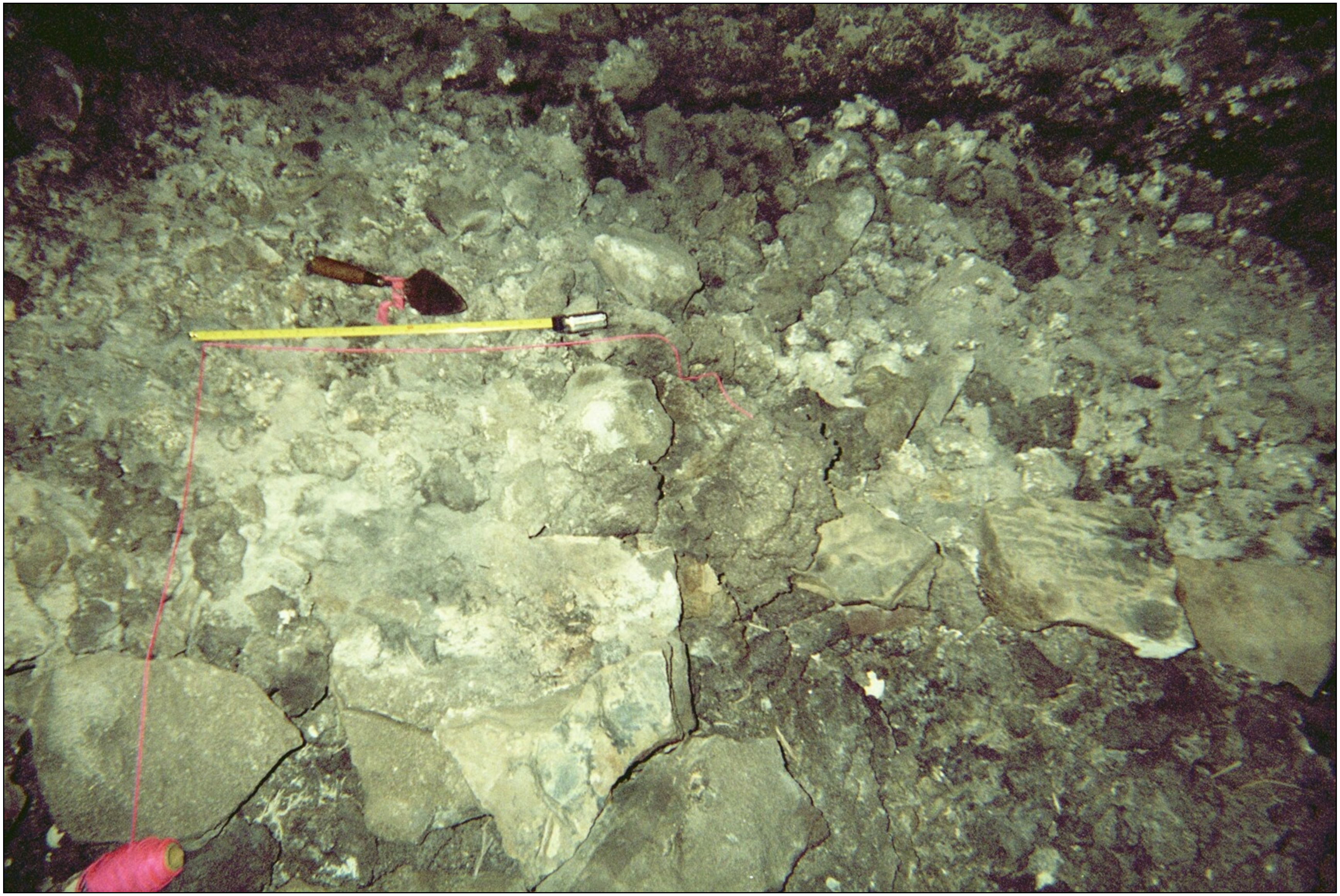

Figure 24: Photograph of Site 24470 Refuge Cave TU-1 Pre-Excavation Looking Southwest.

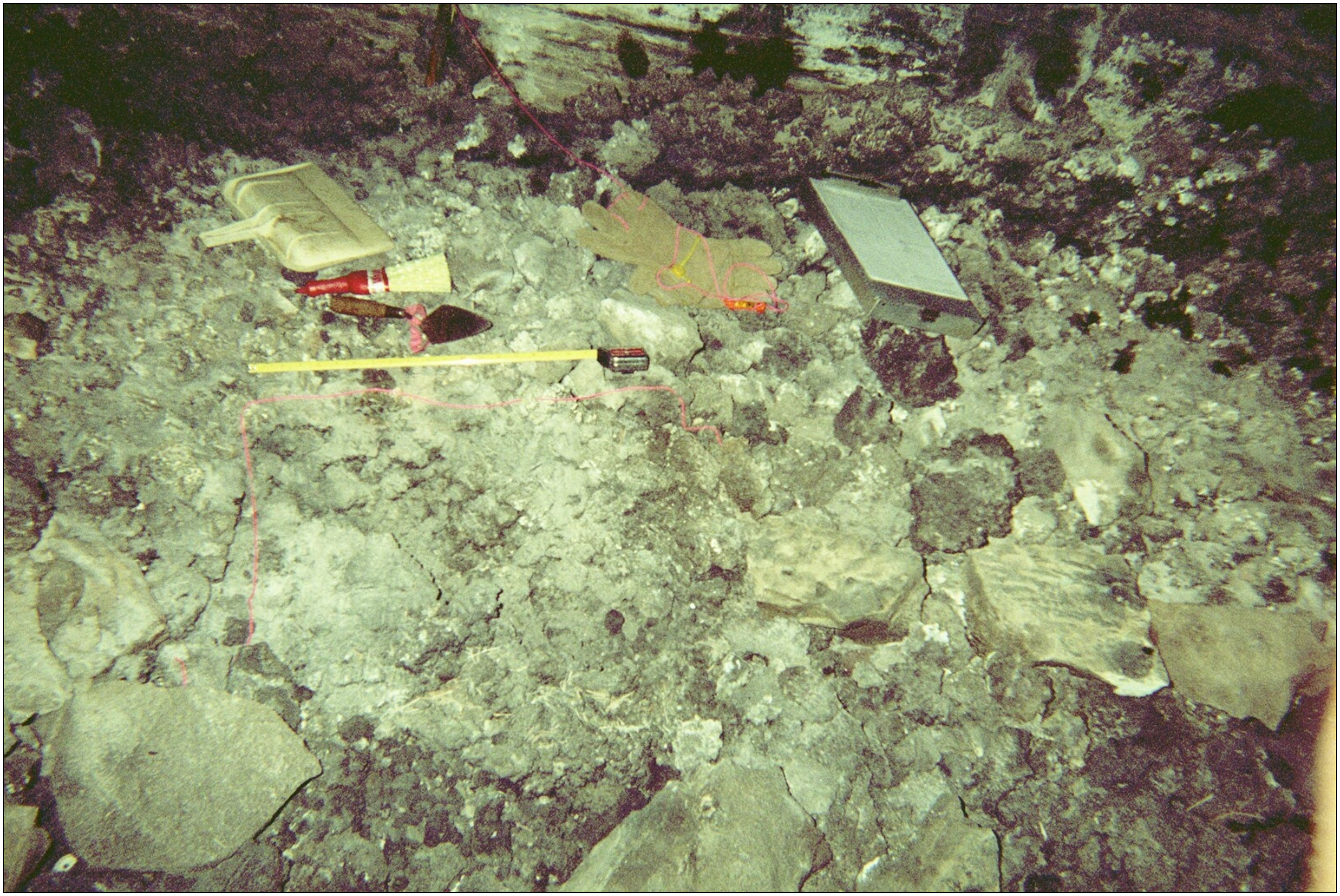

Figure 25: Photograph of Site 24470 Refuge Cave TU-1 Pre-Excavation Looking Southwest.

Figure 26: Photograph of Site 24470 Refuge Cave TU-2 Pre-Excavation Looking South.

Figure 27: Photograph of Site 24470 Refuge Cave TU-2 Post-Excavation Looking South.

SITE 24472

Figure 28: Photograph of Site 24472 Looking East.

SITE 24473

Figure 29: Photograph of Site 24473 Pāhoehoe Excavation Looking Northeast.

Figure 30: Photograph of Site 24473 Pāhoehoe Excavation Looking North.

Figure 31: Photograph of Site 24473 Pāhoehoe Excavation Looking South.

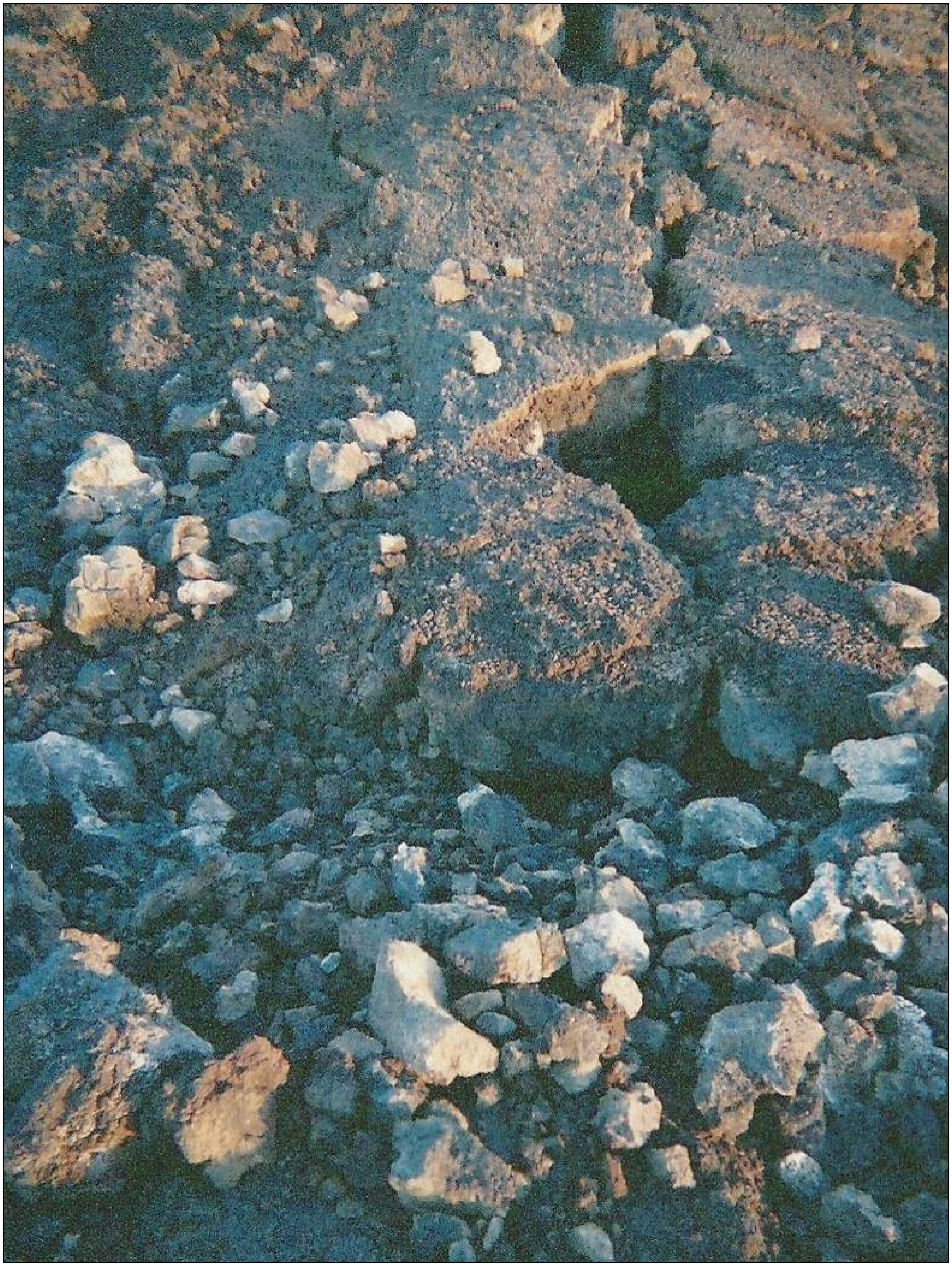

Figure 32: Photograph of Site 24473 Pāhoehoe Excavation Looking South.

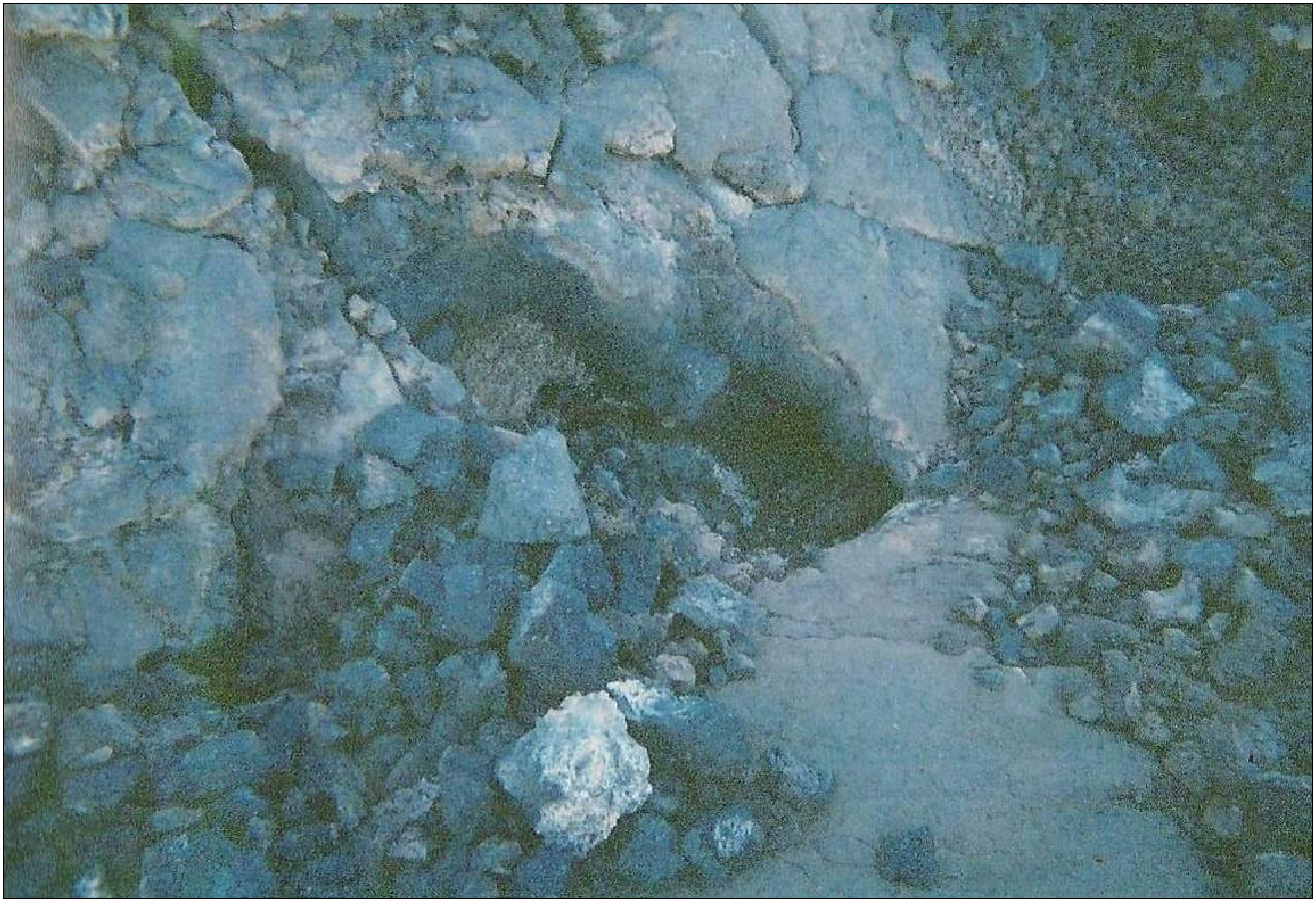

Figure 33: Photograph of Site 24473 Pāhoehoe Excavation Looking East.

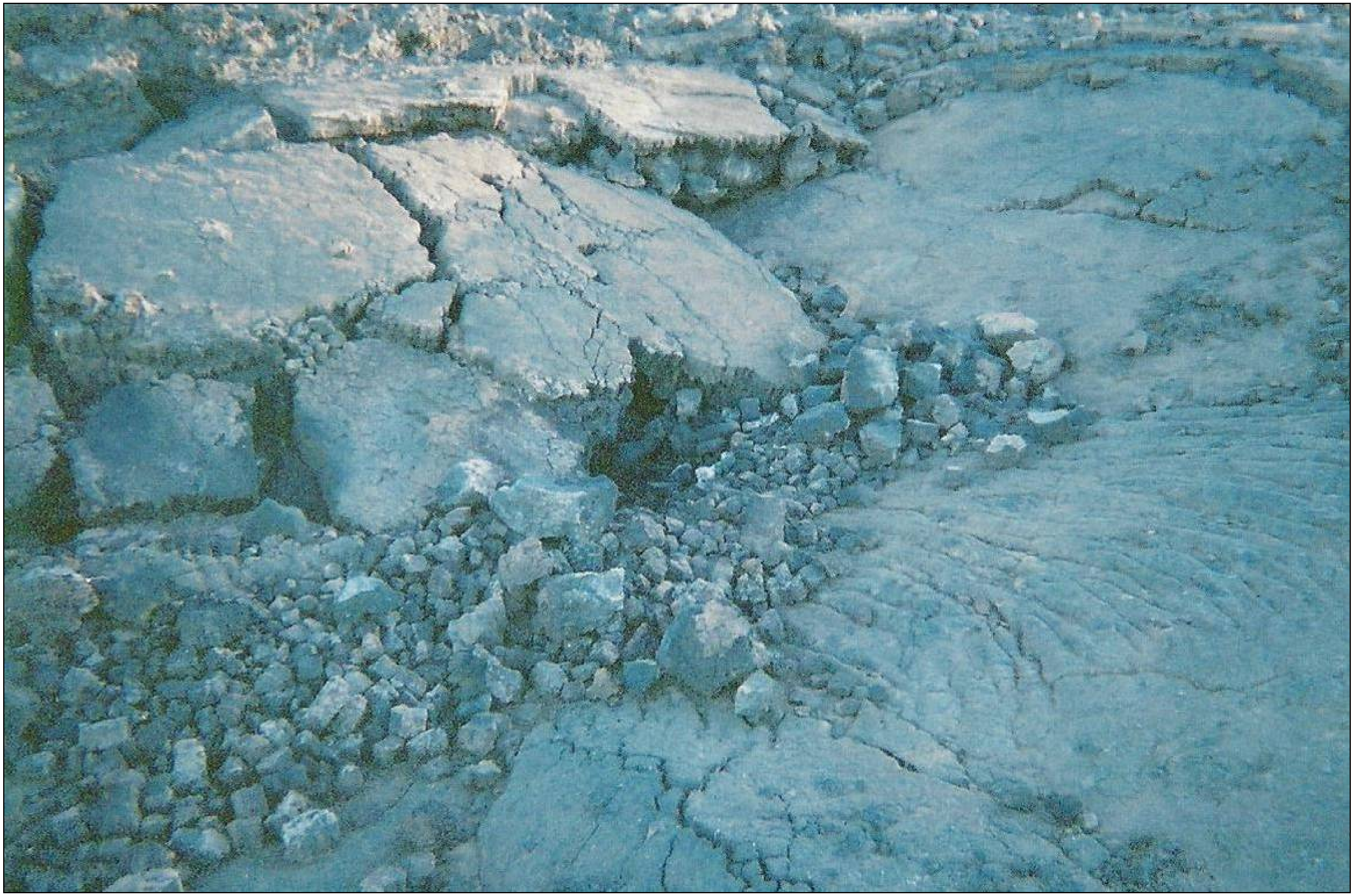

Figure 34: Photograph of Site 24473 Pāhoehoe Excavation Looking South.

Figure 35: Photograph of Site 24473 Pāhoehoe Excavation Looking Southeast.

SITE 24474

Figure 36: Photograph of Site 24474 Overview Looking West.

Figure 37: Photograph of Site 24474 Feature 1 Looking Northwest.

Figure 38: Photograph of Site 24474 Feature 2 Looking West.

Figure 39: Photograph of Site 24474 Feature 3 Looking North.

Figure 40: Photograph of Site 24474 Feature 4 Looking East.

Figure 41: Photograph of Site 24474 Feature 5 Looking East.

Figure 42: Photograph of Site 24474 Feature 6 Looking South.

SITE 24475

Figure 43: Photograph of Site 24475 Looking South.

SITE 24478

Figure 44: Photograph of Site 24478 Lava Tube Entrance Looking North.

Figure 45: Photograph of Site 24478 Rock Alignment Near Lava Tube Entrance, Looking South.

Figure 46: Photograph of Site 24478 *Ahu* Looking North.

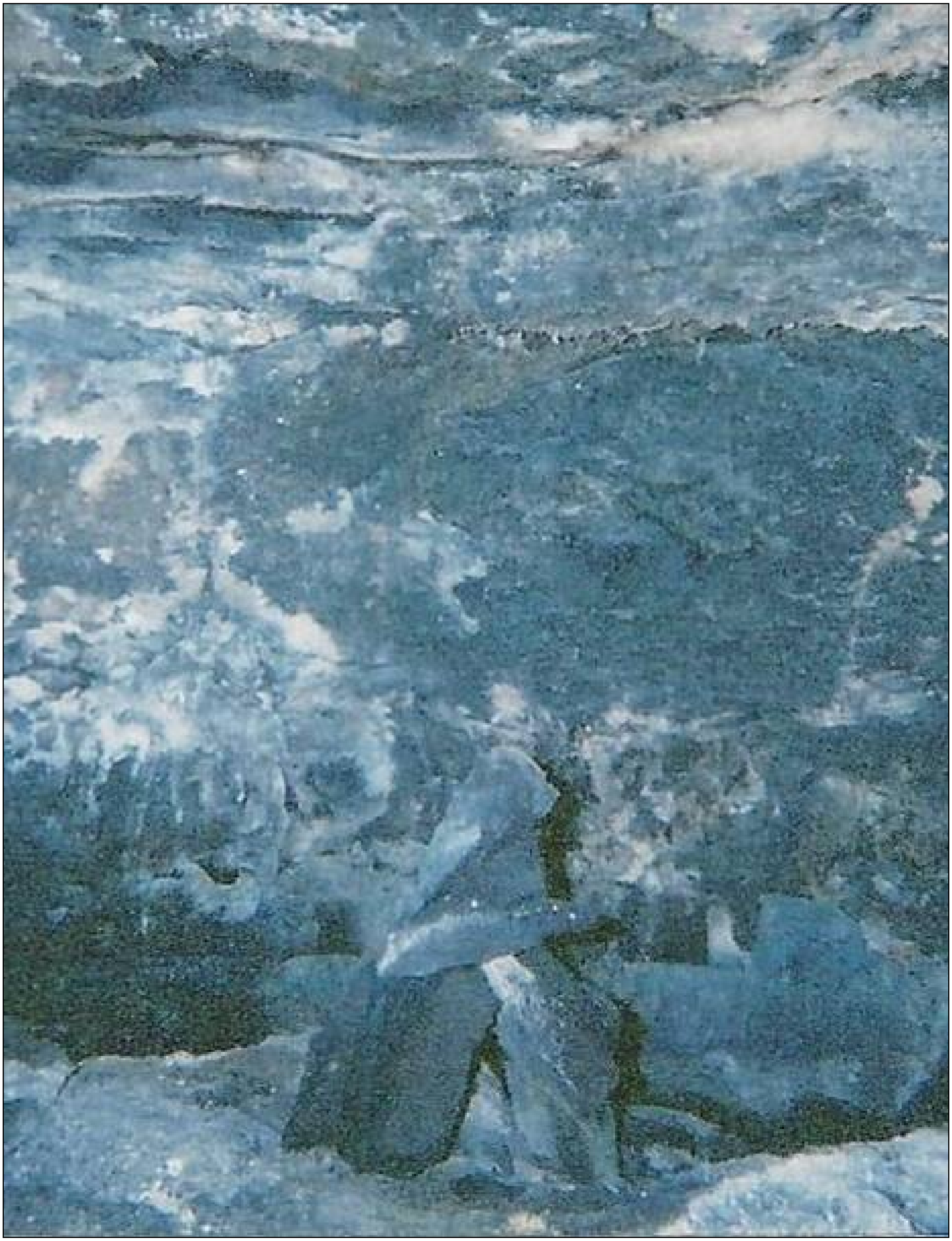

Figure 46: Photograph of Site 24478 *Ahu* Looking North.

SITE 24483

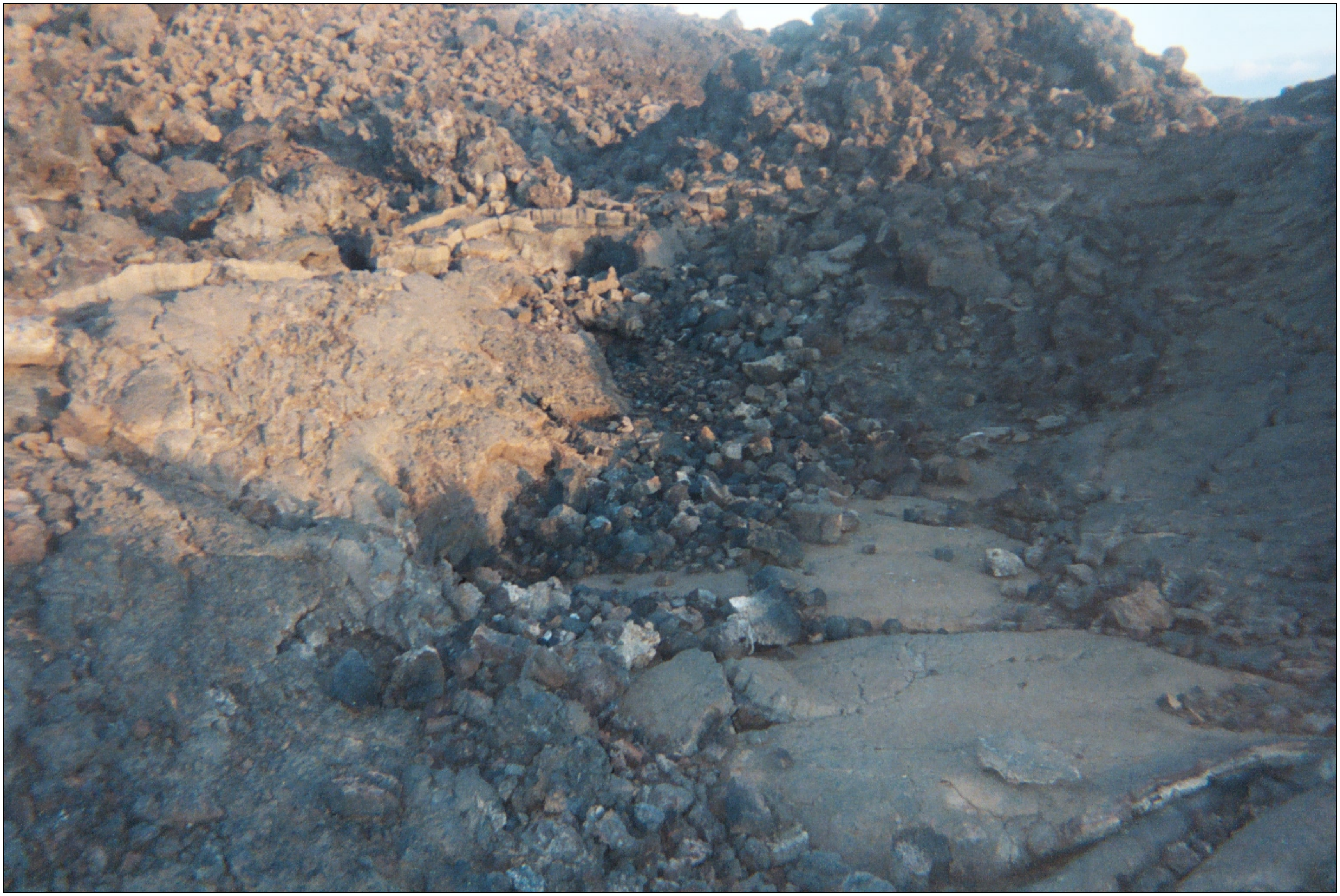

Figure 47: Photograph of Site 24483 Feature 1 Looking Southeast.

Figure 48: Photograph of Site 24483 Feature 3 Looking Southeast.

SITE 24484

Figure 49: Photograph of Site 24484 Ridge Quarry Looking Southwest.


Figure 50: Photograph of Site 24484 Ridge Quarry Looking Northwest.

Figure 51: Photograph of Site 24484 Ridge Quarry Looking Northwest.

Figure 52: Photograph of Site 24484 Ridge Quarry Looking Northeast.

SITE 24486

Figure 53: Photograph of Site 24486 Cache Cave Entrance Looking Northeast.

Figure 54: Photograph of Site 24486 Cache Cave Entrance Looking Southeast.

Figure 55: Photograph of Site 24486 Artifact Cache Looking Southeast.

Figure 56: Photograph of Site 24486 Artifact Cache Looking Southeast.

Figure 57: Photograph of Site 24486 Artifact Cache Looking Southeast.

Figure 58: Photograph of Site 24486 West Tube Entrance Looking West.

Figure 59: Photograph of Site 24486 West Tube Floor Showing Burnt Plant Material, Looking West.

Figure 60: Photograph of Site 24486 West Tube Floor Close-Up Showing Burnt Plant Material, Looking Northwest.

Figure 61: Photograph of Site 24486 West Tube Floor Close-Up Showing Burnt Plant Material, Looking West.

SITE 24494

Figure 62: Photograph of Site 24494 *Ahu* Looking Northeast.

SITE 24511

Figure 63: Photograph of Site 24511Abrader Basins Looking Northeast.

Figure 64: Photograph of Site 24511Abrader Basin Looking Southeast.

Figure 65: Photograph of Site 24511Abrader Basins Looking Southeast.

Figure 66: Photograph of Site 24511Abrader Basins Looking East.

Figure 67: Photograph of Site 24511Abrader Basins Looking Northeast.

Figure 68: Photograph of Site 24511Abrader Basin Looking West.

APPENDIX E: SITE 16 AND SITE 24470 CAVE MAPS

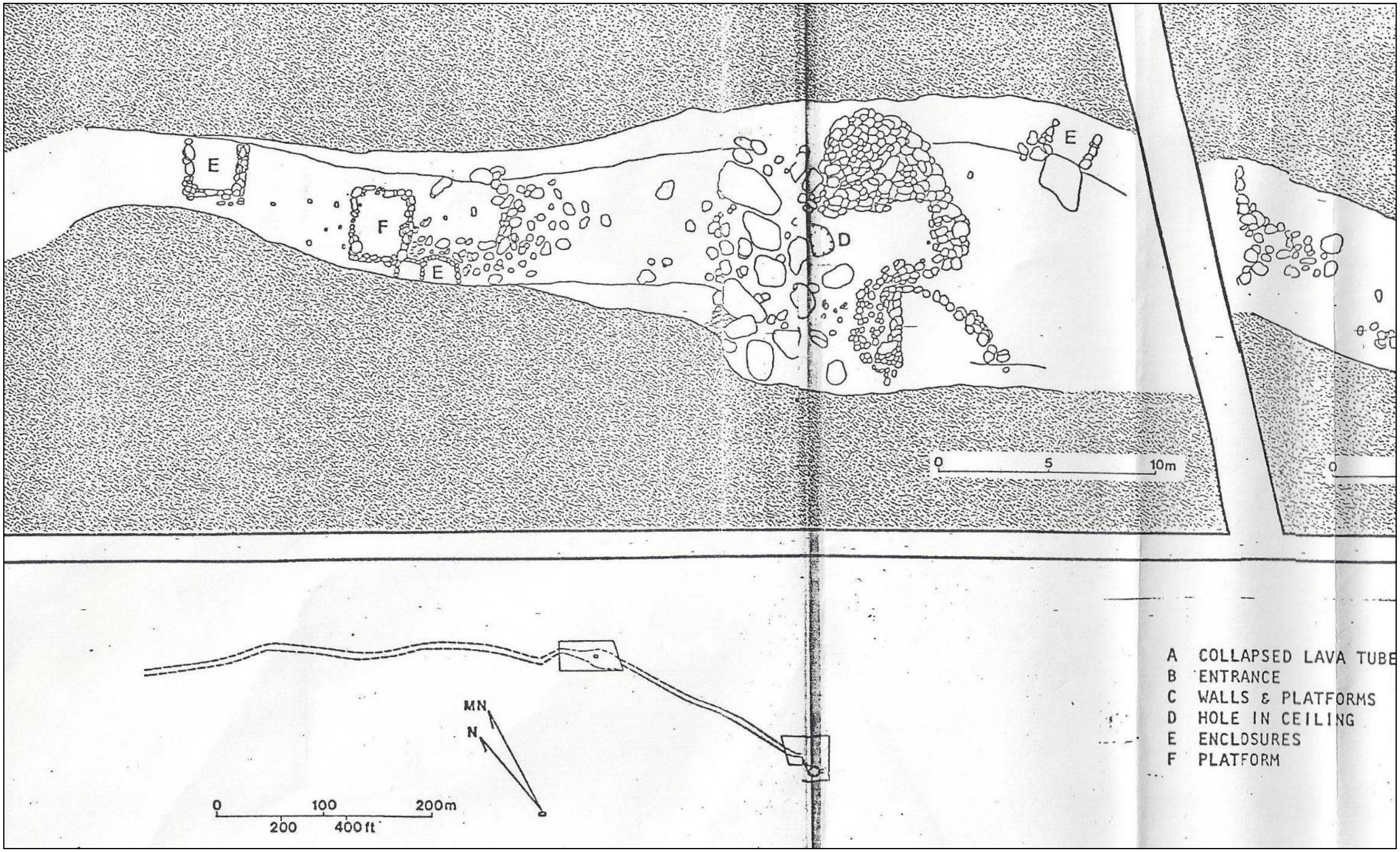

Figure 69: Site 16 Planview Map Showing Cultural Features Under Skylight (Bevacqua 1972, Figure 7 portion).

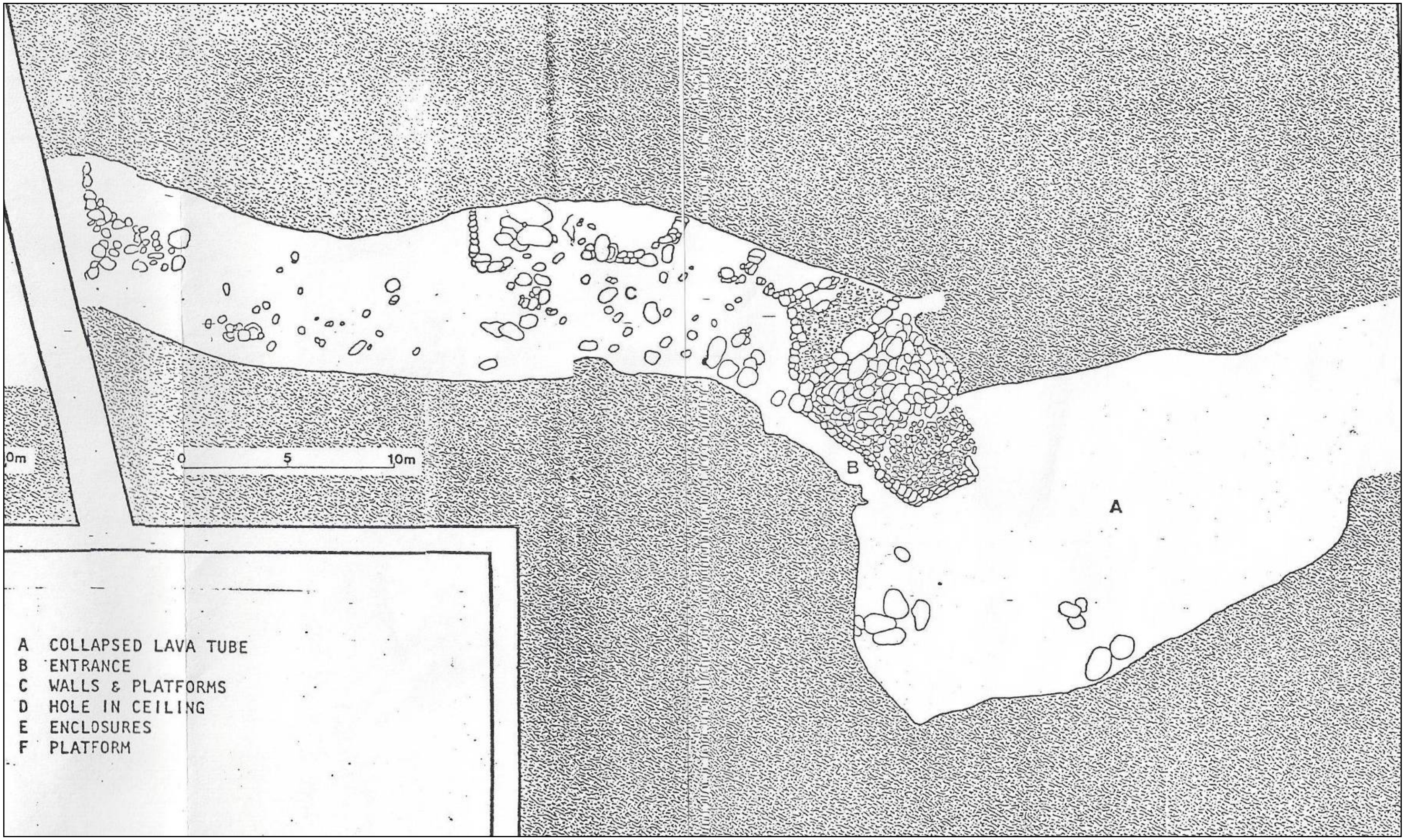

Figure 70: Site 16 Planview Map Showing Cultural Features at Tube Entrance (Bevacqua 1972, Figure 7 portion).

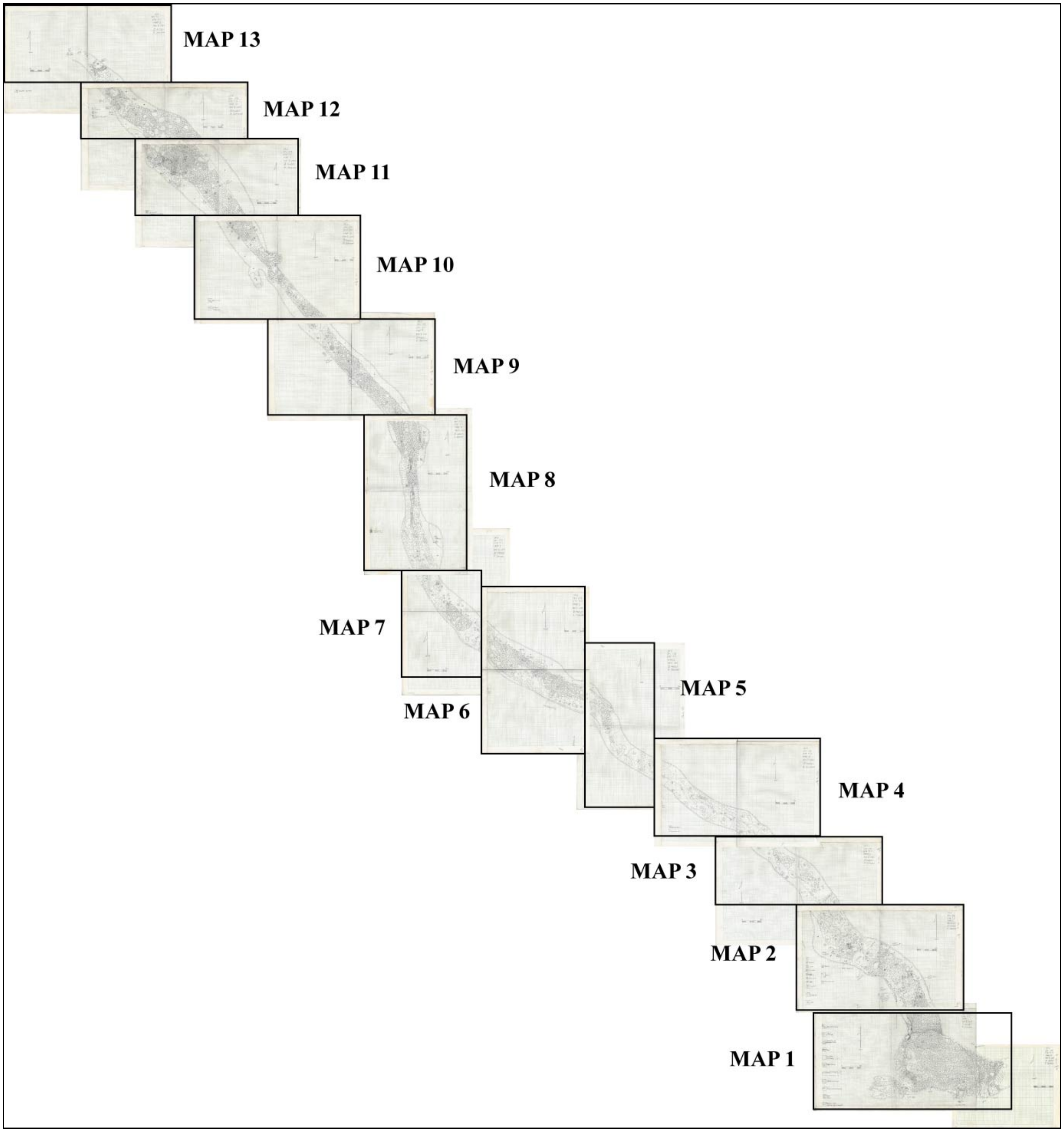

Figure 71: Site 24470 Diagram of Individual Cave Maps Shown Below.

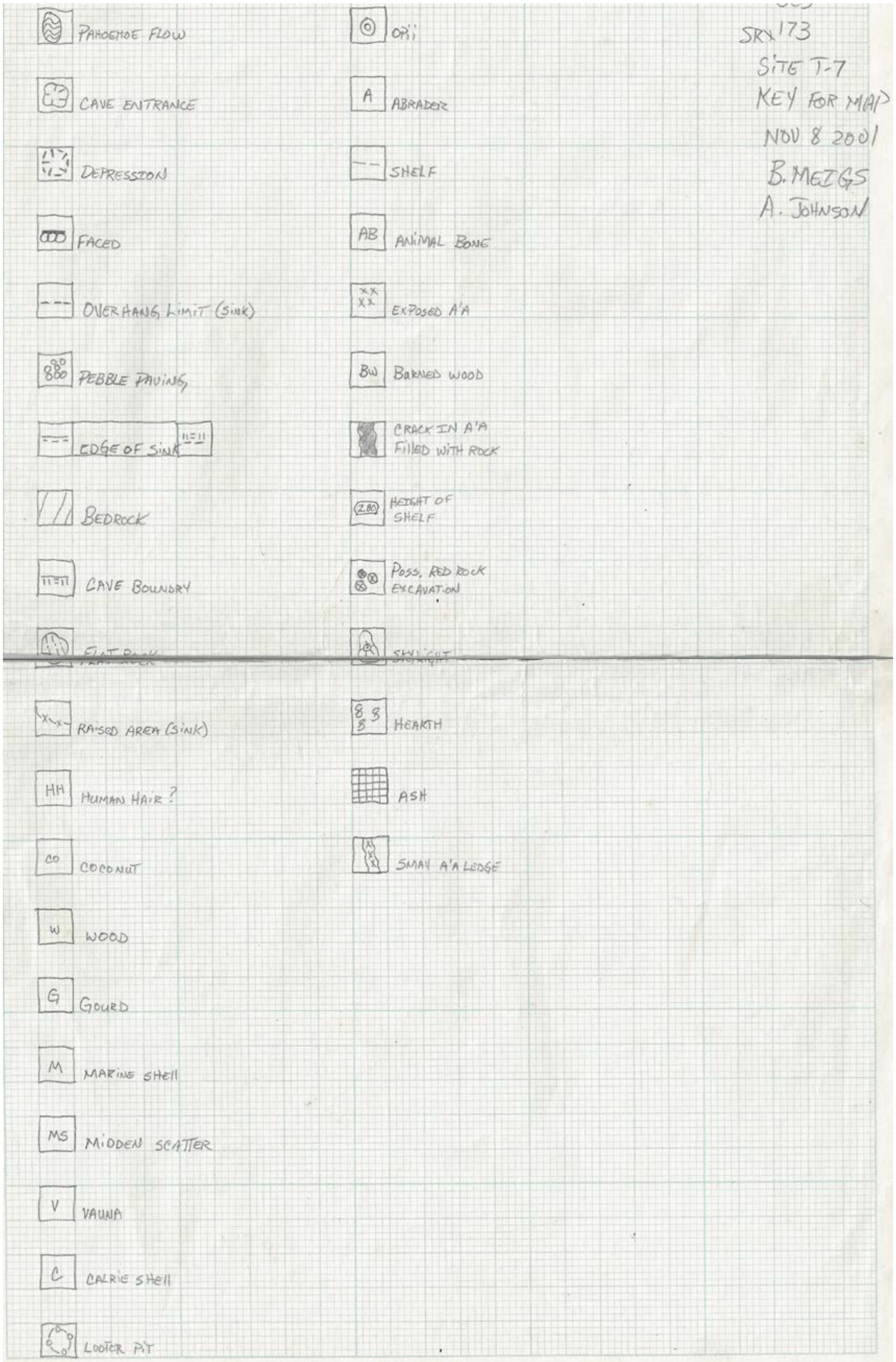

Figure 72: Site 24470 Cave Maps Key.

Figure 73: Site 24470 Cave Map 1.

Figure 74: Site 24470 Cave Map 2.

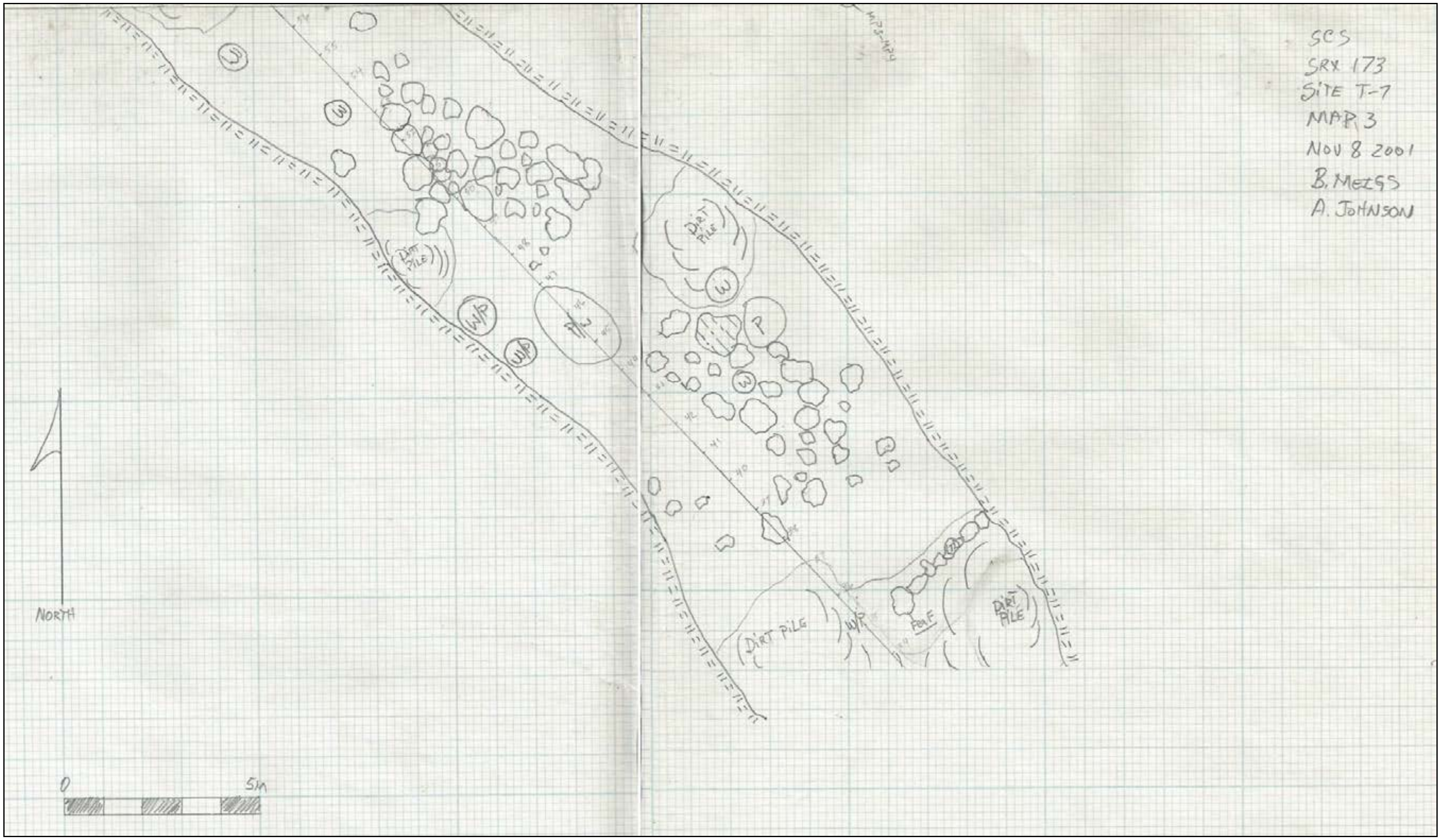

Figure 75: Site 24470 Cave Map 3.

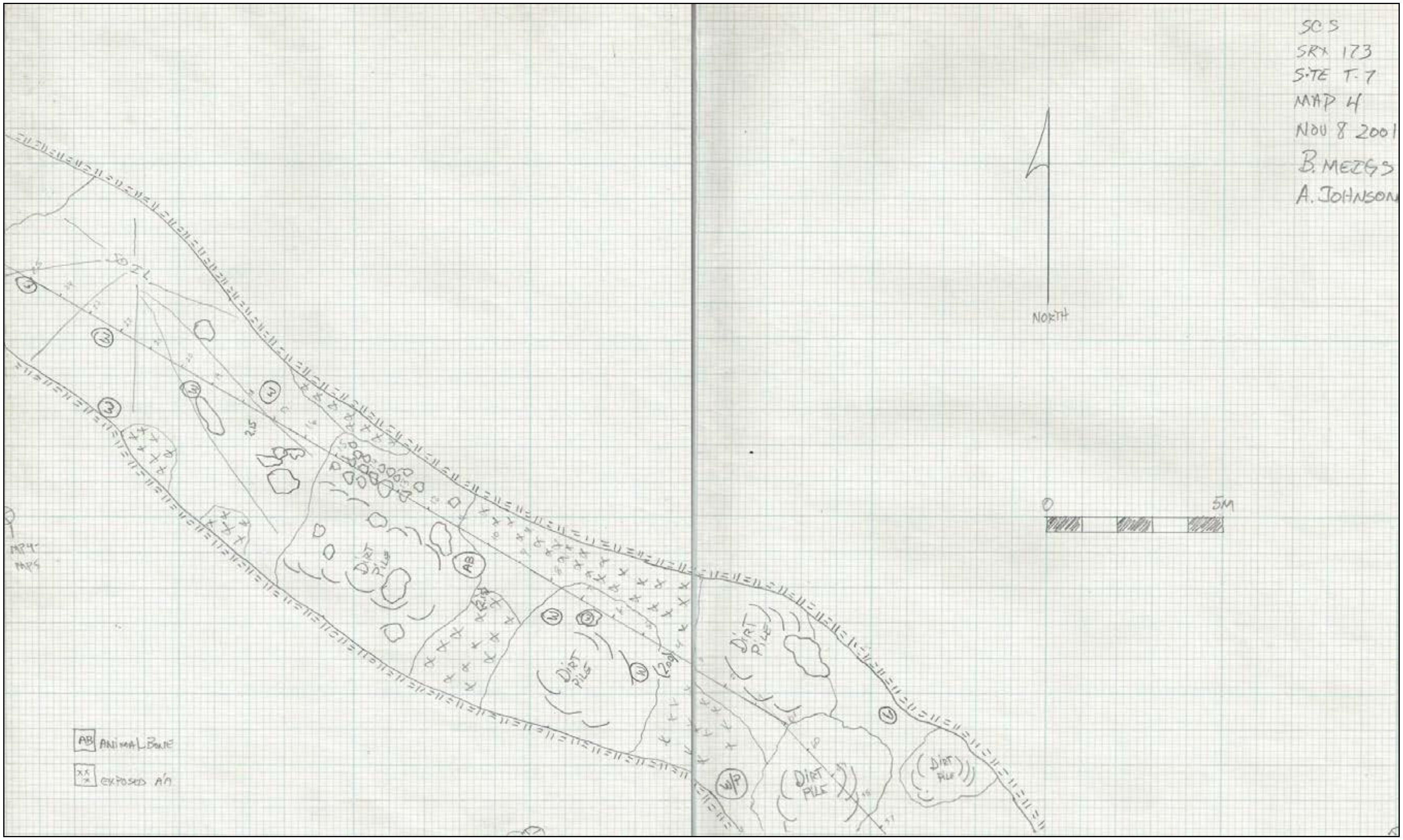

Figure 76: Site 24470 Cave Map 4.

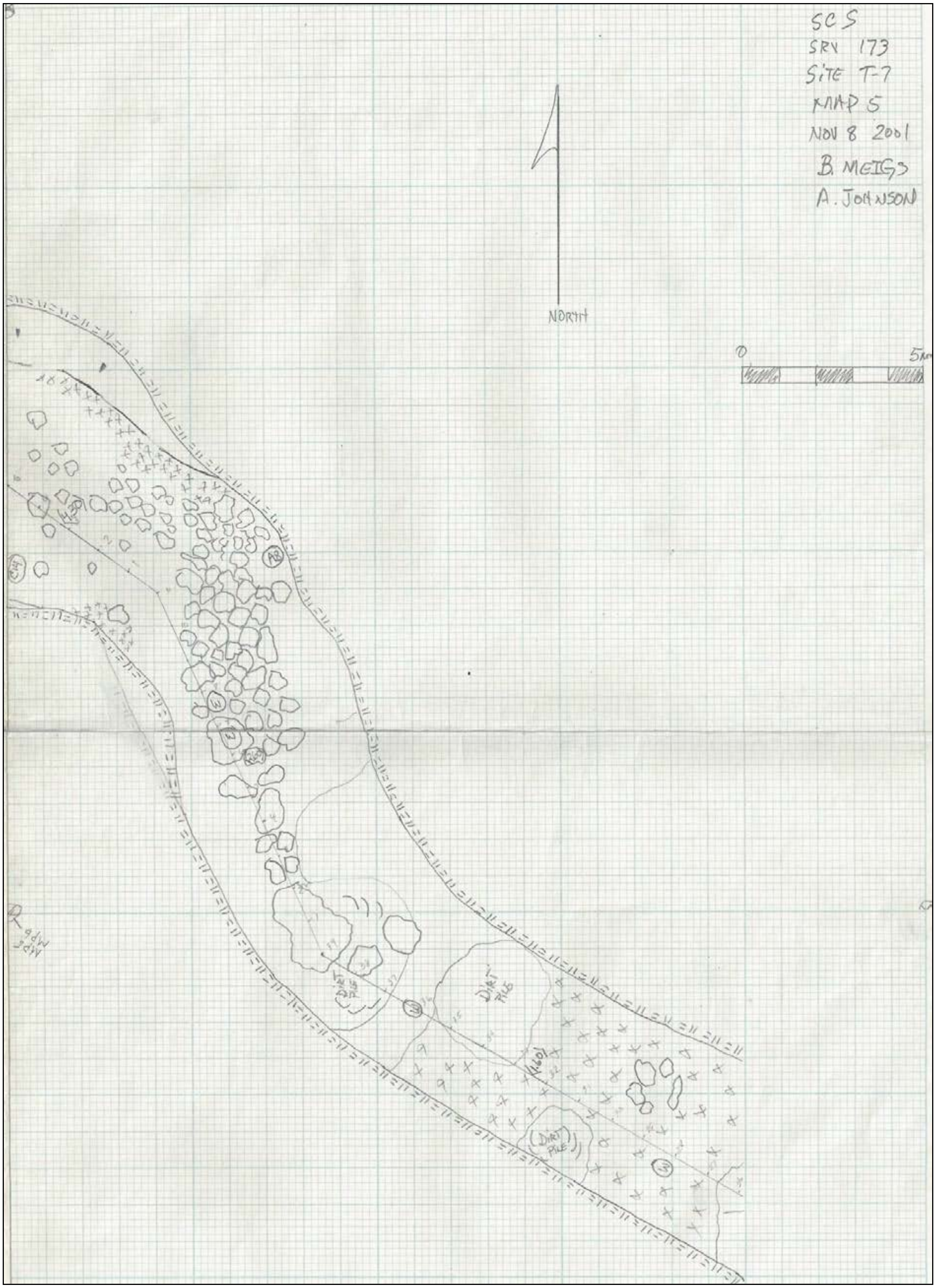

Figure 77: Site 24470 Cave Map 5.

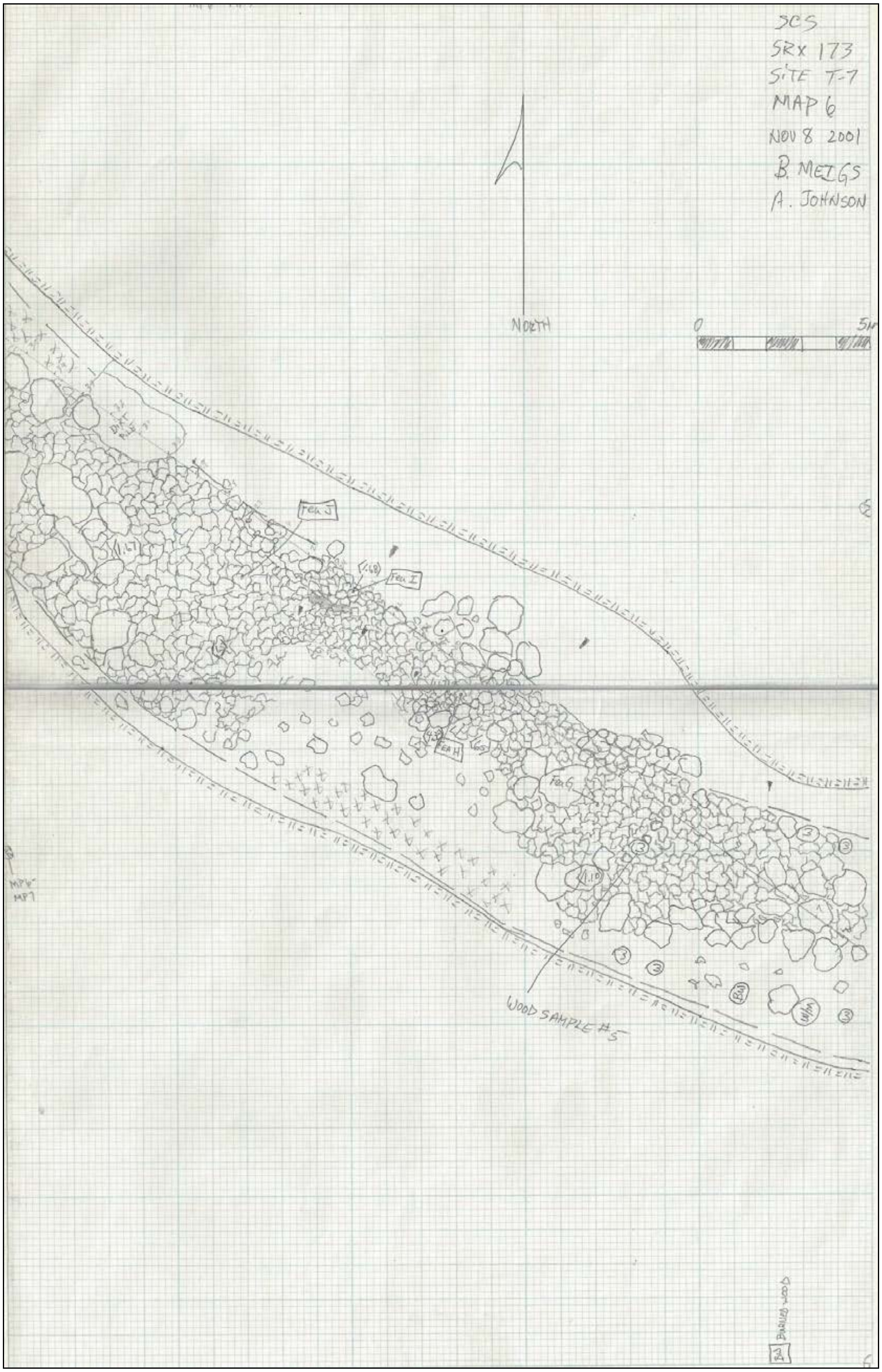

Figure 78: Site 24470 Cave Map 6.

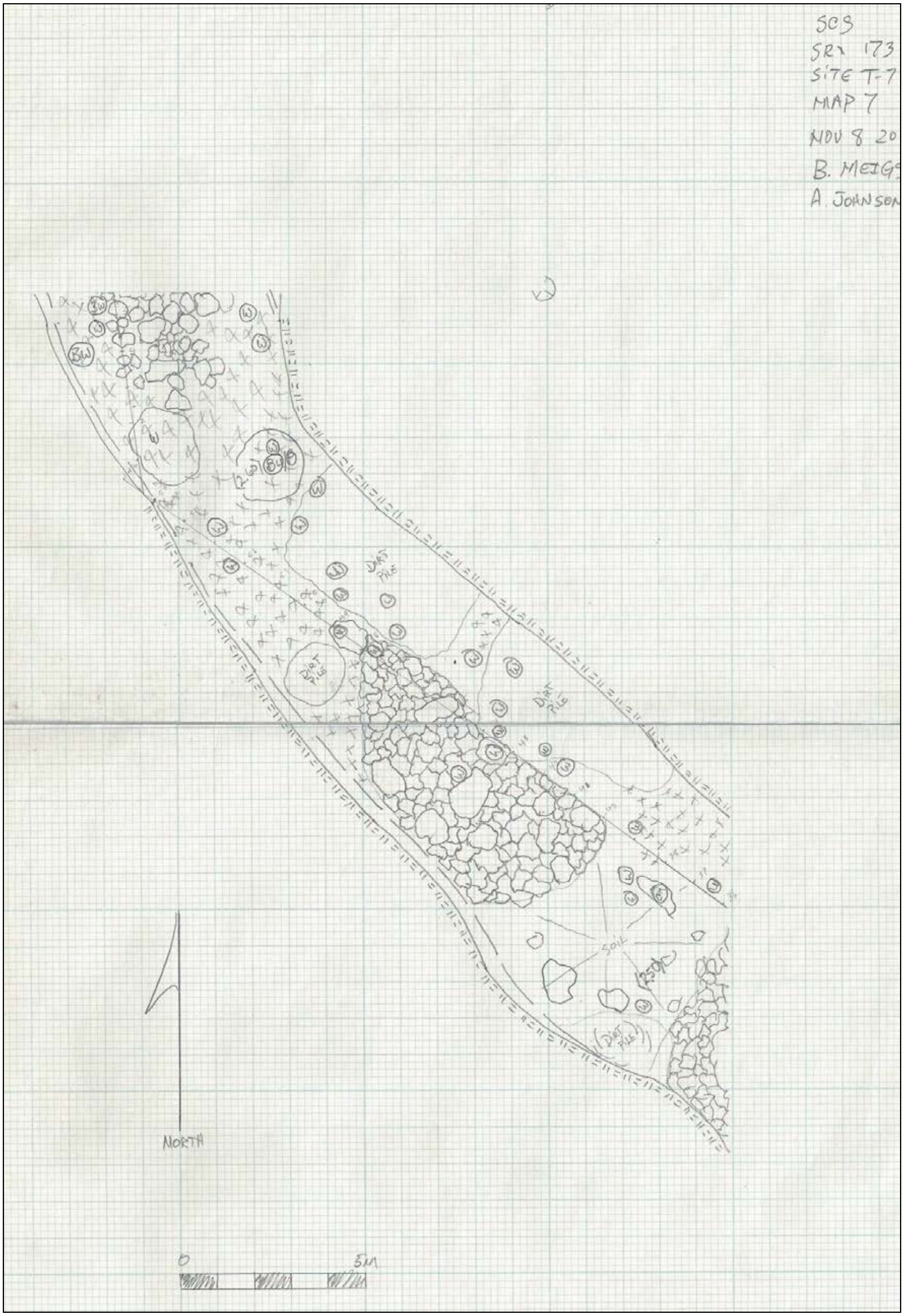

Figure 79: Site 24470 Cave Map 7.

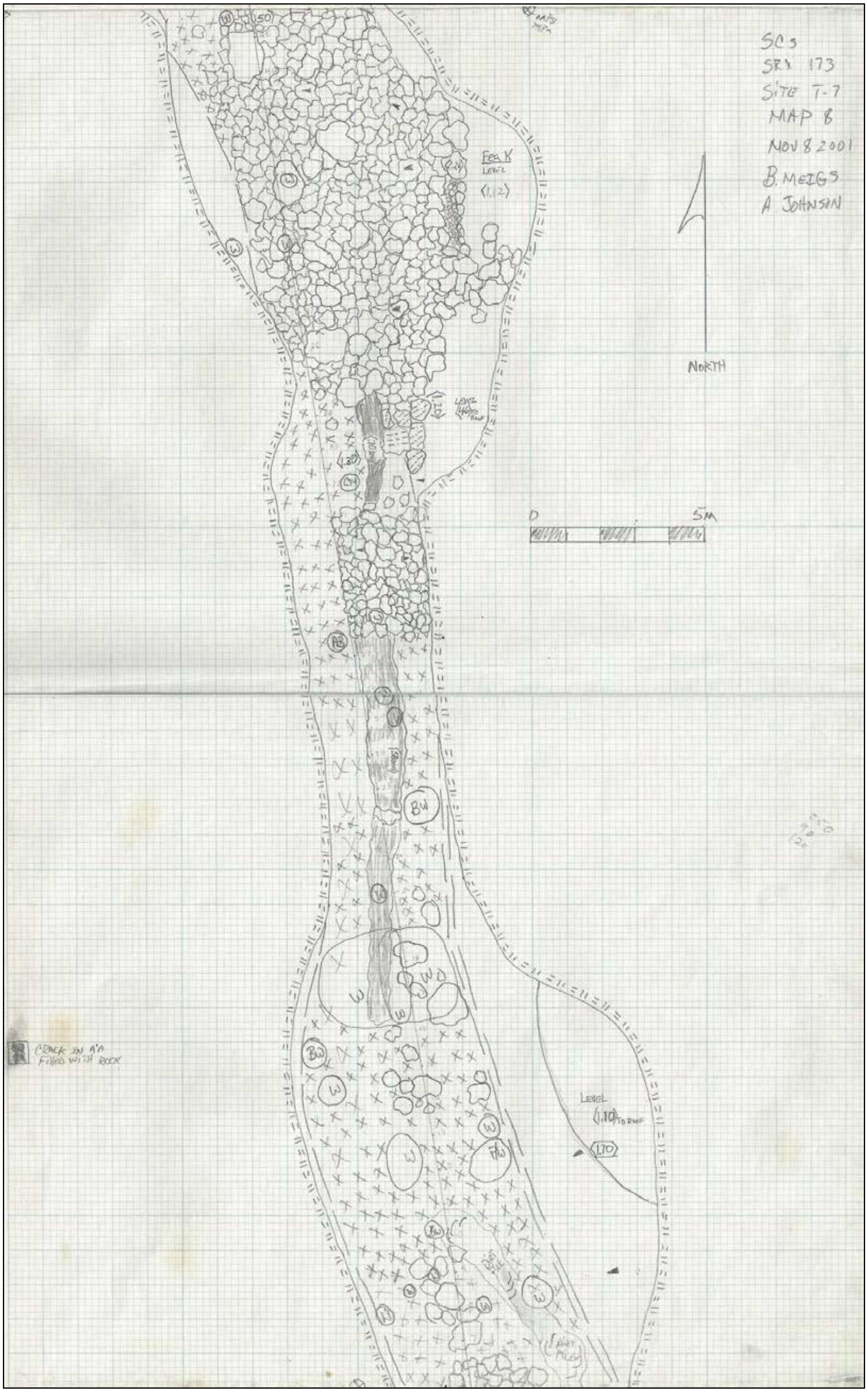

Figure 80: Site 24470 Cave Map 8.

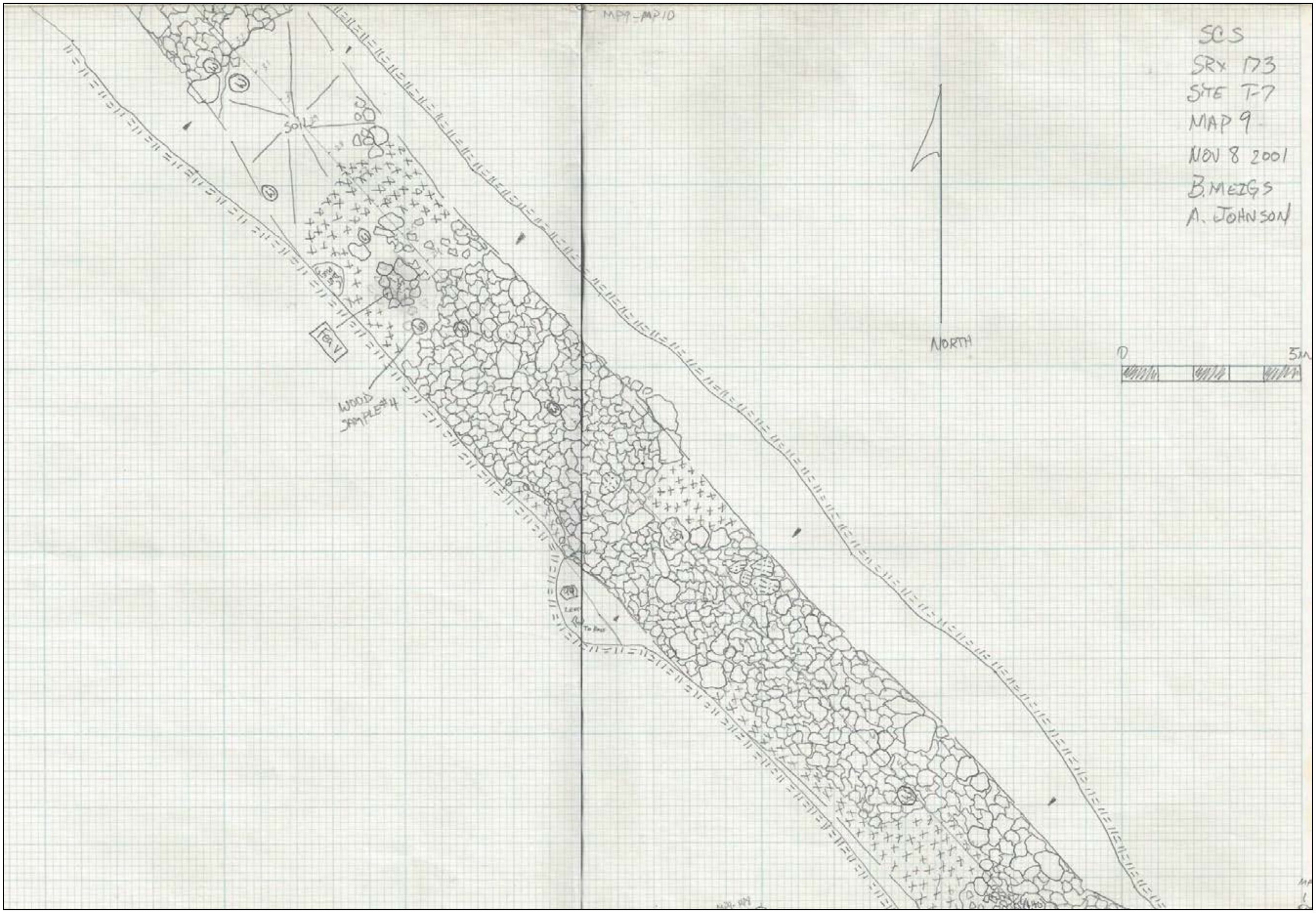

Figure 81: Site 24470 Cave Map 9.

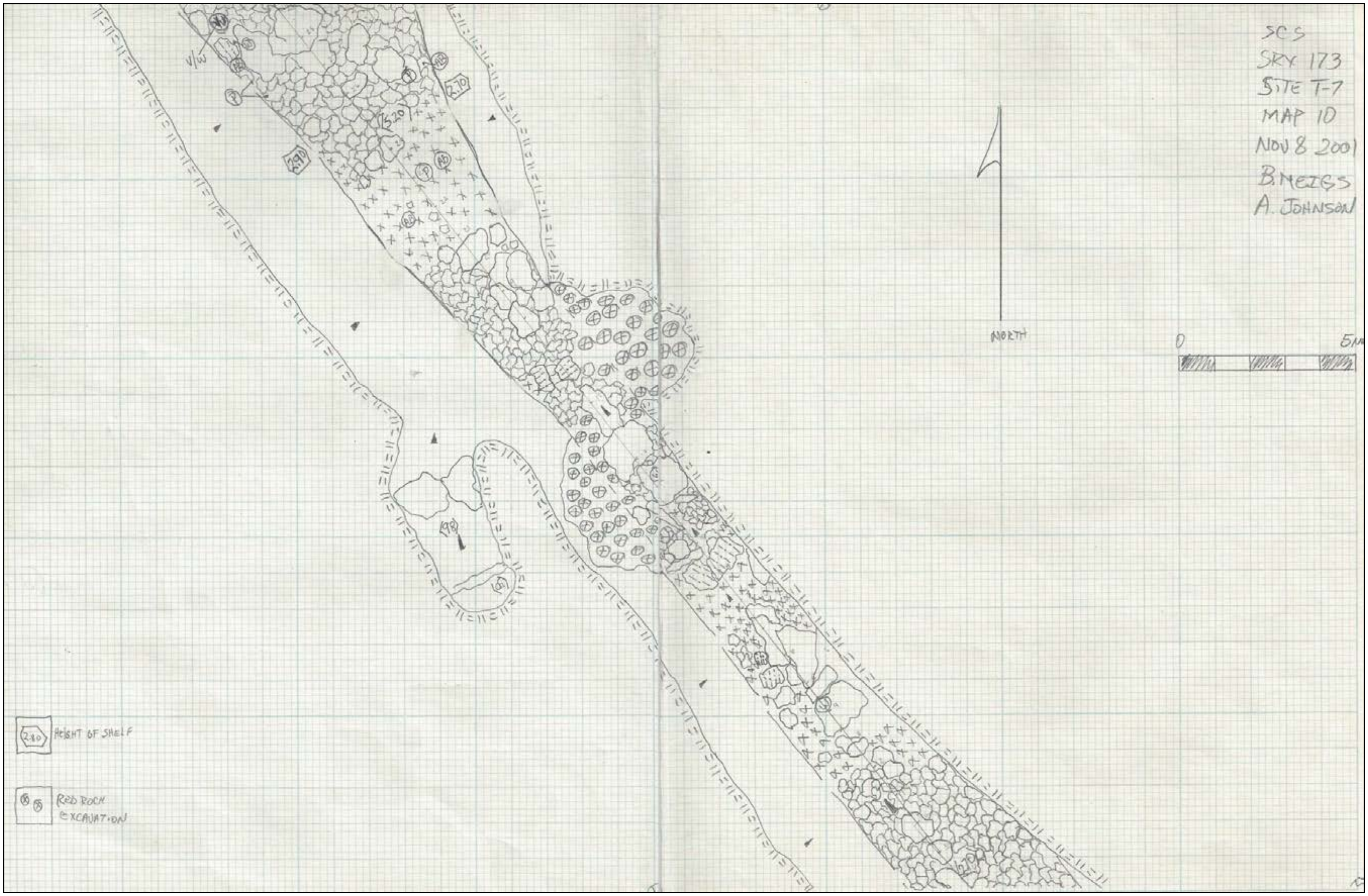

Figure 82: Site 24470 Cave Map 10.

Figure 83: Site 24470 Cave Map 11.

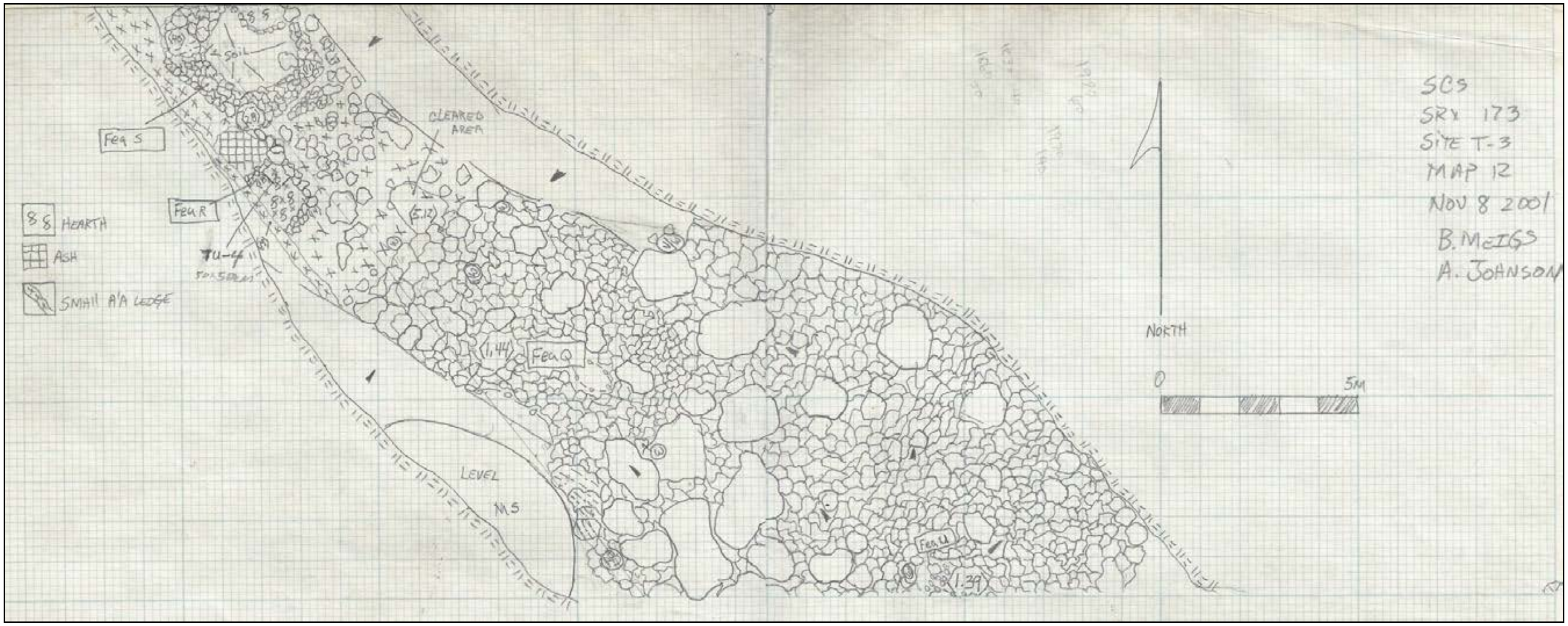

Figure 84: Site 24470 Cave Map 12.

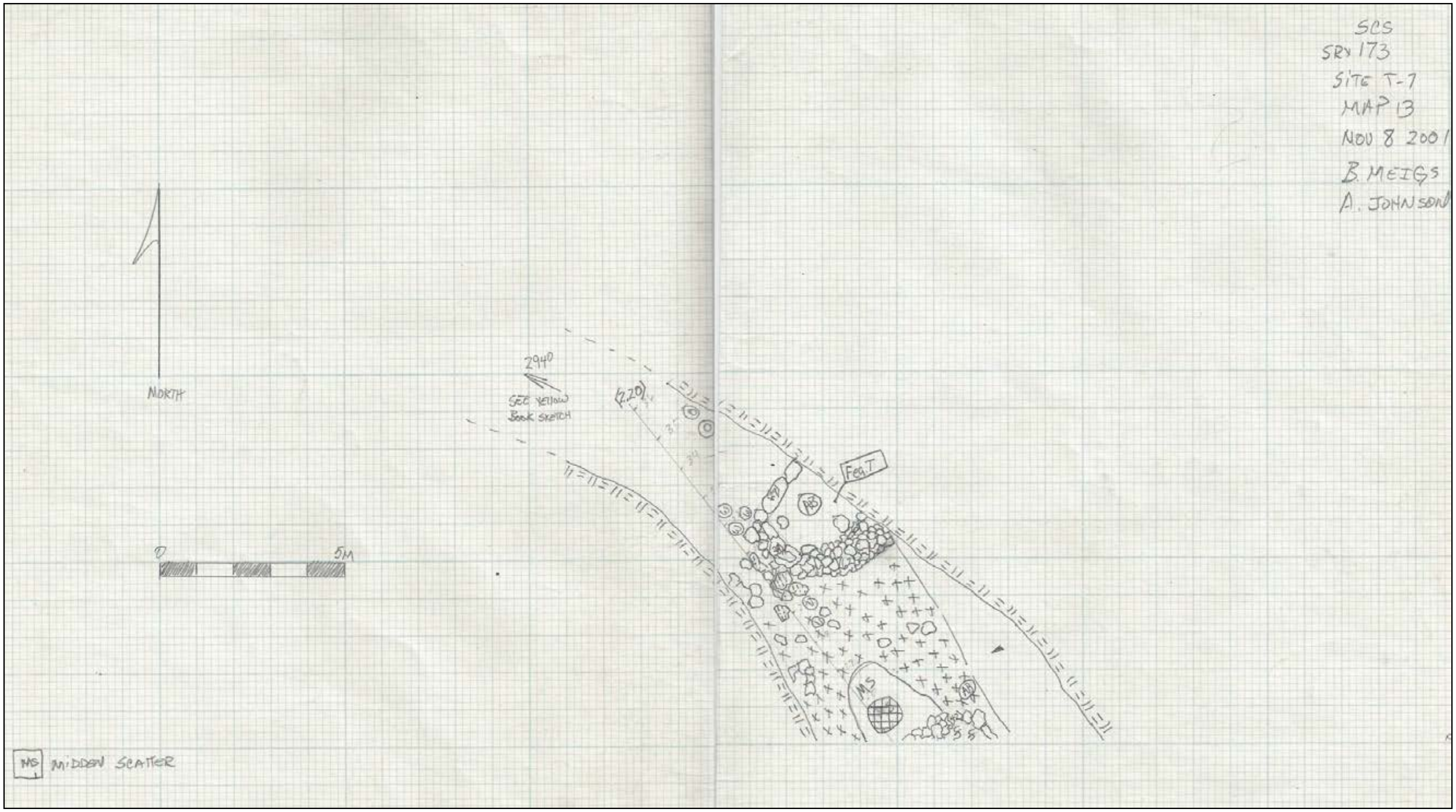

Figure 85: Site 24470 Cave Map 13.

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SADDLE ROAD EXTENSION
SOUTH KOHALA, HAWAI‘I

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Appendix E Historic Properties
E2: Section 106 Correspondence and List of Consulted Parties

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SECTION 106 CONSULTATION IN 2014

As part of ongoing project area oral interviews and Section 106 Consultation, public notices were published in the West Hawaiʻi Today and Hawaiʻi Tribune-Herald newspapers on August 17, 20, and 21, 2014 (Appendix A). The public notice was also published in the Honolulu Star-Advertiser on September 3, 2014 and in the September 2014 issue of the Office of Hawaiian Affairs (OHA) Ka Wai Ola newspaper.

Section 106 consultation letters were mailed to Native Hawaiian Organizations (NHO), cultural practitioners, and individuals who have knowledge of the project area lands (see Appendix A).

Thirteen individuals and members of eleven organizations were contacted to ask if they knew of, or knew of anyone who has information concerning, historic properties, archaeological sites, or cultural practices associated with the project area lands (see Appendix A). Individuals contacted included long-standing members of the Puʻu Anahulu, Kohala, and Waimea communities, and former Parker Ranch employees who are familiar with the project area lands.

Organizations invited to consult included the Office of Hawaiian Affairs (OHA), the Hawaiʻi Island Burial Council (HIBC), the Department of Hawaiian Home Lands (DHHL), The Hawaiʻi State Historic Division (SHPD) Burial Sites Specialist, Hui Mālama I Na Kūpuna ʻO Hawaiʻi Nei, the Ala Kahakai National Historic Trail-National Park Service, the Hawaiʻi County Planning Department Cultural Resources Commission, the Waimea Community association, the Waikoloa Community Association, the Paniolo Preservation Society, the Waimea Hawaiian Civic Club, and the Kona Hawaiian Civic Club.

All of the individuals contacted were interested in consulting, and several of the organizations were interested in consulting. The individuals and organizations that responded asked to review the draft AIS report. The draft AIS report is being provided to these individuals and organizations. Additional consultation comments generated through the review of the draft AIS, or received through additional interviews and meetings, will be included in the final draft of the AIS report.

Meetings, interviews, and telephone interviews were conducted with nine of individuals as well as with members of OHA, DHHL, and the HIBC. Maps of the project area APE were provided to those contacted to provide information and context. During the meetings, information was provided about the land owners affected by the proposed project and the land owners' opinion of the project. The reasons for building the proposed road was discussed. A description of the AIS methods and general results were discussed.

The project area lands have been private property for many generations, and as such, they have not often been accessed by cultural practitioners or community members. Much of the knowledge concerning possible past cultural practices has been lost as a result. Most of the knowledge that exists today is held by former Parker Ranch employees and primarily concerns the locations of trails, rock mound markers, and ranch era features within the wider region surrounding the project area. Over the course of interviews and consultation conducted to date, no past or on-going cultural practices have been identified within the project area APE or in the region surrounding the project area.

Interviews were conducted with members of the Puuanhulu community on September 10, 2014. Those in attendance included Julia Akau, Marnie Humble, Kuulei Keakealani, Merline Kilte, Robert L. Mitchell, and Clarese "Nana" Wilcox. The main points discussed during the meeting are summarized below.

It was noted that there are no burials in the project APE and the question was raised if building a road will increase access to burials in the wider area. The question was asked how that will be addressed. It was explained that the lead federal agency will assess whether or not there is the potential of an indirect impact to burials created by the new road. If there is, the lead agency will determine how to best mitigate any indirect impacts to them.

Kuulei was concerned that the project APE will cross through and will impact the Kanikū lava flow, a storied landscape. Kuulei also mentioned that her father asked whether or not the project APE will cross over and impact the old cattle drive trail from Pu‘u Wa‘awa‘a Ranch to Puakō. Her father would like to visit the project area to tell what he knows of the project area lands.

The primary concern was that every effort would be made to avoid historic properties and rare endemic and indigenous plants. It was explained that a flora study and an archaeological study were conducted to help address these issues. The question was asked if the need for a new road, rather than improving existing roads, justifies impacting undeveloped land.

A telephone interview was conducted on September 30, 2014 with Donnie De Silva who worked for Parker Ranch for thirty-seven years and retired in 1995. Donnie worked at numerous

Parker Ranch sections including at Puʻu Hīnaʻi where there was a wooden corral. Early in his career, he participated in the cattle drives that brought cattle from Waimea to Kawaihae to be shipped to Oʻahu.

The cattle were driven down to Kawaihe at night because the road was used and there wasn't any traffic on the road at night. The cowboys would arrive in Waimea at midnight where the cattle would already have been corralled. They cowboys would saddle their horses and then eat breakfast. After breakfast they would drive the cattle to Kawaihae and return to Waimea. This was the main route for taking cattle to the coast for shipment during his eraly time at Parker Ranch. The practice ceased in the 1960s when the Mauna Kea Hotel was built and night shift workers used the road to commute. From that time on, the cattle were hauled in trucks to Kawaihae for shipment.

Donnie explained that there was a cycle to driving cattle on the lands between Waimea and the saddle region based on rainfall. The area between the Kamuela Airport to the Keʻāmuku ranch station was the winter paddock. The grass was lush in the winter paddock because of the higher precipitation during the rainy season. As the rainfall diminished after winter, the cowboys would drive the cattle up to higher lands where there was still rainfall and better grass. Finally, the cattle would be driven back down to the winter paddock for the next rainy season.

A meeting was held with Shane Palacat-Nelson, the west Hawaiʻi OHA representative, on October 3, 2014 to discuss the Saddle Road Extension project. Shane's family has lived in Kaloko, Honokōhau, and Kona for several generations and he is a traditional cultural practitioner. The primary concern Shane expressed during the meeting was that historic properties are important to cultural practitioners for both their cultural and historical significance. He suggested the an alignment that best avoids the historic properties should be chosen for the proposed project.

A meeting was held on September 2, 2014 with Dr. Billy Bergin, a doctor of veterinarian medicine who worked for Parker Ranch for 25 years, and worked for the state of Hawaiʻi from his office in Waimea. Dr. Bergin will review the draft AIS and provide comments.

Section 106 Consultation and Related Consultation

Name	Title, Organization	Phone call	Email	Letter	Interview
Section 106 Consultation, 2014					
Akau, Julia	Pu‘uanahulu Ohana	-	-	9/10/14	-
Bergin, Billy	Kamuela Ohana	-	7/21/14 & 8/28/14	9/2/14	-
De Silva. Donnie	Parker Ranch Cowboy	9/30/14		-	-
Harp, Isaac Paka	Kona Ohana		8/29/14	-	-
Hind III, Robbie	Pu‘uanahulu/Kona Ohana	7/7/14	7/7/14	-	-
Humble, Marnie		-	-	9/10/14	-
Keakealani, Ku‘ulei	Pu‘uanahulu Ohana	8/1/14	7/21/14 & 8/1/14	-	-
Keakealani, Sonny	Pu‘uanahulu Ohana	-	-		-
Kilte, Merline	Pu‘uanahulu Ohana	-	-	9/10/14	-
Lui, Nicole	Kohala/Kona Ohana	-	8/28/14	8/23/14	-
Mitchell, Robert L.	Pu‘uanahulu Ohana	-	-	9/10/14	-
Vredenburg, Keawe	Kamuela Ohana	7/7/14	-		-
Wilcox, Clarese	Pu‘uanahulu Ohana	-	-	9/10/14	-
Ethnographic/Historical Consultation Conducted					
Andrade, Punahele	Cultural Specialist, Outrigger Hotel	6/25/01	-	6/25/01	11/29/01
Bergin, Billy		-	7/7/14	-	-
Hind, Robby, III	Kamuela ‘Ohana	7/7/01	7/7/14	-	-
Irons, Darby	Resident, Parker Ranch	6/28/01	-	6/28/01	-
McCarthy Keakealani,Ku‘ulei	Pu‘u Anahulu ‘Ohana	6/25/01	7/7/14	6/25/01	11/28/01
Vredenburg, Keawe	Waimea ‘Ohana	7/7/14	-		-
Yamaguchi, Jiro (dec’d)	Paniolo, Parker Ranch	-	-	-	4/15/02
Yamaguchi, Mark	Paniolo, Parker Ranch	-	-	-	4/15/02
Andrade, Punahele	Cultural Specialist, Outrigger Hotel	6/25/01	-	6/25/01	11/29/01
Soon, Ray	Department of Hawaiian Home Lands	-	-	6/25/01	-
Aloot, Sebastian	OHA*	6/26/01	-		-
Sherlock, Ululani	OHA, Hilo Cultural Resource Coordinator	-	-	7/18/01	-
Flores, E. Kalani	OHA, Historic Preservation Council	-	-	6/26/01	-
Springer, Hannah Kihalani	OHA, Historic Preservation Council	-	-	6/29/01	-
McDonald, Ruby (dec’d)	OHA, Kona Cultural Resource Coordinator	-	-	7/18/01	-
Giffin, Jon	DLNR, Division of Forestry and Wildlife	6/25/01	-	-	-
Oshiro, Rod	DLNR, Division of Forestry, Na Ala Hele	-	-	6/25/01	-
Maly, Kepā	Kumu Pono Associates	7/3/01	-		-
Cole, Heather	Nature Conservancy	6/29/01	-		-
Saldua, Ben	Pu‘ukoholā National Historic Park	-	-	6/26/01	-
Tolentino, Mabel	Waimea Hawaiian Civic Club	6/25/01*	-	6/25/01	
Cook, Patti	Waimea Community Association	-	-	-	6/28/01

* Spoke with relative.

1266

AFFIDAVIT OF PUBLICATION

State of Hawaii)
) SS:
County of Hawaii)

LEILANI K. R. HIGAKI, being first duly sworn, deposes and says:

1. That she is the BUSINESS MANAGER of HAWAII TRIBUNE-HERALD, a newspaper published in the City of HILO, State of Hawaii.

2. That the "NOTICE OF CONSULTATION...STATE OF HAWAI'I Project No. DO-HI-0200(5)...etc. ".

of which a clipping from the newspaper as published is attached hereto, was published in said newspaper on the following date(s) August 17, 20, 21, 2014, (etc.).

280418

Leilani K. R. Higaki

Subscribed and sworn to before me

this 2nd day of September, 2014.

Danette K. Koochi

DANETTE K. KOOCHI

Notary Public, Third Circuit, State of Hawaii

My commission expires March 23, 2018

DANETTE K. KOOCHI NOTARY PUBLIC Comm. No. 14-82 STATE OF HAWAII

Page(s): 1

1266

AFFIDAVIT OF PUBLICATION

IN THE MATTER OF
NOTICE OF CONSULTATION

STATE OF HAWAII }
} SS.
City and County of Honolulu }

Doc. Date: SEP - 3 2014 **# Pages:** 1
Notary Name: Patricia K. Reese First Judicial **Circuit**
Doc. Description: Affidavit of Publication

[signature] SEP - 3 2014
Notary Signature Date

PATRICIA K. REESE NOTARY PUBLIC Comm. No. 86-467 STATE OF HAWAII

Rose Rosales being duly sworn, deposes and says that she is a clerk, duly authorized to execute this affidavit of Oahu Publications, Inc. publisher of The Honolulu Star-Advertiser and MidWeek, that said newspapers are newspapers of general circulation in the State of Hawaii, and that the attached notice is true notice as was published in the aforementioned newspapers as follows:

Honolulu Star-Advertiser 1 times on:
09/03/2014

Midweek Wed. 0 times on:

_____ times on:

And that affiant is not a party to or in any way interested in the above entitled matter.

[signature]
Rose Rosales

Subscribed to and sworn before me this 3rd day

of Sept A.D. 2014

[signature]
Patricia K. Reese, Notary Public of the First Judicial Circuit, State of Hawaii
My commission expires: Oct 07 2014

Ad # 0000659743

PATRICIA K. REESE NOTARY PUBLIC Comm. No. 86-467 STATE OF HAWAII

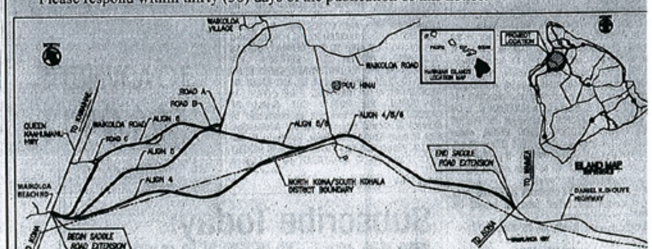
NOTICE OF CONSULTATION
SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT OF 1966 AS AMENDED (2006)

SADDLE ROAD EXTENSION: FROM MĀMALAHOA HIGHWAY TO QUEEN KAʻAHUMANU HIGHWAY, WAIKOLOA AND PUʻUANAHULU AHUPUAʻA, SOUTH KŌHALA AND NORTH KONA DISTRICTS, HAWAIʻI ISLAND, STATE OF HAWAIʻI PROJECT NO. DO-HI-0200(5)
TAX MAP KEY: (3) 6-8-001:005, 066, 067; 6-8-002:013, AND 014, 015; 7-1-003:001

Notice is hereby given that the Federal Highway Administration and the State of Hawaiʻi Department of Transportation, Highways Division propose the construction of a road to improve cross-island transportation. The proposed Saddle Road Extension will link the newly realigned Saddle Road at the Māmalahoa Highway to the Queen Kaʻahumanu Highway at Waikoloa Beach Drive. The project will improve the efficiency and operational level of traffic movement between East Hawaiʻi and West Hawaiʻi in general, and will support the unique modal needs along this corridor, such as commercial and military transportation uses. The project involves grubbing, cutting, and grading to create a new road bed, the creation of shoulders, the construction of drainage culverts, widening of existing roadways at either end of the new road bed, and paving. The project will also involve regrassing/reinforcing any newly exposed cut slope to control erosion, providing best management practices during construction, and providing adequate traffic control to ensure motorists can safely pass during construction at either end of the new road. Three alternate 250-foot wide corridors were selected for study. The Area of Potential Effect (APE) for the three corridors includes 775 acres. Only one corridor will be selected for construction. The maximum length of the proposed road corridor, which traverses unimproved cattle pasture and open lava flows, is 10.7 miles.

The proposed project will utilize federal funding and will be considered a federal action and undertaking, as defined by Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended (2006). Therefore, the FHWA will require compliance with the NHPA and other federal requirements. We would like to invite you to participate in the Section 106 consultation for the proposed project in accordance with Title 36 of the Code of Federal Regulations, Section 800.3. Pursuant to Section 106 of the NHPA of 1966, as amended (2006), Native Hawaiian organizations and Native Hawaiian descendants with ancestral lineal or cultural ties to, cultural knowledge or concerns for, and cultural or religious attachment to the proposed project area are requested to contact Michael Will, Project Manager, via email at michael.will@dot.gov, or by US Postal Service to 12300 West Dakota Ave., Ste. 380, Lakewood, CO 80228.

Please respond within thirty (30) days of the publication of this notice.



SP.NO.: ____________ L.N.

Hawai'i Island,
STATE OF HAWAI'I
Project No. DO-HI-0200(5)
Tax Map Key: (3) 6-8-001:005, 066, 067;
6-8-002:013, AND 014, 015; 7-1-003:001

Notice is hereby given that the Federal Highway Administration and the State of Hawai'i Department of Transportation, Highways Division propose the construction of a road to improve cross-island transportation. The proposed Saddle Road Extension will link the newly realigned Saddle Road at the Māmalahoa Highway to the Queen Ka'ahumanu Highway at Waikoloa Beach Drive. The project will improve the efficiency and operational level of traffic movement between East Hawai'i and West Hawai'i in general, and will support the unique modal needs along this corridor, such as commercial and military transportation uses. The project involves grubbing, cutting, and grading to create a new road bed, the creation of shoulders, the construction of drainage culverts, widening of existing roadways at either end of the new road bed, and paving. The project will also involve regrassing/reinforcing any newly exposed cut slope to control erosion, providing best management practices during construction, and providing adequate traffic control to ensure motorists can safely pass during construction at either end of the new road. Three alternate 250-foot wide corridors were selected for study. The Area of Potential Effect (APE) for the three corridors includes 775 acres. Only one corridor will be selected for construction. The maximum length of the proposed road corridor, which traverses unimproved cattle pasture and open lava flows, is 10.7 miles.

The proposed project will utilize federal funding and will be considered a federal action and undertaking, as defined by Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended (2006). Therefore, the FHWA will require compliance with the NHPA and other federal requirements. We would like to invite you to participate in the Section 106 consultation for the proposed project in accordance with Title 36 of the Code of Federal Regulations, Section 800.3. Pursuant to Section 106 of the NHPA of 1966, as amended (2006), Native Hawaiian organizations and Native Hawaiian descendants with ancestral lineal or cultural ties to, cultural knowledge or concerns for, and cultural or religious attachment to the proposed project area are requested to contact Michael Will, Project Manager, via email at michael.will@dot.gov, or by US Postal Service to 12300 West Dakota Ave., Ste. 380, Lakewood, CO 80228.

Please respond within thirty (30) days of the publication of this notice.

SCS 1266 SRX

1266

AFFIDAVIT OF PUBLICATION

State of Hawaii)
) SS:
County of Hawaii)

M. R. Chavez, being first duly sworn, deposes and says:

1. That she is the Classified Accountant of WEST HAWAII TODAY, a newspaper published in the City of Kailua-Kona, State of Hawaii.

2. That "**NOTICE OF CONSULTATION SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT OF 1966 AS AMENDED (2006) SADDLE ROAD EXTENTION**..." of which a clipping from the newspaper is attached hereto, was published in said newspaper on the following date(s) August 17, 20 and 21, 2014 (etc.)

M. R. Chavez

Subscribed and sworn to before me
This 21st day of August, 2014

Henriann P. Kahananui

Notary Public, Third Circuit,
State of Hawaii

HENRIANN P. KAHANANUI NOTARY Comm. No. 11-188 PUBLIC STATE OF HAWAII

Henriann P. Kahananui

My Commission expires: June 6, 2015
Page(s): 1

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Suite 380A
Lakewood, CO 80228-2583
Office: 720-963-3647
Fax: 720-963-3596
Michael.will@dot.gov

August 7, 2014

In Reply Refer To:
HFPM-16

[Organization or Individual Name]

RE: SADDLE ROAD EXTENSION: FROM MĀMALAHOA HIGHWAY TO QUEEN KA‘AHUMANU HIGHWAY, WAIKOLOA AND PU‘UANAHULU AHUPUA‘A, SOUTH KŌHALA AND NORTH KONA DISTRICTS, HAWAI‘I ISLAND, STATE OF HAWAI‘I PROJECT NO. DO-HI-0200(5) TAX MAP KEY: (3) 6-8-001:005, 066, 067; 6-8-002:013, AND 014, 015; 7-1-003:001

Dear Mr./Ms. [name]:

On behalf of the Federal Highway Administration (FHWA), the State of Hawai‘i Department of Transportation (HDOT) would like to invite you to participate in consultation for the proposed Saddle Road Extension Project.

The project addresses the improvement of cross-island transportation. The proposed Saddle Road Extension will link the newly realigned Saddle Road at the Māmalahoa Highway to the Queen Ka’ahumanu Highway at Waikoloa Beach Drive [Enclosure 1]. The project will improve the efficiency and operational level of traffic movement between East Hawai‘i and West Hawai‘i in general, and will support the unique modal needs along this corridor, such as commercial and military transportation uses. Three alternate 250-foot wide corridors were selected for study. The Area of Potential Effect (APE) for the three corridors includes 775 acres. Only one corridor will be selected for construction. The maximum length of the proposed road corridor, which traverses unimproved cattle pasture and open lava flows, is 10.7 miles.

The proposed project will utilize federal funding and will be considered a federal action and undertaking, as defined by the Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended (2006). Therefore, the FHWA will require compliance with the National Environmental Policy Act, NHPA, and other federal requirements. The FHWA has authorized the HDOT and its consultants, Lennie Okano-Kendrick of Okahara and Associates, Inc. and Glenn Escott, M.A., of Scientific Consulting Services, Inc, to act on behalf of the FHWA regarding the NHPA Section 106 notification and consultation. We would like to invite you to participate in the Section 106 consultation for the proposed project in accordance with Title 36 of the *Code of Federal Regulations*, Section 800.3.

Overview of the Undertaking

The project area is located between 60 and 2,500 feet (18 and 762 meters) above mean sea level (amsl). The coastal and near coastal portions of the project area are covered by bare *pāhoehoe* and *ʻaʻā* lava flows. The lava flows in the center of the project area are primarily bare *ʻaʻā* lava. The upper portions of the project area have more soil and are open grass and shrublands.

The proposed Saddle Road Extension project involves grubbing, cutting, and grading to create a new road bed, the creation of shoulders, the construction of drainage culverts, widening of existing roadways at either end of the new road bed, and paving. The project will also involve regrassing/reinforcing any newly exposed cut slope to control erosion, providing best management practices during construction, and providing adequate traffic control to ensure motorists can safely pass during construction at either end of the new road.

Cultural and Historical Background

The project area lands are arid, hot, and barren and were not locations known for traditional Hawaiian habitation. The closest villages were along the coast to the west and in the upper *kula* lands of Lālāmilo and Waimea to the northeast. Historical narratives of the Waikoloa area stress its geographical location as a nexus of travel. Trails from Kona to Kohala crossed the lava flats inland of ʻAnaehoʻomalu and Puakō. Trails stretched from the coast to Waimea. Other trails ran from Kona, east of Hualalai, and down to Waimea or the coast. Trails from Hilo crossed the saddle between Mauna Kea and Mauna Loa, and then led downhill to Lālāmilo, where travelers could take trails either east or west. The trails leading to the uplands were often used to access areas where natural resources were collected and hunted.

Large areas of the foothills of southern Waikoloa were covered in *pili* grass (*Heteropogon contortus*) traditionally used for thatching. *Māmane* (*Sophora chrysophylla*), *naio* (*Myoporum sandwicense*), *wauke* or paper mulberry (*Broussonetia papyrifera*), *ʻiliahi* or sandalwood (*Santalum paniculatum*), and *ʻōhiʻa* (*Metrosideros polymorpha*) grew on the plains of Waimea and at upper elevations in the foothills of Mauna Kea and Mauna Loa. Traditional resource extraction from the area included *kapa* cloth made from *wauke*, *māmane* limbs cut for adze handles, and birds trapped for their meat and feathers.

During the early post-Contact era, much of grassy, upland Waikoloa became bullock hunting grounds that were later fenced for cattle ranching. Large portions of the Waikoloa grasslands were first purchased in 1868 by the Waimea Grazing and Agricultural Company (WGAC). The WGAC property was sold to Parker Ranch in 1904. The upper project area lands are now owned by private individuals that still use it for cattle ranching.

The lower barren lava portions of the project area were used traditionally for bird hunting and egg collection. They were also an area for the extraction of pahoehoe for the manufacture of abraders. There are documented trails, trail markers, and caves used for temporary habitation while travelling through the area.

The lower portion of Waikoloa was leased by the U.S. War Department from 1943 to 1946 as part of the Waikoloa Maneuver Area. The military used portions of the lease land for troop maneuvers and weapons practice, while other areas served as artillery, aerial bombing and naval gun fire ranges.

Summary of Archaeological Sites within the APE

Prior archaeological and cultural studies conducted in the area did not identify any sites listed on the National Register of Historic Places, or on the Hawaiʻi Register of Historic Places. As part of the current proposed project, an archaeological inventory survey of the APE and surrounding lands was conducted. Twenty eight archaeological sites were documented within the APE and twenty four archaeological sites were documented on lands outside of the APE. The sites are potentially significant and will be considered when assessing potential impacts from the proposed project.

Consultations

Consultation with individuals and families in the Waimea community has already been initiated, and Section 106 notice/advertisements will be included in the West Hawaiʻi Today, Hawaiʻi Tribune Herald, Honolulu Star Advertiser, and Ka Wai Ola. Section 106 consultation letters have also been sent to other organizations or individuals (Association of Hawaiian Civic Clubs; *Hui Mālama I Na Kūpuna O Hawaiʻi Nei*; Kona Hawaiian Civic Club; *Laʻi ʻŌpua* 2020; Office of Hawaiian Affairs; and Mr. Isaac Harp) that might attach significance to this area, inviting them to participate in the process.

Native Hawaiian Organizations and Native Hawaiian descendants with ancestral lineal or cultural ties to, cultural knowledge or concerns for, and cultural or religious attachment to the proposed project area are asked to provide a response within 30 days of notification.

We welcome any comments you have on this proposed project. We are particularly interested in information you may have about historic and cultural sites in the broader area, or about the general history of the lands where the proposed project area is located. In addition, if you are acquainted with any persons or organization that is knowledgeable about the proposed project area, or any descendants with ancestral lineal or cultural ties to or cultural knowledge or concerns for, and cultural or religious attachment to the proposed project area, we would appreciate receiving their names and contact information.

We would appreciate a written response within 30 days from date of receipt, to Michael Will, Project Manager, via email at michael.will@dot.gov, or by US Postal Service to 12300 West Dakota Ave., Ste. 380, Lakewood, CO 80228.

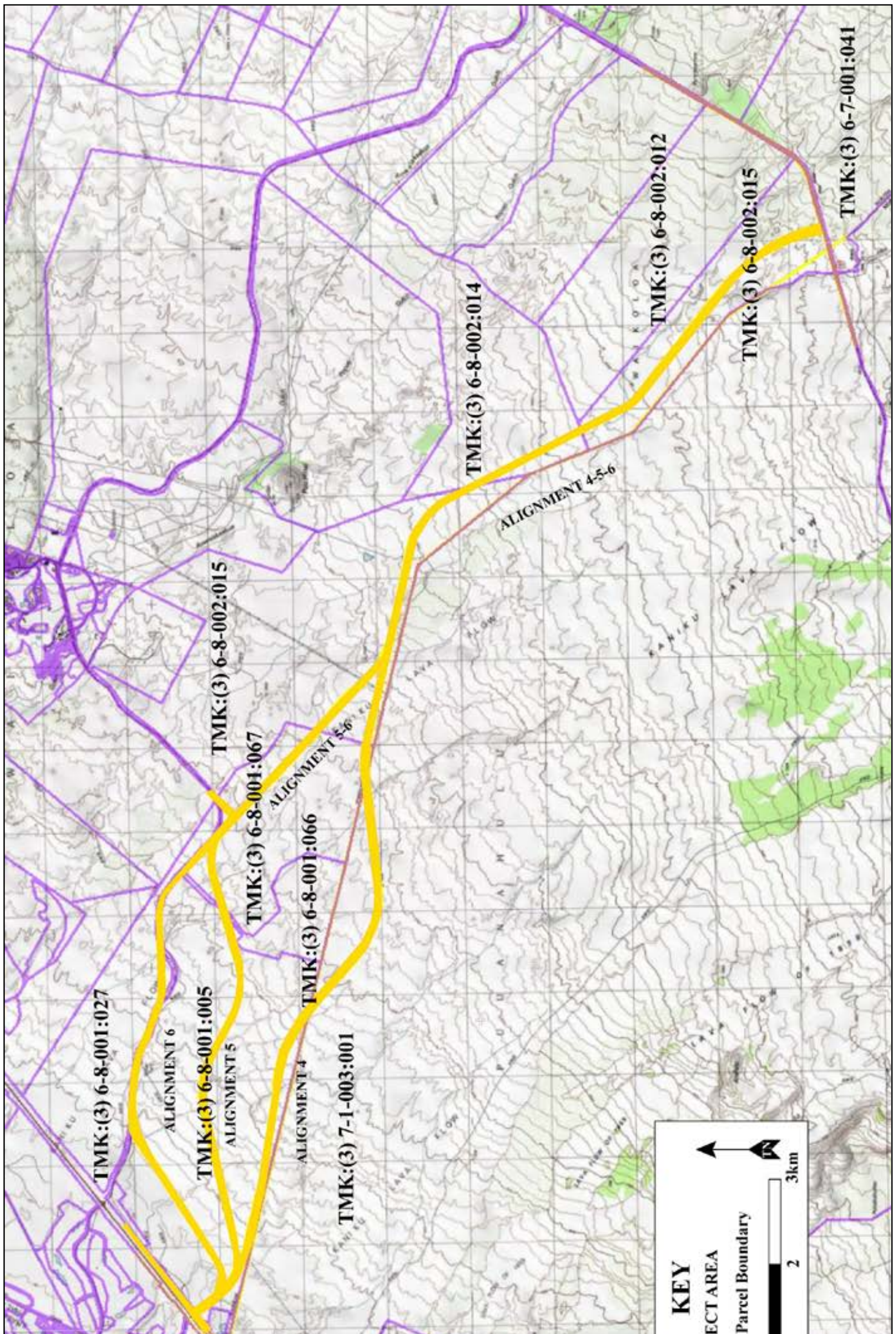
If you have any questions regarding the archaeological or cultural studies in the area, please contact Glenn Escott of Scientific Consulting Services, Inc. at (808) 938-0968 or you may also contact the lead federal agency representative, Nicole Winterton by telephone at (720) 963-3689 or nicole.winterton@dot.gov. We look forward to working with you and the SHPD on these needed improvements.

Sincerely,

Michael Will, P.E.
Project Manager

Enclosure 1: Map of Proposed Project Area of Potential Effect

cc: [Okahara and Associates], FHWA [Nicole Winterton], HDOT [Ken Tatsuguchi]



Enclosure 1: 7.5-Minute Series USGS Topographic Map Showing Location of TMK Parcels and Project Area (Anaeho‘omalu, Pu‘u Hīna‘i, Pu‘u Anahulu, and Ke‘āmuku Quads) (National Geographic Topo! 2003).

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

JESSE SOUKI
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING
601 KAMOKILA BLVD STE 555
KAPOLEI HI 96707

AGENDA
HAWAII ISLAND BURIAL COUNCIL MEETING

DATE: Thursday, October 23, 2014
TIME: 9:30 am
PLACE: DLNR-Forestry & Wildlife
Conference Room
19 East Kawili Street
Hilo, Hawaii 96720

I. CALL TO ORDER

II. ROLL CALL/PULE

III. MINUTES

A. None

IV. BUSINESS

A. Section 106 Consultation Regarding Saddle Road Extension: From Mamalahoa Highway to Queen Kaahumanu Highway, Waikoloa & Pu'uanahulu Ahupua'a, South Kohala & North Kona Districts, Hawaii Island, Project NO. DO_HI-0200(5), TMK (3) 6-8-001:005,066,067; 6-8-002:013, & 014, 015; 7-1-003:001.
Information/Discussion/Recommendation: Discussion and recommendation of the consultation listed above. Presentation by Scientific Consultant Services.

B. Information Regarding Twenty-One Burial Sites Located at Kawala Ahupua'a, Ka'u District Island of Hawaii, TMK (3) 9-5-10:001.
Information/Discussion/Recommendation: Discussion and recommendation of the plan listed above. Presentation by ASM Affiliates.

C. Update on hiring of a replacement Burial Specialist.
Presentation by HIBC Chair.

D. Develop a yearlong agenda to include meeting dates and locations.
Presentation by HIBC Chair.

E. Clarification on the process and time line of adding or submitting items to the Burial Council Agenda.
Presentation by HIBC Chair.

F. Clarification on the procedures to review past BTPs approved as an update for status review.
Presentation by HIBC Chair.

G. Discussion with SHPD Administrator, Alan Downer.
Presentation by HIBC Chair.

H. Burial Council Identification Card.
Presentation by HIBC Chair.

V. SHPD INADVERTENT DISCOVERIES/OTHER CORRESPONDENCE

A. None

VI. ANNOUNCEMENTS

A. Next meeting date is scheduled for Thursday, November 20, 2014

VII. ADJOURNMENT

Pursuant to §92-3 HRS, all interested persons shall be afforded an opportunity to present oral testimony or submit data, views, or arguments, in writing on any agenda item. Additionally, pursuant to a policy adopted by the Oahu Island Burial Council at its September 14, 2005 meeting, oral testimony for items listed on the agenda is limited to three minutes per person, per agenda item.

Pursuant to sections §92-4, §92-5(a)(8), and §6E-43.5, Hawaii Revised Statutes (HRS), and upon compliance with the procedures set forth in section 92-4, HRS, the council may go into a closed meeting to consider information that involves the location or description of a burial site.

A request to be placed on a burial council meeting agenda must be made with the Burial Sites Program staff at least two weeks preceding the scheduled meeting date. In addition, the request must be accompanied by all related documents. Failure to comply with this procedure will delay the item to the following month's agenda.

Materials related to items on the agenda are available for review at the State Historic Preservation Division in room 555 of the Kakuhihewa Building located at 601 Kamokila Boulevard, Kapolei, Hawaii 96707. Persons with disabilities requiring special assistance should contact the division in advance at (808) 692-8015.

Hawaiʻi Island Burial Council Meeting - October 23, 2014 9:30 AM

Department Of Forestry And Wildlife Conference Room 19 East Kawili Street Hilo, HI

Ron Terry (Geometrician Associates) and Lennie Okano-Kendrick (DMT Consultant Engineers) began by stating that the purpose of meeting was to conduct Section 106 Consultation with the Hawaiʻi Island Burial Council (HIBC) as a Native Hawaiian Organization (NHO), even though there were no burials within the area of potential effect (APE). As part of the ongoing Section 106 Consultation, Ron and others planned to present the proposed Saddle Road Extension project details and background, and to ask HIBC members about their concerns and recommendations regarding the proposed project.

Ron introduced members of the Saddle Road Task Force (SRTF) who were in attendance at the HIBC meeting. They were Craig Bo Kahui, Walter Kunitake, and Duane Mukai.

Ron and Lennie presented information about the proposed project corridors and explained the long history of planning and environmental studies to date. Ron asked if any of the Hawaiʻi Island Burial Council (HIBC) members had questions.

HIBC member Mary Maxine Kahaulelio asked how many properties the project corridors crossed and how large the owners' parcels were. She stated that these people own thousands of acres of land. She asked about burials and archaeological sites on the project area.

Ron Terry stated there were four property owners. Ron also said that the proposed road corridors were selected to avoid archaeological sites, burials, and endangered species. He said that Glenn Escott (Scientific Consultant Services, Inc.) would present a summary of the archaeological study next.

Maxine asked about the presence of unexploded ordnance (UXO) on the project area and the presence of goats and cattle.

Ron stated that there was potentially UXO on the project area. He spoke about the ongoing UXO clearance efforts in the area and coordinating UXO support for construction of the proposed road. He also said that there would be fencing along the highway to keep animals off of the road.

Maxine asked about the start date for Construction.

Ron stated that the scheduled construction start date was in 2018. He spoke about the engineering and condition of the old Saddle Road and the high incidence of accidents, injuries, and deaths associated with it. Ron noted the improved design of the new Saddle Road and the fact that there are now far fewer accidents per vehices travelling on the new highway. Even though traffic on the new corridor has tripled, there have only been three reported deaths over the past 10 years.

HIBC Member Fred Cachola spoke about the dangerous conditions of the old Saddle Road. He said that he wished the road was going to go closer to Waimea rather than Kona. He spoke about the likelihood of burials and artifacts in lava tubes in the area of the project area lands. He requested that cultural monitors be present during the construction of the proposed road. He suggested that there is a qualitative difference between cultural monitors and that some are more acceptable then others. He recommended that Native Hawaiian Organizations (NHOs) and the Hawaiian community be consulted in the selection and hiring of cultural monitors.

Ron spoke about the selection of the proposed road corridors and explained that there were many corridor options that were evaluated. There was a wide area of study beyond the area within the existing proposed corridors.

HIBC Chair Edwin Miranda asked which of the proposed alignments will be chosen for the actual road construction.

Lennie described the various alignments and explained that Alignment 4-5-6 would be used as the *mauka* end of the road and that either Alignment 4, 5, or 6 would be chosen as the *makai* end of the road.

Ed asked, if a snag is hit during the construction of one of the alignments, such as the presence of an inadvertent or previously undocumented cultural site, will the budget include sufficient money to revise the alignment or choose an alternate route. He won't agree to the removal or relocation of a significant site to complete the proposed road.

Ed asked about soil erosion and drainage studies for the project. Ron answered that the appropriate studies were conducted and will reported in the EIS.

Ed spoke about the importance of native plant species to the aesthetic of burial sites. He hoped that endangered species would be preserved in place. He asked who conducted the botanical study. Ron said that Geometrician Associates conducted the botanical study.

Ed asked about the social aspects of the proposed project. Ron spoke about the past and ongoing consultation with community associations and individuals. Specifically, Ron spoke about consultation conducted with the Waikoloa Village Home Owners Association. The association expressed various suggestions along different lines regarding the project.

Ed suggested that there should be a plan to control or eradicate fireweed in the proposed road corridor. He spoke about the spread of fireweed along the newly realigned Saddle Road. He believes that the fireweed will continue to spread downhill along the new Saddle Road and the proposed Saddle Road corridor. The fireweed has a negative effect on horses and cattle.

Ed asked again about drainage for the project area. He asked if a 100-year flood study was conducted for the proposed project. Lennie answered in detail. Ron added that best management practices are being implemented.

Fred mentioned that Alignment 4 crosses or touches the North Kona-South Kohala *moku* (district) boundary in three places. He expressed that these are traditional boundaries that are culturally and historically important to Hawaiians. In addition, there was likely pre-contact era activity along the boundary, including the construction of rock mounds to mark the boundary. There might also be other archaeological features, such as trails and burials, along the *moku* boundary. He asked that we consult the Advisory Council on Historic Preservation (ACHP) publications regarding the treatment of traditional cultural boundaries and trails.

Fred suggested that, since the *moku* boundary is culturally important, there is the potential to educate the public about this boundary. He suggested there should be signage to mark the boundary.

Ed Miranda asked if there were any endangered plants in the project area. Ron stated that years ago, there was a *wiliwili* treeand an *uhiuhi* tree near the project area, but since then both trees have died. Ron stated there are no *wiliwili* trees or *uhiuhi* trees in the corridor. Ed expressed that he would like to see *uhiuhi* trees planted in the area.

Maxine returned to the question of how many land owners there were whose property the proposed road would cross. The road will create access to their property increasing the possibility of them developing their properties.

Maxine feels that only conducting Section 106 Consultation with area civic clubs is not enough since many clubs don't have members that are familiar with the project lands or traditional cultural practices. The project has the potential to open up undeveloped lands to new development. She stated that already there is lots of traffic on the Saddle Road, too many trucks and tourists coming into remote areas of the island, like at Puʻu Huluhulu. She feels that development is "moving us out of our own island." She stated that these large land owners, rich outsiders, in the area of the proposed Saddle Road Extension bought up the properties without anyone knowing. She stated the properties are big and these owners are buying up the land of the Hawaiian people. She asked who are these people. How did they get access to these properties? She stated that the Section 106 process is supposed to protect Hawaiian cultural lands, not to sneak in projects. She wants to ensure that the Section 106 process is being properly applied.

Maxine also discussed the potential for animals to be killed on the road and asked that HIBC member Kalena Blakemore be informed if any lava tubes were identified during the construction of the new road since she has experience with caves.

Fred restated that the Section 106 process should be properly applied in accordance with ACHP publication guidance.

Maxine discussed previous construction projects conducted in the distant past where burials were dug up and moved. She also stated that, in some cases, the burials were paved over with roads.

Fred stated that the project has the potential to take 736 acres of what he considers to be a cultural landscape, and that the cultural landscape will be gone forever. He requested that Hawaiians be allowed to collect information and artifacts from sites within the project area prior to the start of construction. He stated that he felt Section 106 mitigation should include scholarships for Native Hawaiians archaeology students to collect the information and artifacts.

HIBC member Keikiʻaloha Kekipi spoke to thank the Saddle Road Extension team for all the work they have conducted collecting important cultural information for everyone including future generations.

Maxine stated that she didn't feel the same as Keiki. She related that she grew up in Kakaʻako and that development has completely destroyed all of the burials. That was her past experience concerning development and she doesn't want to relive it.

Ed stated that the HIBC was not there to offend anyone, but was there to defend cultural properties and practices.

Glenn Escott, Senior Archaeologist for Scientific Consultant Services, Inc (SCS) presented information regarding the history of the project area archaeological investigations, cultural informant interviews, and Section 106 Consultation. He gave a summary description of site types documented in the project area. He stated that there are no burials identified within the project area, but there are known burials in lava tubes in the broader area.   Glenn asked if any the Hawaiʻi Island burial council (HIBC) members had questions.

Fred spoke again about the cultural importance of the traditional North Kona - South Kohala *moku* boundary. He again expressed that the project will follow state and federal regulations in assessing its importance.

Fred spoke about the fact that Hawaiians and non-Hawaiians have different views concerning what constitutes an archaeological site. He feels that in the past, archaeological studies have overlooked the larger cultural landscape and in recording them as isolated individual sites. He asked what will be the spiritual impact to the Hawaiian people of losing this landscape to the proposed project.

Maxine spoke about the fact that Hawaiians arrived on the island first. This is their island. They used different regions within the landscape for different purposes. There was a place to eat, a place to live, a place to give birth, and there are important places in between these areas as well. She thinks it is likely that the project lands between the coast and the mountains were important to Hawaiians. She is afraid that sites will be destroyed, especially burials.

She stated that the people who are developing the island ("you folks") are motivated by power and profit. She continued, "You folks don't have any respect. You folks don't do a good job of finding and protecting sites. You damage sites. You guys are putting a highway over our burials. The military is bombing the island. What more do you guys want? We stopped the Queen Kaʻahumanu Highway. We stopped it!"

She went on to say that the last phase of the realigned Saddle Road should not be called the Daniel K. Inouye Highway, it should be named after a Hawaiian. She stated the highway is named after Senator Inouye because he gave lots of money to the military. She continued, "You guys come over here and destroy the island!"

HIBC member James Kimo Lee spoke to defend Senator Inouye, citing the programs Senator Inouye supported that have benefited the Hawaiian community. Maxine stated that she did not agree.

HIBC member Nalei Kahakalau spoke to say he feels that most archaeological studies conducted in Hawaiʻi are good. He asked if there were any burials. Glenn stated there are no burials in the project area. He asked if Glenn could say with certainty that there were no burials in the project area. Glenn stated that he could say with certainty that there are no marked burials in the project area. In Hawaiʻi there is always the possibility that there might be unmarked burials that cannot be detected without subsurface excavation. Nalei asked that any inadvertent burial discoveries be considered as previously documented burials.

Nalei stated that his primary concerns regarding the proposed project are the moku boundaries, the need to have cultural monitors, providing scholarships for native Hawaiian students to collect information on project area sites, in-place preservation of any burials, and large preservation buffers at those burial sites.

Fred asked how many trails were in the project area. Glenn stated that there was a trail network within the makai portion of the project area, along Queen Kaʻahumanu Highway. Fred asked that the trails be marked where the proposed road crosses them. He suggested that the road surface color might be different from the rest of the road there, or perhaps signs could be placed explaining the trails. He asked that it be considered whether the trail crossing could be a significant pedestrian crossing.

The Director of the Saddle Road Task Force, Walter Kunitake closed the meeting by explaining that HIBC members' input, as well as all of the community input they have received, is very important to the task force for steering the direction of the project. He thanked the members for their concern and help. He said that the task force would do its best to implement HIBC recommendations throughout the course of the project.

From:	Makamaka
To:	Parker, Thomas W (FHWA)
Cc:	Will, Michael (FHWA); Fred Keakaokalani Cachola; Aaron Steen
Subject:	Re: Project Name : HI STP SR200 SADDLE ROAD EXTENSION
Date:	Wednesday, July 20, 2016 8:38:38 PM

Thanks Thomas!

Aloha,

Isaac

From: Parker, Thomas W (FHWA)
Sent: Wednesday, July 20, 2016 5:55 AM
To: Makamaka
Cc: Will, Michael (FHWA) ; Fred Keakaokalani Cachola ; Aaron Steen
Subject: RE: Project Name : HI STP SR200 SADDLE ROAD EXTENSION

Isaac,

Please see attached Draft AIS that is currently under review by SHPD. Let me know if you have any questions.

Regards,
Thomas W. Parker
Environmental Protection Specialist
Federal Highway Administration
Central Federal Lands Highway Division
12300 W. Dakota Ave., Suite 280
Lakewood, CO 80228
Work: (720) 963-3688
Mobile: (970) 509-0858

please consider the environment before printing this email

From: Makamaka [mailto:makamaka@sandwichisles.net]
Sent: Tuesday, July 19, 2016 8:01 PM
To: Parker, Thomas W (FHWA)
Cc: Will, Michael (FHWA); Fred Keakaokalani Cachola; Aaron Steen
Subject: Re: Project Name : HI STP SR200 SADDLE ROAD EXTENSION

Aloha Thomas,

I took it for granted that the Draft AIS was attached to your e-mail below. I was quite surprised to open the attachment only to discover that it was merely a list of consulted parties, many from 15-yeas ago.

Could you please send me a copy of the Draft AIS? An electronic copy will suffice.

Thank you,

Isaac Harp

P.O. Box 437347
Kamuela, HI 96743

From: Parker, Thomas W (FHWA)
Sent: Tuesday, July 19, 2016 6:30 AM
To: makamaka@sandwichisles.net
Cc: Will, Michael (FHWA)
Subject: FW: Project Name : HI STP SR200 SADDLE ROAD EXTENSION

Isaac,

Good morning. Thank you for your inquiry into the Saddle Road Extension project. Attached are our responses to you inquiry. We have submitted our draft AIS to SHPD in February, but have not received comments on it to date. We could provide our draft AIS report to you with the understanding that it is draft and subject to change pending SHPD comment and resolution.

Also, unfortunately we do not have title report information at this time. Our process usually starts with a vesting deed which identifies land owners within an area (refer to table 4 in attachment). If a project requires property acquisitions, then we will complete a full title search but that process occurs closer to the acquisition action. Title information should be available later in the project process and can be provided once available.

Regards,
Thomas W. Parker
Environmental Protection Specialist
Federal Highway Administration
Central Federal Lands Highway Division
12300 W. Dakota Ave., Suite 280
Lakewood, CO 80228
Work: (720) 963-3688
Mobile: (970) 509-0858

please consider the environment before printing this email

From: Will, Michael (FHWA)
Sent: Tuesday, July 12, 2016 11:57 AM
To: 'ron terry' (rterry@hawaii.rr.com); Parker, Thomas W (FHWA); Winterton, Nicole (FHWA)
Subject: FW: Project Name : HI STP SR200 SADDLE ROAD EXTENSION

Could use your support on the below message.

J. Michael Will, P.E.: Project Manager / Construction Operations Engineer
Federal Highway Administration
Central Federal Lands Highway Division: 12300 W. Dakota Avenue, Suite 380; Lakewood CO 80228
office: 720.963.3647 **:** cell: 303-956-5054 **:** **fax:** 720.963.3596 **:** **email:** michael.will@dot.gov **:** **web:** http://www.cflhd.gov

---

From: Makamaka [mailto:makamaka@sandwichisles.net]
Sent: Saturday, July 02, 2016 1:06 AM
To: Will, Michael (FHWA)

Cc: Fred Keakaokalani Cachola; Isaac "Paka" Harp
Subject: Project Name : HI STP SR200 SADDLE ROAD EXTENSION

Aloha Michael,

I understand that Public Review of the Draft Environmental Impact Statement for Project Name : HI STP SR200 SADDLE ROAD EXTENSION is scheduled for late summer / early fall 2016.

I am interested in any details you might share on Section 106 of the National Historic Preservation Act of 1966.

1) Please include any comments provided by the Hawaii State Historic Preservation Officer and the Federal Advisory Council on Historic Preservation.

2) Please include a list of individuals and organizations that have been involved in consultation.

3) Please provide a list of property owners, private and or government, whose property may be affected by the project.

4) Finally, if property has been or will need to be acquired for the project, please provide the chain of title to each property.

Thank you,

Isaac Harp
P.O. Box 437347
Kamuela, HI 96743

SADDLE ROAD EXTENSION
SOUTH KOHALA, HAWAI‘I

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Appendix F Traffic Report

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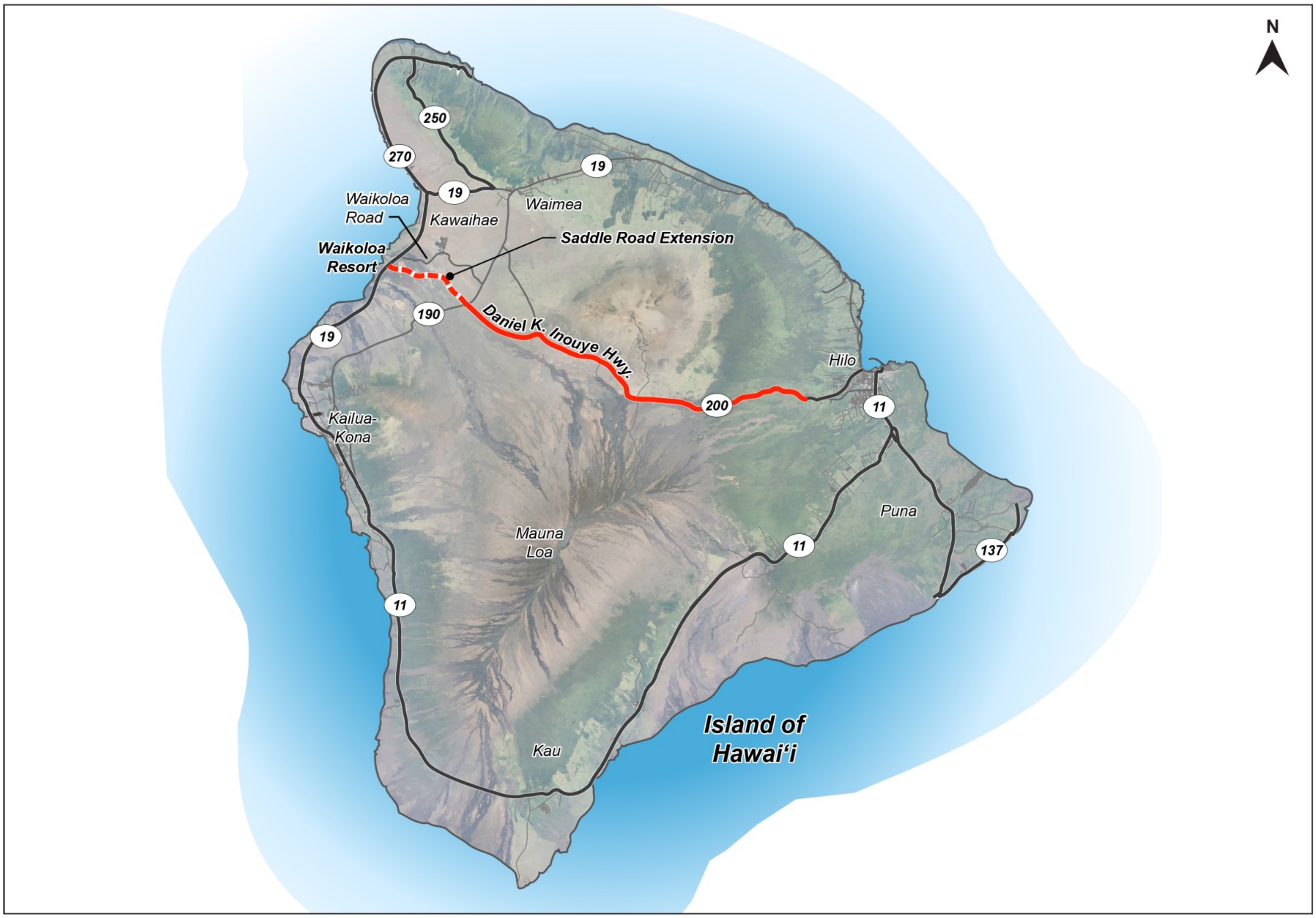
Transportation Impact Assessment Report

Saddle Road Extension

January 2017



AECOM

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About AECOM

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Transportation Impact Assessment Report

Saddle Road Extension
Māmalahoa Highway to Queen Ka‘ahumanu Highway
Waikoloa, Hawai‘i

January 2017

Prepared for:

Okahara & Associates, Inc.
200 Kohola Street
Hilo, Hawai‘i 96720
(808) 961-5527

Prepared by:

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1001 Bishop Street, Suite 1600
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Project Reference: 60436539

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EXECUTIVE SUMMARY

HDOT in association with FHWA-CFL has been improving Saddle Road with the intent of making it the key cross-island highway on the island of Hawaiʻi. Recent traffic volumes counts have indicated rapid growth in travelers using Saddle Road and projected year 2035 volume forecasts indicate that Saddle Road will be the primary cross-island route in the future.

As Saddle Road achieves its purpose as the primary cross-island route, there is a need to assure that appropriate roadway network connections are provided on the west side of the island of Hawaiʻi. Currently, the primary regional north-south route on this side of the island is Queen Kaʻahumanu Highway. Māmalahoa Highway also serves this direction of travel but is secondary to Queen Kaʻahumanu Highway in traffic volume capacity and in its suitability to carry high-speed regional traffic.

Regional traffic using Saddle Road needs connectivity with Queen Kaʻahumanu Highway to maintain a regional roadway system. Currently, this connection is provided by an existing circuitous route via Waikoloa Road, a collector roadway that connects Queen Kaʻahumanu Highway and Māmalahoa Highway. Waikoloa Road is meant to provide access to and from the Waikoloa Village community and other future developments along the Waikoloa Road corridor and is not an arterial type roadway suitable for regional traffic.

The Saddle Road Extension (SRX) is a proposed connector roadway that will provide the appropriate regional connection between the current terminus of Saddle Road at Māmalahoa Highway and Queen Kaʻahumanu Highway.

The analyses contained in this report indicate that in addition to providing the appropriate regional connection to Queen Kaʻahumanu Highway, the proposed SRX will benefit the roadway network in reducing projected future traffic congestion at key intersections within the study area and reducing the need for roadway improvements on Māmalahoa Highway. Improvements would be needed on Queen Kaʻahumanu Highway where the SRX is proposed to intersect it. An added benefit of the proposed SRX is the forecasted reduction in through traffic volume using Waikoloa Road, thereby improving traffic operations at the Waikoloa Village access and increasing traffic safety along Waikoloa Road.

I. INTRODUCTION

A. Purpose of this Study

The purpose of this study is to evaluate the traffic impacts of the proposed Saddle Road Extension between Māmalahoa Highway and Queen Kaʻahumanu Highway. Figure 1 illustrates the general study corridor for the proposed Saddle Road Extension (SRX).

The proposed SRX will provide a roadway of the appropriate functional classification and provide a more direct route between the existing western terminus of Saddle Road at Māmalahoa Highway and the Queen Kaʻahumanu Highway regional arterial roadway. The proposed SRX is essentially a completion of the regional roadway network on the west side of the island of Hawaiʻi.

Future peak hour traffic operations at key intersections are evaluated and compared for three alternative alignments of the proposed SRX and a "no build" alternative.

The analyses in this study will also be incorporated into the Environmental Assessment (EA) being prepared for the proposed SRX.

B. Background of Saddle Road and the Saddle Road Extension

The State of Hawaiʻi Department of Transportation (HDOT) and the Federal Highways Administration Central Federal Lands Highway Division (FHWA-CFLHD) have been working for the past decade to upgrade the Saddle Road (Route 200) on the Island of Hawaiʻi (Big Island).

Five improvement phases have been completed so far:

1. Mauna Kea Access Road to Mauna Kea State Park (2007)
2. MP 19 to Mauna Kea Access Road (2008)
3. Mauna Kea State Park to MP 42 (2009)
4. MP 11 to MP 19 (2011)
5. W-7 (MP 42 to realigned terminus at Māmalahoa Hwy) (2013)

Figure 2 illustrates the location of Saddle Road and approximately identifies the extent of the improvements.

The Saddle Road has been officially renamed as the Daniel K. Inouye Highway. To maintain consistency with some historical documentation, however, this report will continue to refer to Route 200 as Saddle Road. The improvements to Saddle Road have transformed a majority of its length from a rural roadway to a modern principal arterial facility. As improvements have been completed, Saddle Road has increasingly become a desirable alternative route to the existing Māmalahoa Highway along the Hamakua Coast between east and west areas of the Big Island.

Currently, the western end of Saddle Road terminates at Māmalahoa Highway (Route 19). From that intersection, traffic from eastern Big Island must turn either north or south to travel to major destinations:

- South along Māmalahoa Highway to Kailua-Kona;
- North along Māmalahoa Highway to Waimea;
- North along Māmalahoa Highway then west on Waikoloa Road to Waikoloa Village and South Kohala resort areas;
- North along Māmalahoa Highway, west on Waikoloa Road, then north on Queen Kaʻahumanu Highway to Kawaihae Harbor.

Figure 1 Saddle Road Extension Study Corridor

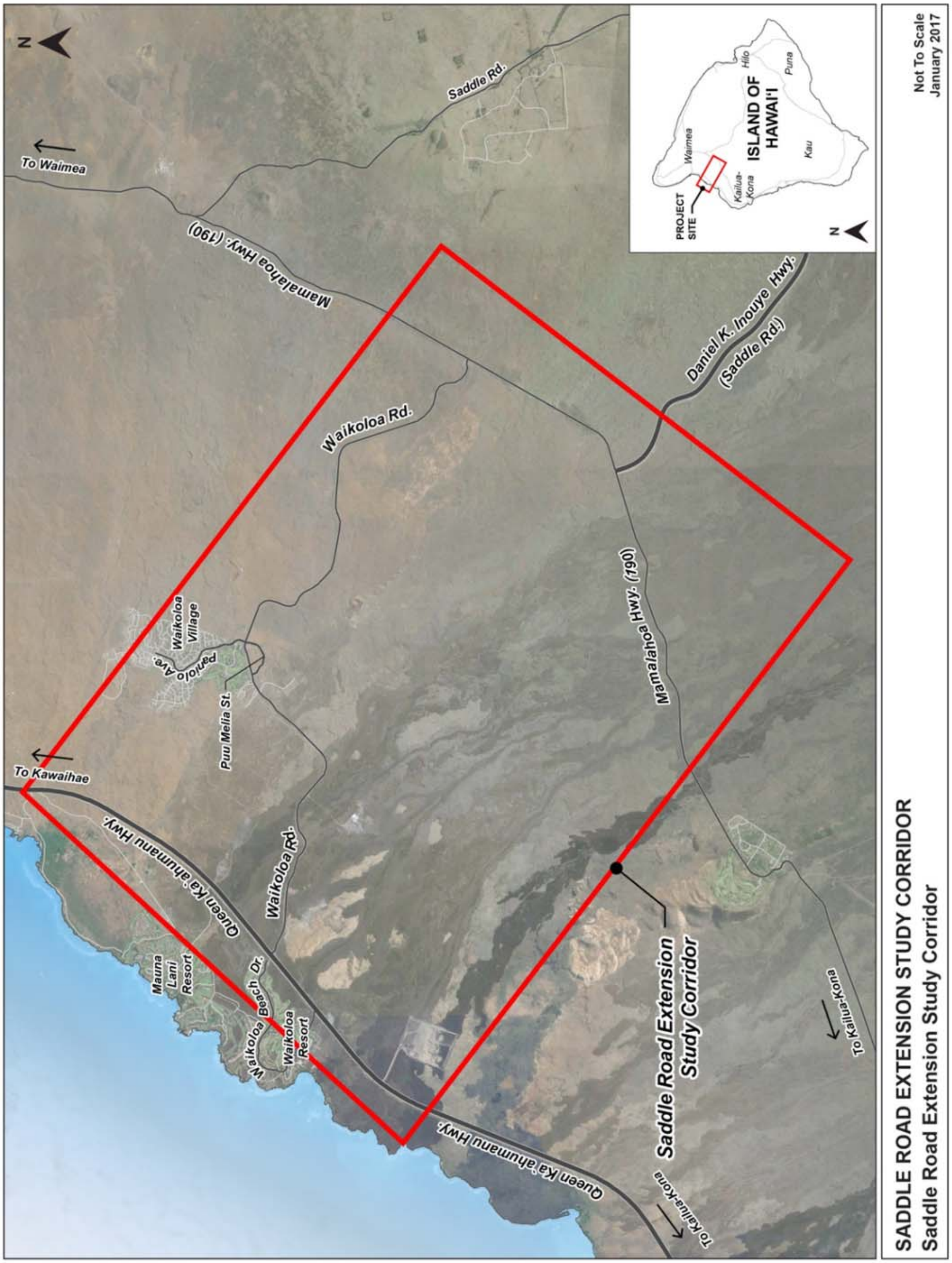
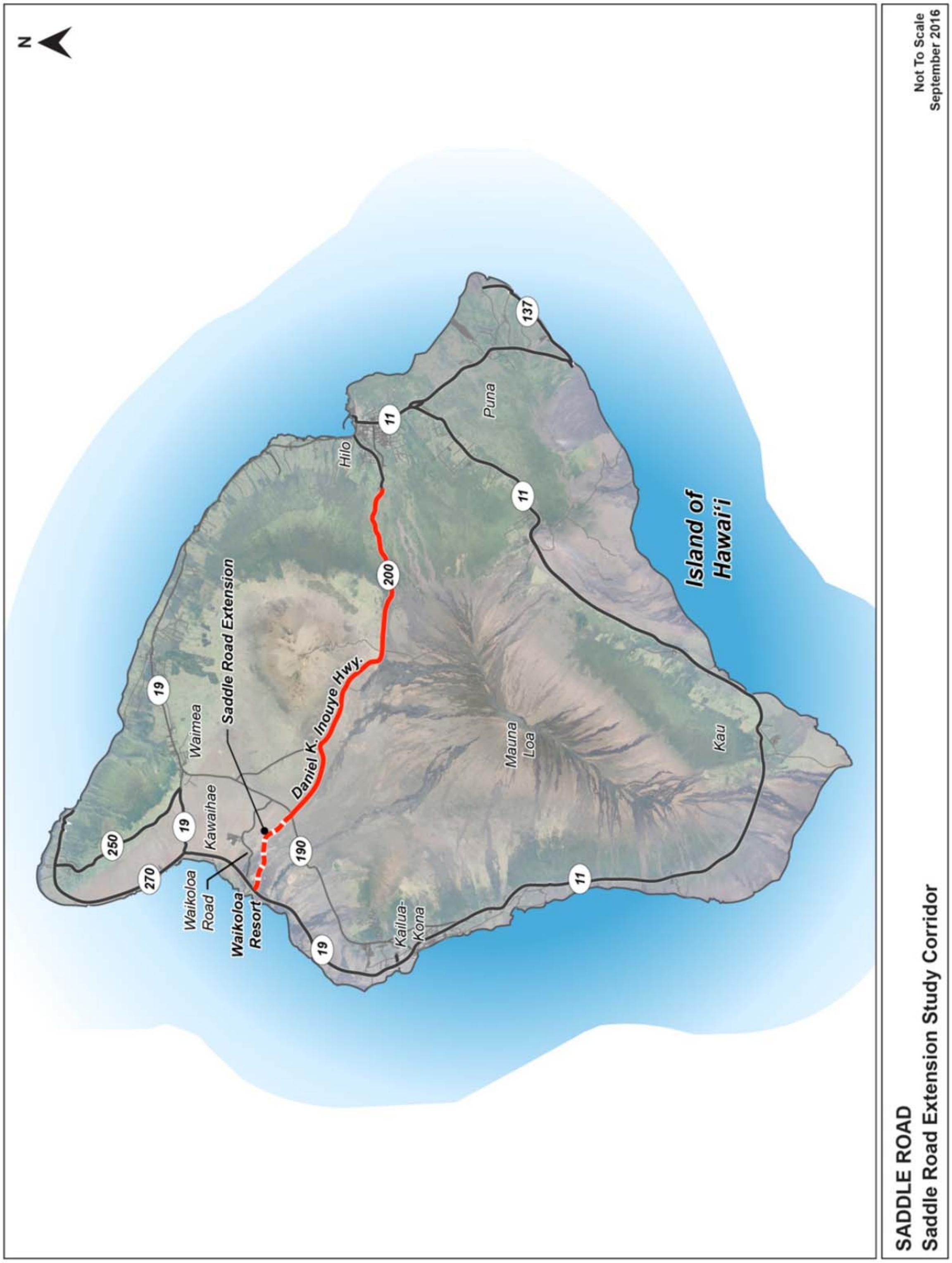


Figure 2 Saddle Road



While Māmalahoa Highway was once the primary roadway for travel between Kailua-Kona and Waimea, Kawaihae, and Kohala, construction of Queen Kaʻahumanu Highway 40 years ago as a new, modern standard roadway has made it the primary north-south roadway in this area. Although HDOT continues to maintain Māmalahoa Highway, its alignment and overall roadway cross-section makes it less desirable to handle regional traffic due to its older design constraints.

As Saddle Road increases in importance as the primary cross-island connector, traffic demand between its Saddle Road/Māmalahoa Highway terminus and Queen Kaʻahumanu Highway is projected to increase. This is projected to challenge the ability of the existing roadway network on the west side of the Big Island to accommodate this demand.

Māmalahoa Highway and Waikoloa Road are two roadway network elements projected to be affected by the forecasted increase in demand. Currently, Waikoloa Road serves as the de-facto connector between Māmalahoa Highway and Queen Kaʻahumanu Highway in this part of the Big Island. Waikoloa Road is not designed to handle regional traffic, and because its primary purpose is to provide access to and from the Waikoloa Village community, it is not desirable for Waikoloa Road to handle regional traffic.

These factors led to the consideration of an extension to the existing Saddle Road that would help to convey regional traffic more directly between Saddle Road and Queen Kaʻahumanu Highway with less impact to the existing local roadway network.

C. Study Approach

This transportation impact assessment is focused on evaluating peak hour traffic operational impacts of the proposed SRX at key intersections. The evaluation will consist of comparative analyses between the "no build" and three "build" SRX alternatives.

AM and PM peak hour traffic operations are evaluated at the following intersections:

- Queen Kaʻahumanu Highway/Waikoloa Road;
- Māmalahoa Highway/Waikoloa Road;
- Māmalahoa Highway/Saddle Road/SRX;
- Queen Kaʻahumanu Highway/Waikoloa Beach Road/SRX;
- Waikoloa Road/Paniolo Drive/Pua Melia Street;
- Waikoloa Road/SRX (Future Alternatives 5 and 6 only).

Figure 3 illustrates the location of the key intersections.

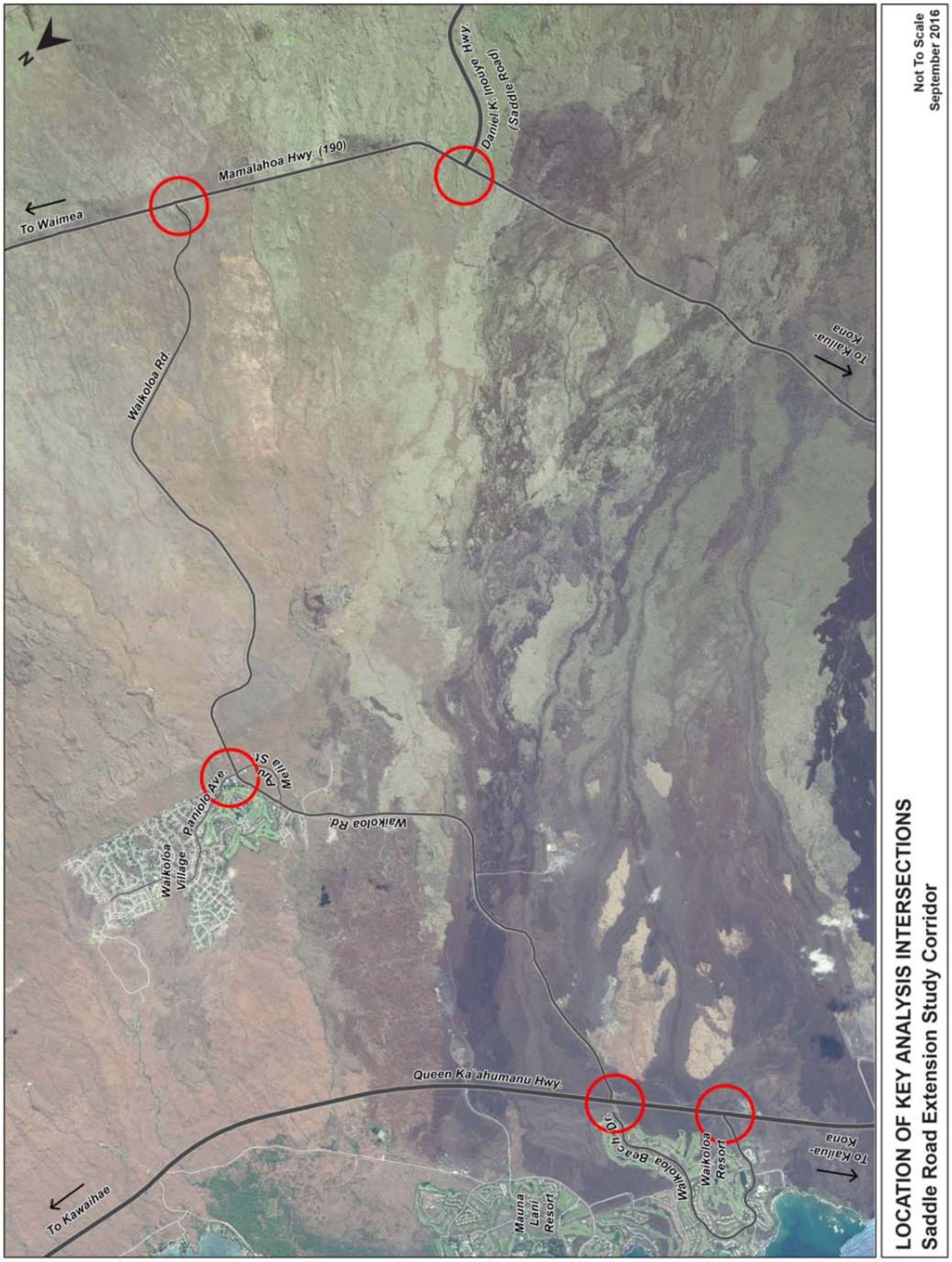
This analysis focuses on a sub-area comparison of alternatives. As such, standard intersection configurations are assumed. However, as project moves into implementation, alternative intersection configurations such as roundabouts could be considered where appropriate.

Intersection operations are evaluated for the following time frames:

- Base Year 2014
- Projected Year 2035

The projected 2035 time frame is the planning horizon year for the Federal-Aid Highways 2035 Transportation Plan for the District of Hawaii, used by the State of Hawaiʻi Department of Transportation (HDOT) as its long-range transportation plan for the Island of Hawaiʻi.

Figure 3 Locations of Key Analysis Intersections



II. EXISTING CONDITIONS

A. Existing Roadways

Key roadways within the study area are:

- Saddle Road (Daniel K. Inouye Highway);
- Queen Kaʻahumanu Highway;
- Māmalahoa Highway;
- Waikoloa Road.

Saddle Road (Daniel K. Inouye Highway)

Saddle Road is a regional arterial roadway that provides cross-island mobility for the Big Island. It is mostly a two-lane, undivided roadway with paved shoulders along its improved segments. An additional eastbound climbing lane is provided from Māmalahoa Highway to the vicinity of the junction with the old Saddle Road segment.

Saddle Road has been incrementally improved over the past decade and is now a principal arterial roadway capable of handling. It is posted at 55 mph with selected reduced speed segments posted at 35 mph.

Queen Kaʻahumanu Highway

Queen Kaʻahumanu Highway is the primary regional north-south arterial roadway handling traffic on the west side of the Big Island between Kailua-Kona and Kawaihae. It is mostly a two-lane, undivided roadway with paved shoulders. HDOT has been incrementally widening Queen Kaʻahumanu Highway to a four-lane, divided roadway starting from Kailua-Kona. The widening has reached Kealakehe Parkway and is planned to extend to the Kona Airport Access Road in the near future.

Most of its length is posted with a 55 mph speed limit with selected areas of reduced speed posted between 35 and 45 mph. Within the study area, Queen Kaʻahumanu Highway is posted at 45 mph.

Key intersections along its length are channelized with left-turn lanes and right-turn acceleration and deceleration lanes. Selected intersections are signalized. Within the study area, the intersections of Waikoloa Beach Drive and Waikoloa Road are both signalized.

Māmalahoa Highway

Māmalahoa Highway serves as the mauka north-south arterial roadway on the west side of the Big Island. It is a two-lane, unidvided arterial roadway with curvilinear horizontal and vertical alignment.

It is posted primarily at 50 mph with selected areas of reduced speed posted between 35 and 45 mph. Within the study area, Māmalahoa Highway is posted at 50 mph.

Wtihin the study areas, key intersections are at Saddle Road (Daniel K. Inouye Memorial Highway) and at Waikoloa Road. Both intersections are unsignalized with STOP-sign control on the Saddle Road and Waikoloa Road approaches.

Waikoloa Road

ne, undivided roadway for most of its length. In the vicinity of Waikoloa Village, it is a 4-lane, divided roadway with unsignalized intersections at Paniolo Drive/Pua Melia Street (mauka leg), Pua Melia Street (makai leg), and Uluwehi Street.

Waikoloa Village is a major residential community with a community shopping center and other facilities such as a post office and other support facilities. The Waikoloa Road/Paniolo Drive/Pua Melia Street (mauka leg) intersection provides primary access into Waikoloa Village including the community shopping center and the golf course. The post office, other commecial development, and apartments are located along Pua Melia Street with most of the existing development concentrated near the Paniolo Drive intersection. Routing regional traffic through Waikoloa Road would force this intersection to handle regional through traffic as well as local community traffic. As an example, existing AM peak hour traffic volumes mauka of Paniolo Avenue total 420 vehicles per hour (vph). Under the "No-Build" alternative, projected year 2035 AM peak hour traffic volumes would total 1,995 vph. Local vehicular and pedestrian traffic frequently cross Waikoloa Road in travelling between land uses located on the north and south sides of Waikoloa Road at this intersection. Indicative of the disruption that even existing levels of traffic cause, traffic calming measures have been implemented to preserve traffic safety at this intersection.

Waikoloa Road is posted at 45 mph for most of its length with the segment in the vicinity of Waikoloa Village posted at 35 mph.

B. Base Year 2014 Traffic Volumes

Base Year 2014 link traffic volumes were collected for the major roadways within the study area and peak hour traffic turning movement volumes were collected for key intersections.

Figure 4 illustrates the link volumes while Figure 5 illustrates peak hour turning movements for the Base Year 2014 time frame.

The link traffic volumes were collected by HDOT and reflect traffic volumes on the major roadways for a 24-hour period. The turning movement traffic volumes were collected via turning movement counts conducted by Phillip Rowell and Associates at the key intersections shown.

C. Base Year 2014 Intersection Operations

The key intersections were analyzed for the Base Year 2014 condition based on peak hour traffic turning movement volumes shown in Figure 5 and the existing intersection configurations. The appropriate signalized or unsignalized intersection capacity methods documented in the 2010 Highway Capacity Manual were applied using the Synchro/Sim Traffic software.

Table 1 summarizes the results of the analyses.

As shown, most intersections operate acceptably for peak hour conditions.

Figure 4 Base Year 2014 24-hour Traffic Volumes

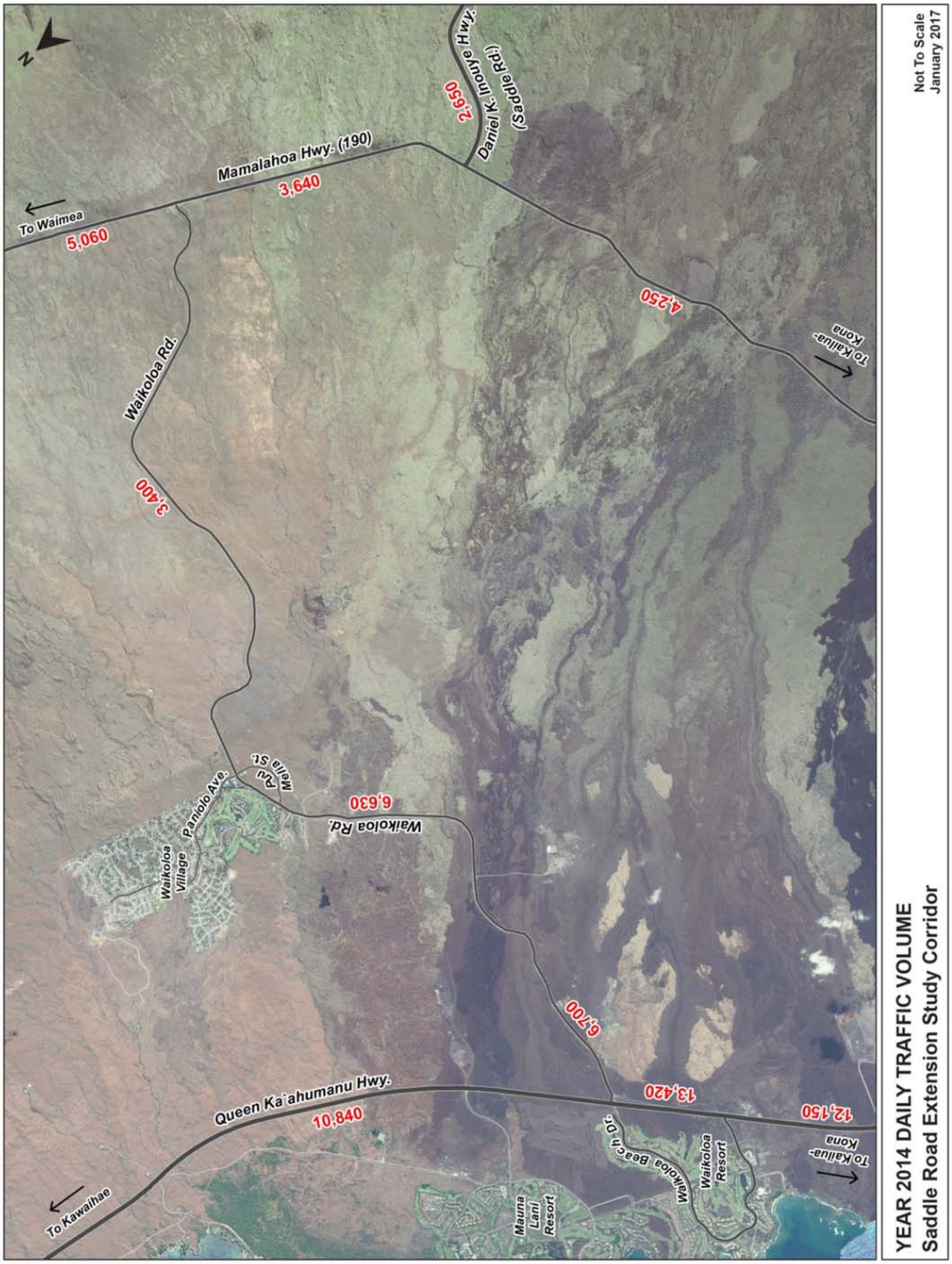
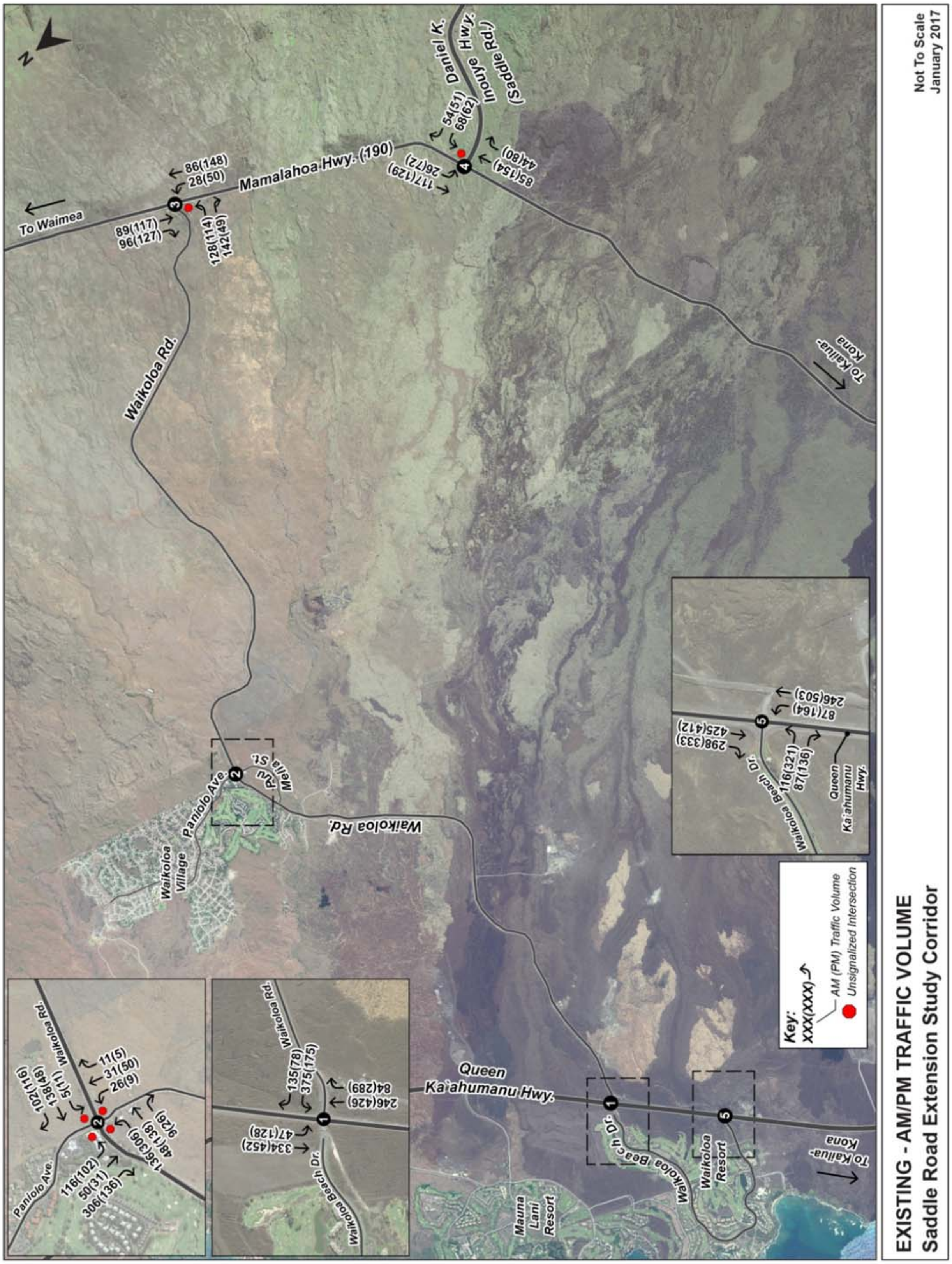


Figure 5 Base Year 2014 PM Peak Hour Traffic Volumes



Intersection	Control	AM Peak Hour		PM Peak Hour	
		Delay	LOS	Delay	LOS
Māmalahoa Hwy/SRX	2-way Unsig	7.4/10.7/9.0	A/B/A	7.7/12.9/9.4	A/B/A
Māmalahoa Hwy/Waikoloa Rd	2-way Unsig	0.1/0.7/0.6	A/B/A	7.6/12.8/9.1	A/B/A
Queen Kaahumanu Hwy/Waikoloa Beach Road	Signalized	12.2	B	19.6	B
Queen Kaahumanu Hwy/Waikoloa Road	Signalized	14.9	B	14.4	B
Waikoloa Rd/Paniolo Dr/Pua Melia	All-way Unsig	10.5/10.8/ 11.3/16.5	B/B/ B/C	16.5/10.5/ 10.8/11.3	C/B/ B/B

Note: Delay is in seconds/vehicle
2-way unsig = Left turn from major street/left turn from minor street/right turn from minor street
All-way unsig = EB approach/WB approach/NB approach/SB approach
Synchro worksheets are in Appendix

Table 1 Base Year 2014 PM Peak Hour Intersection Operations

As shown in Table 1, the key intersections operate acceptably to well for peak hour conditions with Level of Service (LOS) C and B operation. There instances of vehicle queueing that occur for selected movements, especially the left-turn movements. However, the observed queuing was for a fairly short duration and the overall operation was LOS C or better.

III. PROJECTED YEAR 2035 CONDITIONS

A. Projected Year 2035 Roadways

The projected Year 2035 roadways are based on the long-range transportation planning assumptions contained in the Federal-Aid Highways 2035 Transportation Plan for the District of Hawaii, July 2014 (LR Plan). The following are assumed:

- Saddle Road – Improvements completed to Hilo (Table 6-2 of LR Plan);
- Queen Kaʻahumanu Highway – widen from two to four from Kona International Airport to Kawaihae-Waimea Road (Table 6-2 of LR Plan);
- Waikoloa Beach Drive – loop through Waikoloa Beach Resort completed with second connection to Queen Kaʻahumanu Highway located opposite existing Waikoloa Road (Current Conditions of Development);
- Intersection control: both Saddle Road and Waikoloa Road intersections on Māmalahoa Highway and the Waikoloa Road/Paniolo Drive intersection assumed to be signalized by the projected year 2035 time frame to enable comparative analyses. Alternative configurations could be explored at implementation;
- Intersection configuration: all key intersections are assumed to be fully channelized, providing separate lanes for right and left-turning movements.

B. Saddle Road Extension (SRX) Alternatives

Four (1 No Build and 3 Build) alternatives were evaluated as part of this analysis.

The Build Alternatives resulted from previous efforts that screened a larger number of alternatives to the three alternatives through consultations with agencies and the community. These three Build alternatives were selected for more detailed evaluation in comparison with the No Build alternative.

No Build

The No Build alternative analyses reflect conditions that would occur if no Saddle Road Extension were constructed. In this case, all traffic using the Saddle Road would use Māmalahoa Highway for at least part of their trip. This includes regional traffic destined for Kailua-Kona, North Kona and Kawaihae as well as the more local trips destined for Waikoloa Village, Waimea, and mauka areas along Māmalahoa Highway. Traffic that desire to reach Queen Kaʻahumanu Highway, the primary regional roadway on the west side of the Big Island, would need to utilize Waikoloa Road, a collector type roadway meant to be used as access to Waikoloa Village and future development in the surrounding areas. Regional traffic traveling between areas to the south such as Kailua-Kona and North Kona are projected to primarily utilize Māmalahoa Highway.

Build Alternative 4

This alternative would extend Saddle Road between Māmalahoa Highway and Queen Kaʻahumanu Highway as an independent alignment, thereby allowing regional traffic between Saddle Road and Kailua-Kona, North Kona and Kawaihae to directly access Queen Kaʻahumanu Highway without impacting Waikoloa Road. Saddle Road traffic destined for Waikoloa Village and surrounding areas would still utilize Māmalahoa Highway and Waikoloa Road. Figure 6 illustrates the proposed Build Alternative 4 alignment.

Build Alternative 5

Alternative 5 is similar to Alternative 4 except it proposes a Saddle Road Extension alignment that approaches closer to the existing Waikoloa Road, facilitating a connection with Waikoloa Road that requires only a short segment of connecting roadway between the proposed Saddle Road Extension and the existing Waikoloa Road. In this alternative, this intersection junction would occur approximately 3 miles mauka of Queen Kaʻahumanu Highway. With this configuration, regional traffic between Māmalahoa Highway and Queen Kaʻahumanu Highway would use the proposed Saddle Road Extension as in Alternative 4. Waikoloa Village and surrounding areas are assumed to use the proposed Saddle Road Extension instead of existing Waikoloa Road to reach Saddle Road. Additionally, traffic associated with Waikoloa Village and surrounding areas are projected to use the Saddle Road Extension to access Queen Kaʻahumanu Highway to the south. Waikoloa Village traffic interacting with areas to the north would continue to use existing Waikoloa Road to access Queen Kaʻahumanu Highway and Māmalahoa Highway. Figure 7 illustrates the proposed Build Alternative 5 alignment.

Alternative 6

Alternative 6 proposes an alignment for the Saddle Road Extension that is similar to Alternative 5 between Māmalahoa Highway and the point where is intersects with the existing Waikoloa Road. From there to Queen Kaʻahumanu Highway, Alternative 6 proposes an alignment that would generally utilize the existing Waikoloa Road alignment to a point approximately 0.50 miles mauka of Queen Kaʻahumanu Highway. From there, it would turn south and parallel Queen Kaʻahumanu Highway before turning makai to intersect it at the existing Waikoloa Beach Drive intersection. Existing Waikoloa Road would continue makai to its existing intersection with Queen Kaʻahumanu Highway. Given the short distance between the existing Queen Kaʻahumanu/Waikoloa Road intersection and the proposed Saddle Road Extension in this alternative, both Waikoloa Village and surrounding area and regional traffic to and from Kawaiahae and Kohala via Queen Kaʻahumanu Highway to the north would pass through the existing Waikoloa Road intersection as they do in the No Build Alternatives. Both Waikoloa Village and surrounding area and regional traffic to and from south Kohala coast and Kailua-Kona via Queen Kaʻahumanu Highway to the south area assumed to utilize the proposed Saddle Road Extension to its connection to the Waikoloa Beach Drive intersection. Figure 8 illustrates the proposed Build Alternative 6 alignment.

Figure 6 Build Alternative 4 Alignment

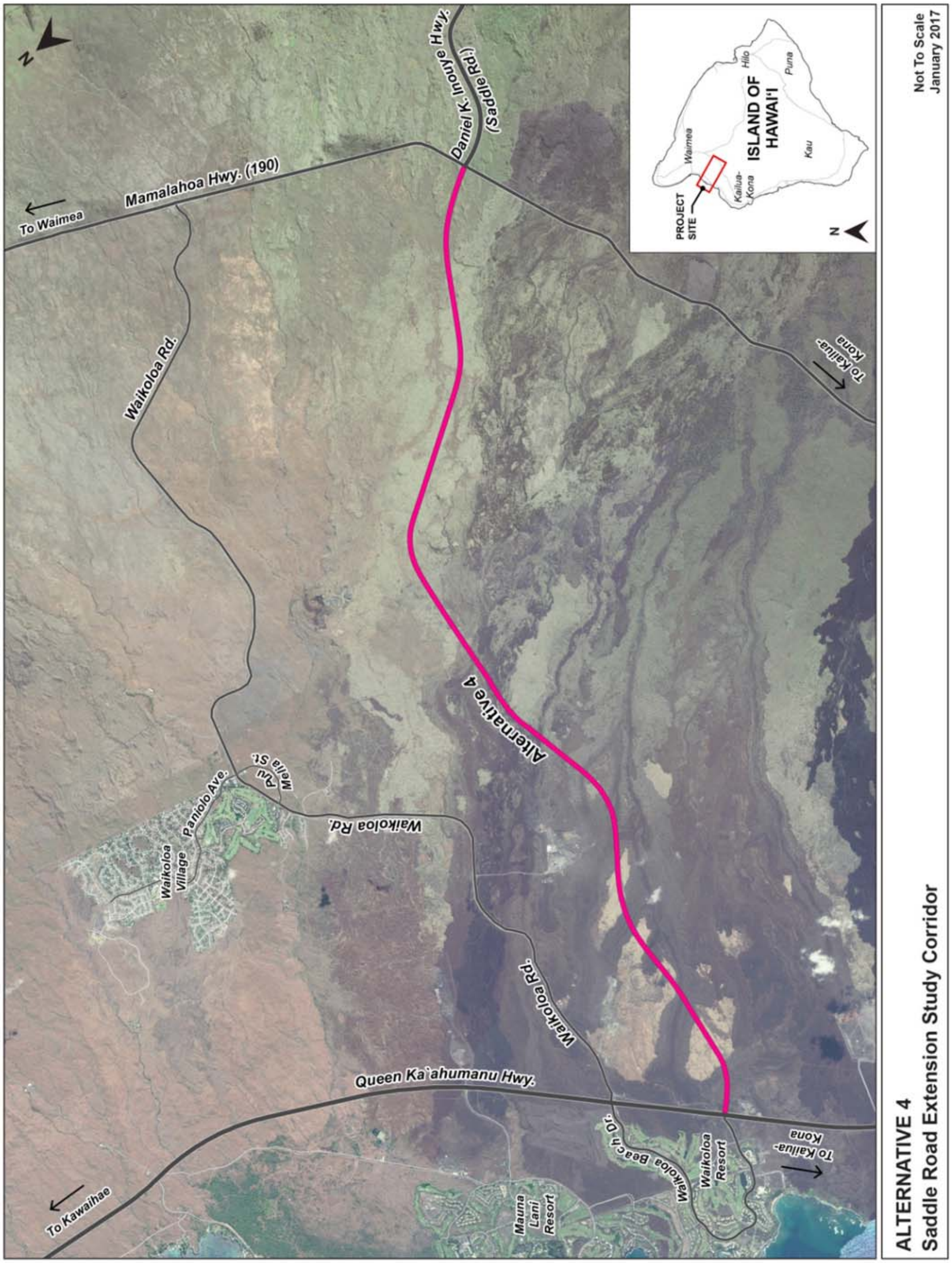


Figure 7 Build Alternative 5 Alignment

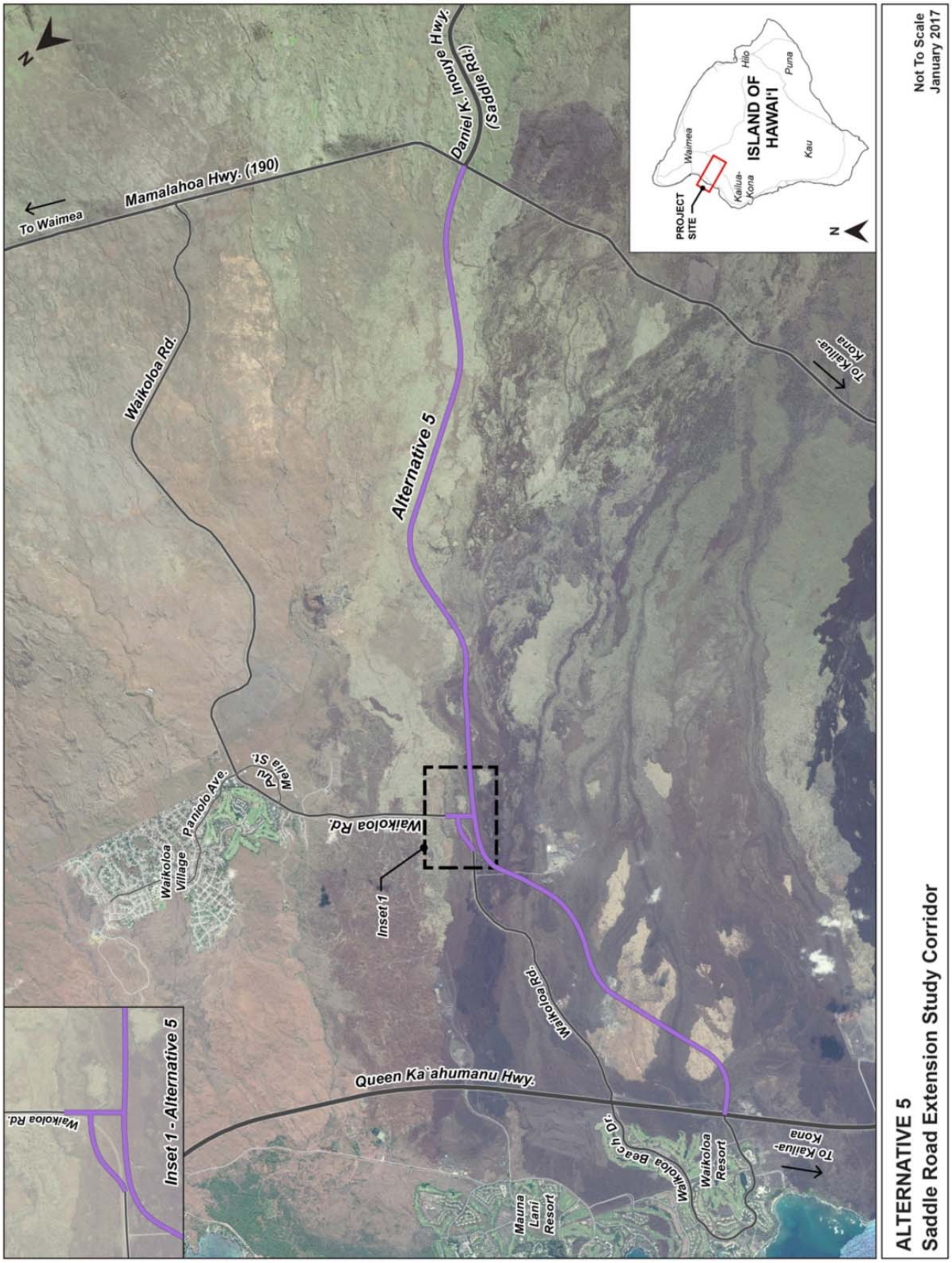
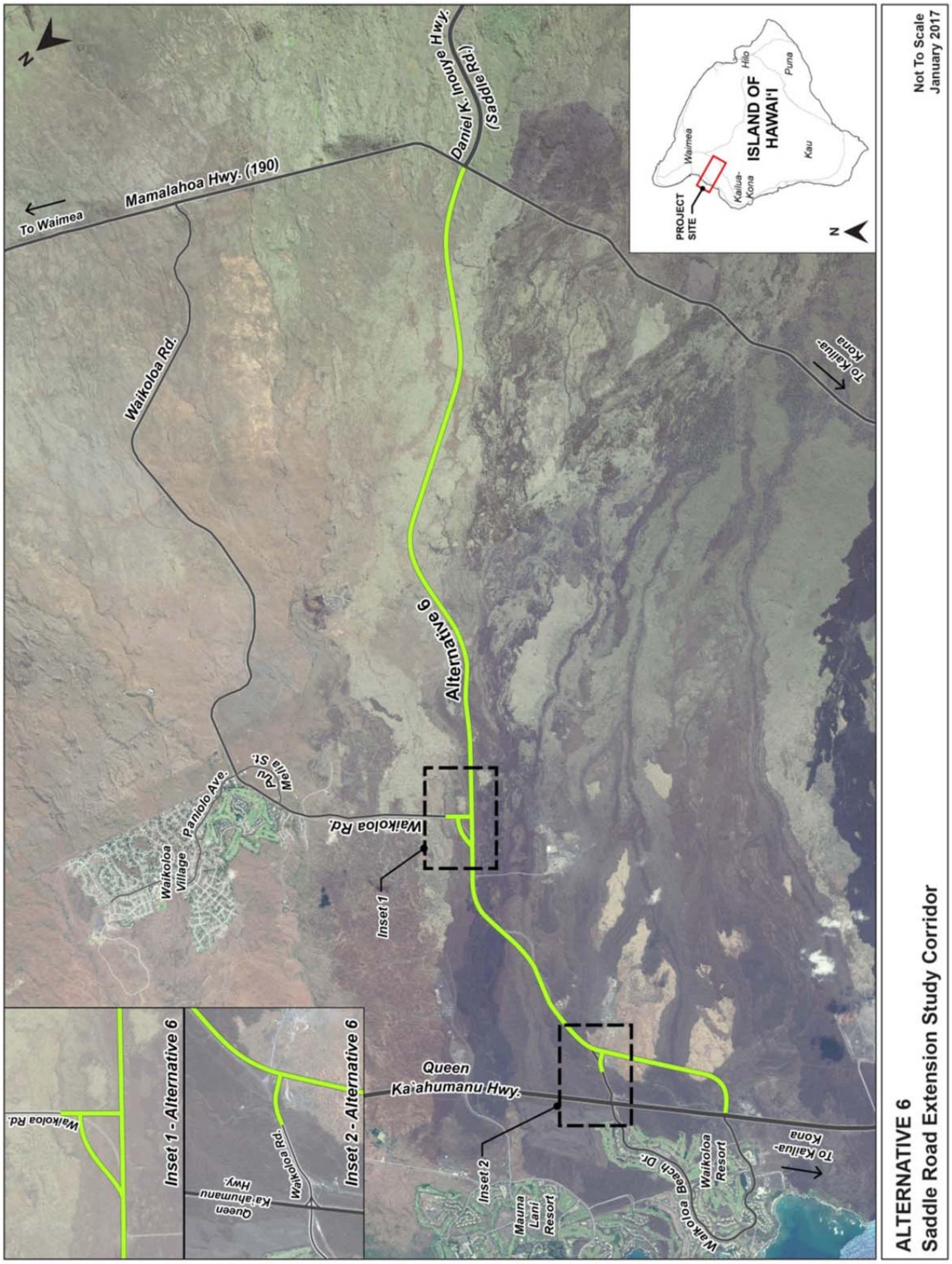


Figure 8 Build Alternative 6 Alignment



C. Projected Year 2035 Traffic Volumes

The projected Year 2035 traffic volumes for this study were derived from the travel demand model forecasts used as the basis for the Federal-Aid Highways 2035 Transportation Plan for the District of Hawaii, July 2014. These forecasted volumes were in the form of 24-hour and PM peak hour link volumes.

Figure 9 illustrates the forecasted Year 2035 No Build Alternative 24-hour traffic volumes. As shown, traffic volumes on Saddle Road are projected to increase significantly from current levels. Year 2014 daily traffic volume on Saddle Road, mauka of Māmalahoa Highway is 2,650 vehicles per day (vpd). The projected year 2035 daily traffic volume at the same location is forecasted to be 19,400 vpd. This is consistent with recent traffic volumes counts that have documented rapid increases in traffic volume on Saddle Road since the most recent improvements. Projected traffic volumes are also forecasted to significantly increase system wide within the study area with the most significant increases on Queen Kaʻahumanu Highway.

The forecasted Year 2035 No Build volumes, shown in Figure 9, indicate that as Saddle Road achieves its role as a primary cross-island arterial highway, these regional traffic volumes are expected to challenge the ability of both Māmalahoa Highway and Waikoloa Road to acceptably handle the traffic volume demand. The Saddle Road Extension provides a way to conduct this regional demand to Queen Kaʻahumanu Highway, the primary regional arterial on the west side of Hawaii Island using a roadway of the appropriate functional classification.

The projected Year 2035 "No Build" volumes were then reassigned for each "Build" alternative based on the likely diversion of traffic provided by the SRX. Figures 10, 11, and 12 illustrate the reassignment of the projected 2035 24-hour traffic volumes to reflect the effects of Build Alternatives 4, 5, and 6, respectively.

The forecasted Year 2035 24-hour volumes were translated into peak hour intersection turning movements for all alternatives using patterns analysis and traffic volumes balancing based on NCHRP 255 methods. Figure 13 illustrates the resulting projected year 2035 peak hour turning movements for the "No Build" alternative. Figures 14, 15, and 16 illustrate the projected Year 2035 peak hour turning movements for Build Alternatives 4, 5, and 6, respectively.

Figure 9 Projected Year 2035 24-hour Traffic Volumes – No Build

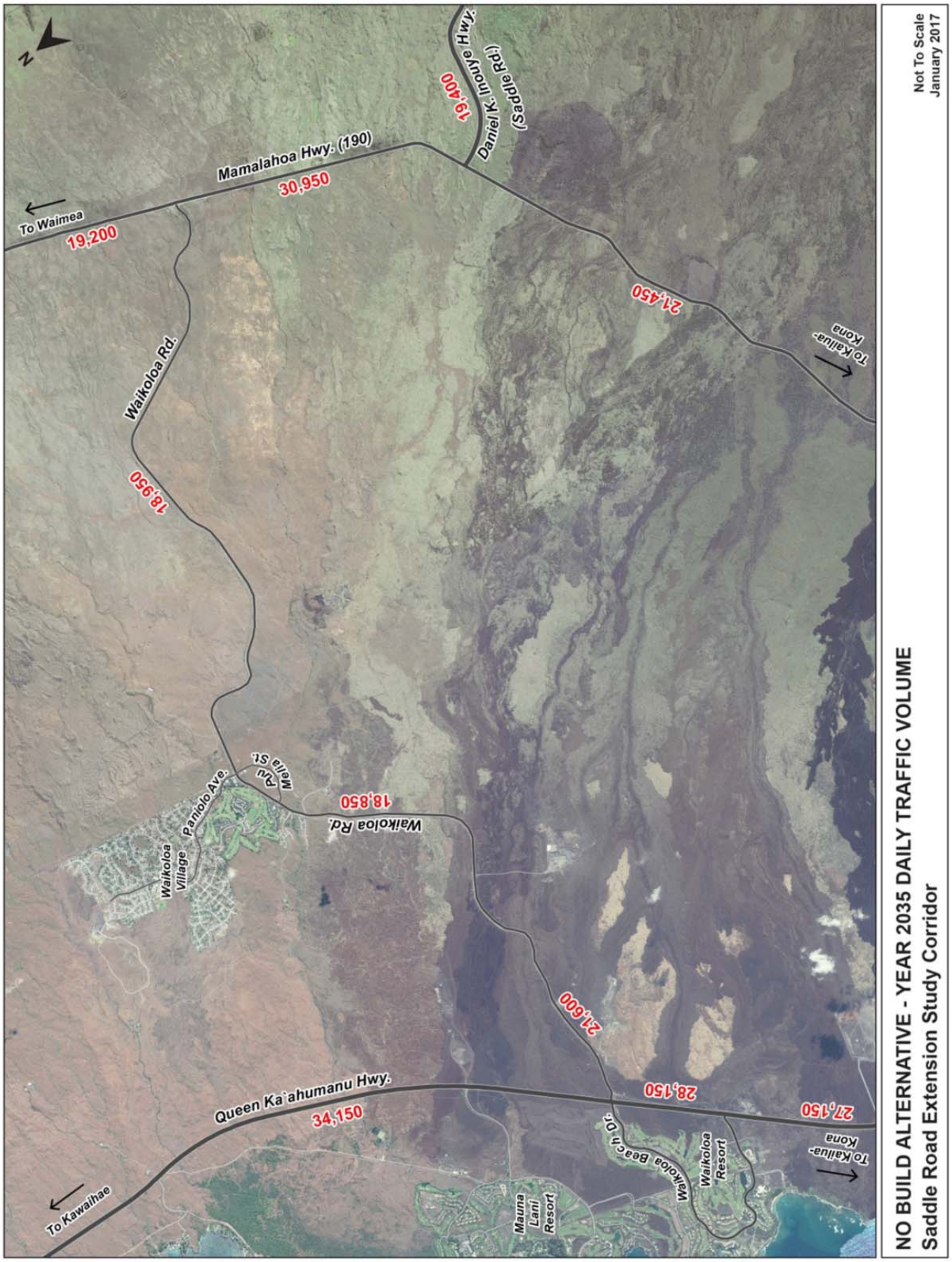


Figure 10 Projected Year 2035 24-hour Traffic Volumes –Alternative 4

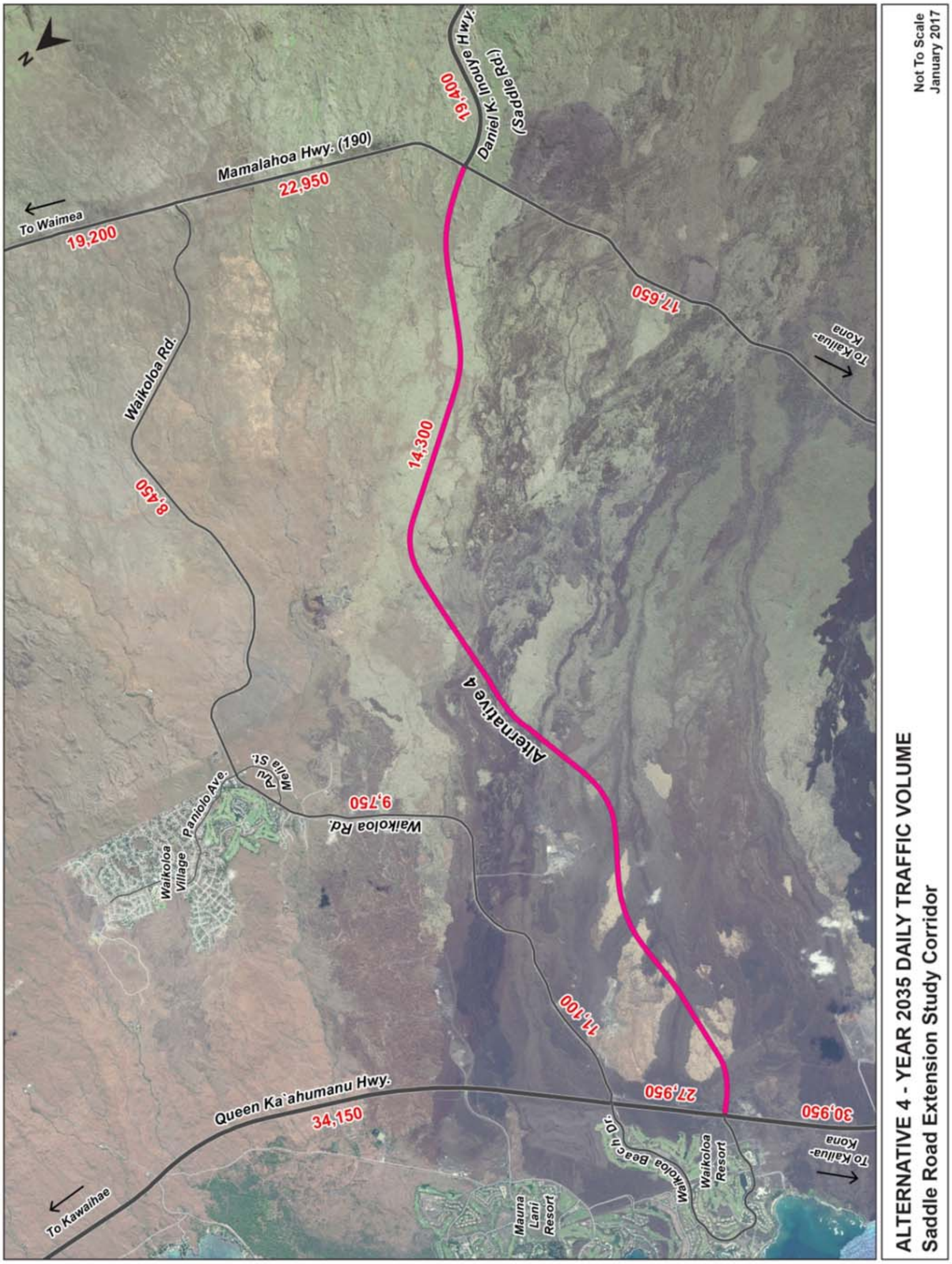


Figure 11 Projected Year 2035 24-hour Traffic Volumes – Alternative 5

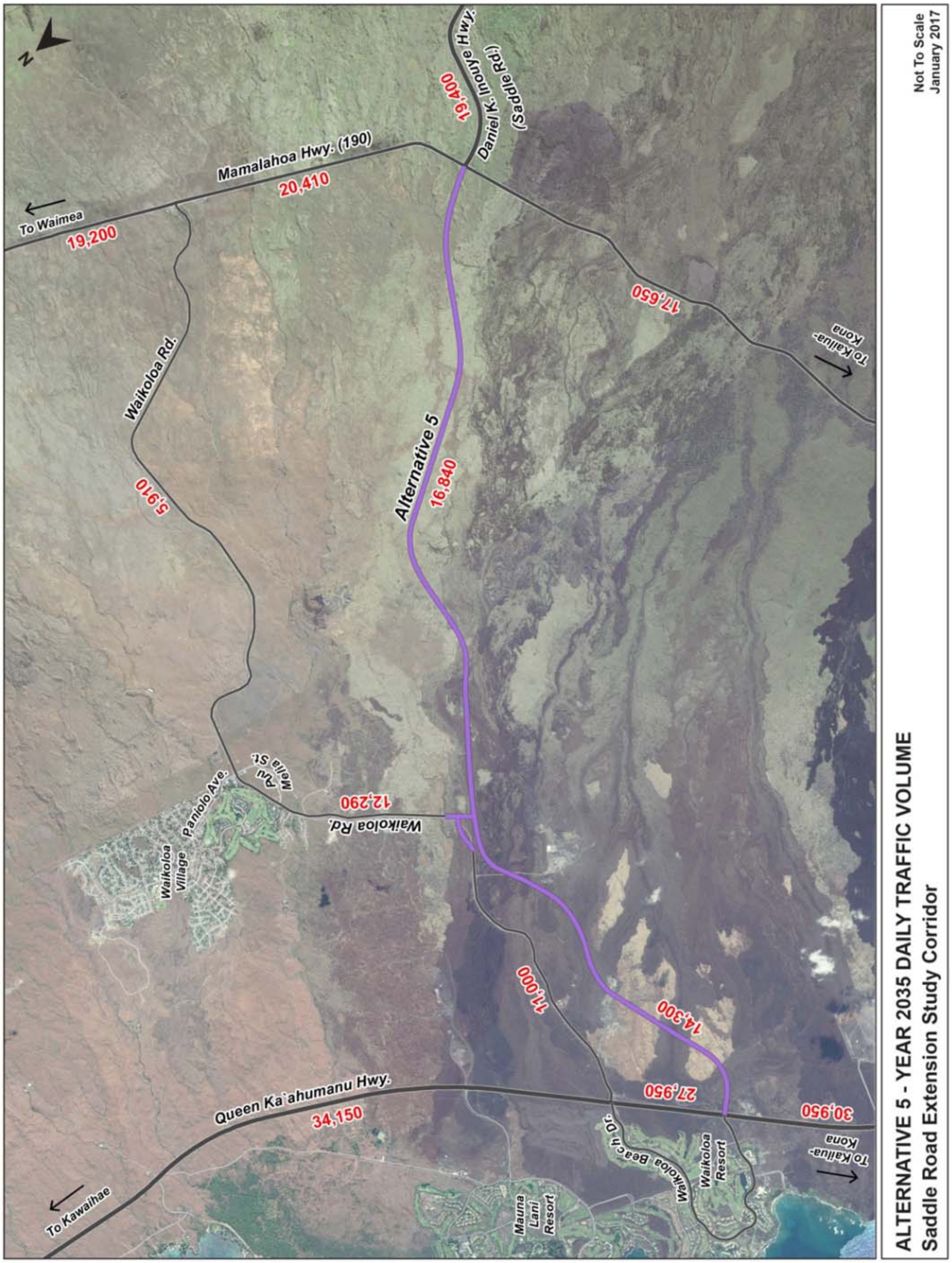


Figure 12 Projected Year 2035 24-hour Traffic Volumes – Alternative 6

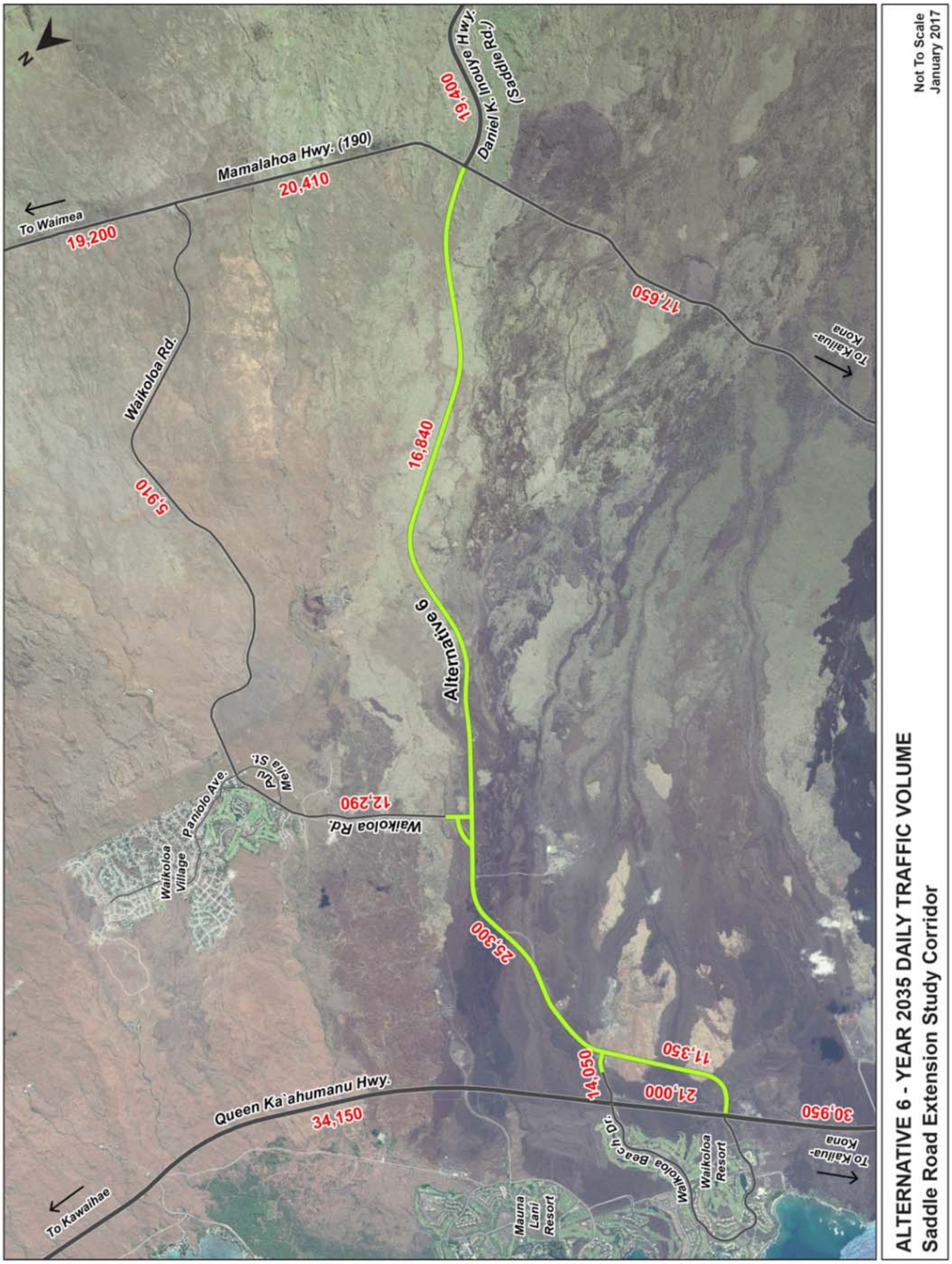


Figure 13 Projected Year 2035 Peak Hour Turning Movements- No Build Alternative

Figure 14 Projected Year 2035 Peak Hour Turning Movements- Build Alternative 4

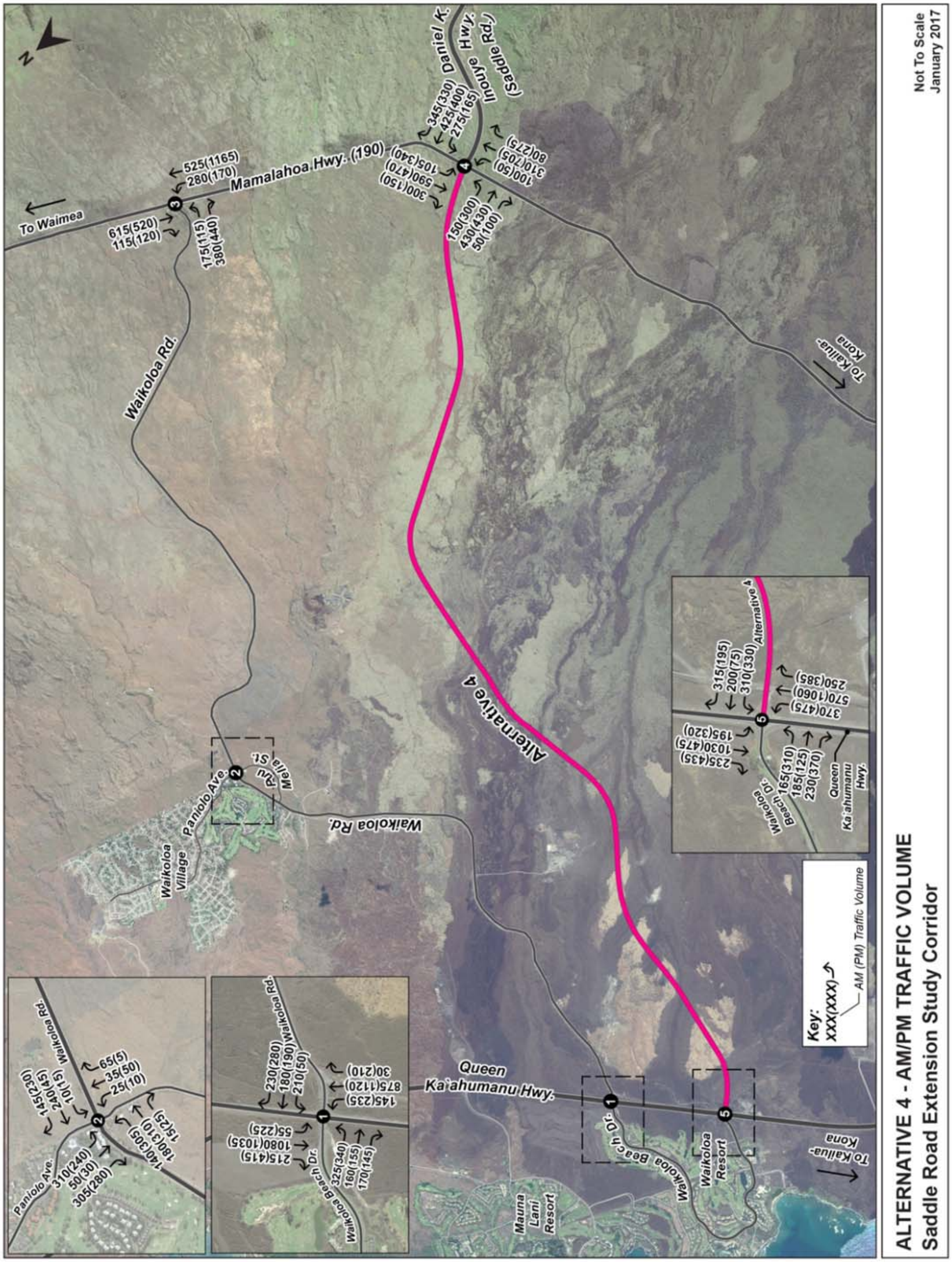


Figure 15 Projected Year 2035 Peak Hour Turning Movements- Build Alternative 5

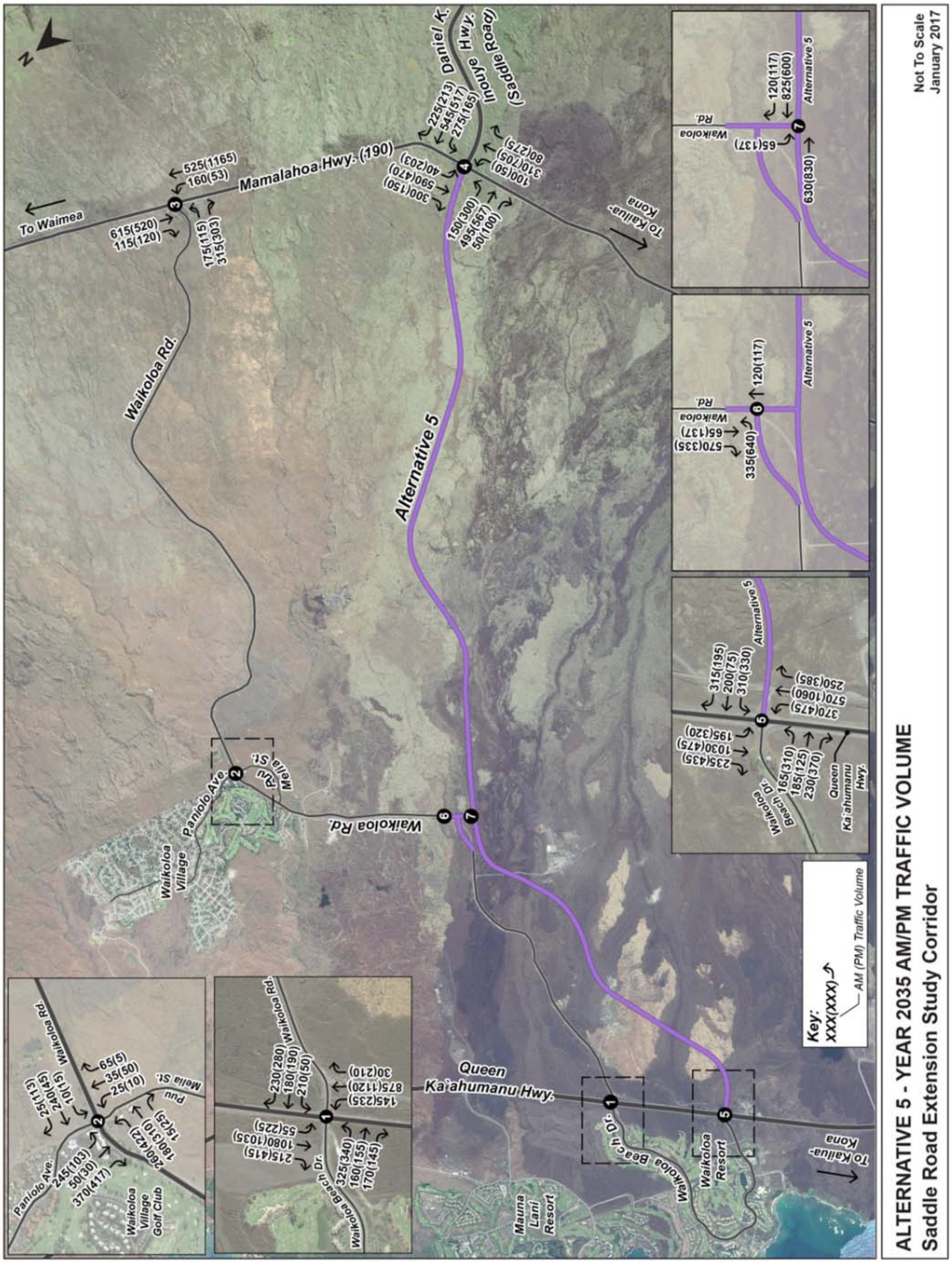
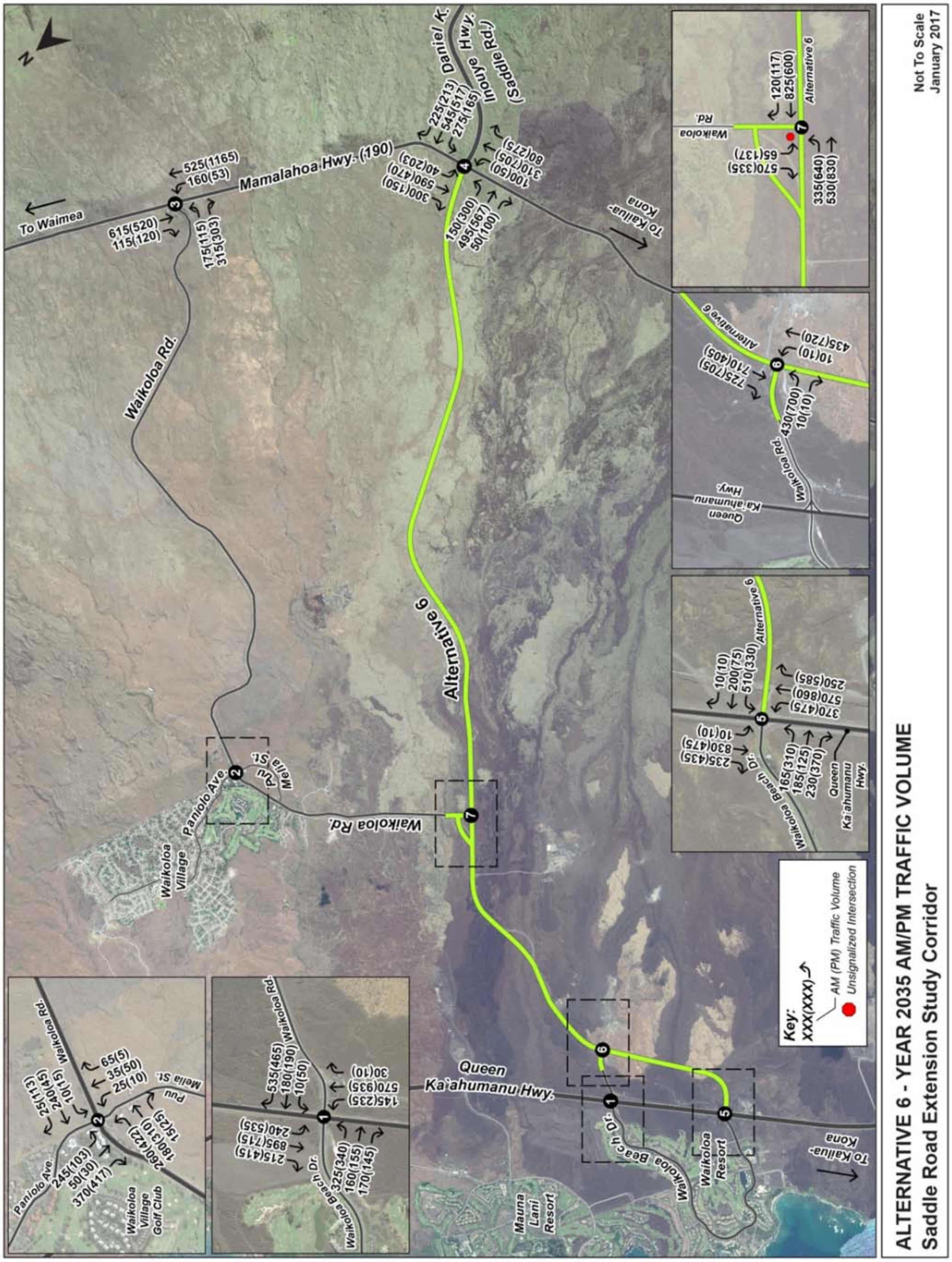


Figure 16 Projected Year 2035 Peak Hour Turning Movements- Build Alternative 6



D. Projected Year 2035 Intersection Operations

Key intersections were evaluated in terms of peak hour intersection operations. The following intersections were evaluated:

- Queen Kaʻahumanu Highway/Waikoloa Road;
- Waikoloa Road/Paniolo Drive/Pua Melia Street;
- Māmalahoa Highway/Waikoloa Road;
- Māmalahoa Highway/Saddle Road/SRX;
- Queen Kaʻahumanu Highway/Waikoloa Beach Road/SRX;
- Waikoloa Road/SRX (Future Alternatives 5 and 6 only).

The intersections were evaluated using signalized and unsignalized intersection capacity methods documented in the 2010 Highway Capacity Manual as implemented in the Synchro software. The purpose of these analyses is to provide an operational comparison between the alternaives. Cost and other impact and benefit comparisons will be evaluated as part of the greater EIS effort for this project.

Table 2 compares the projected year 2035 intersection operations for the “No Build” and the three “Build” alternatives.

Table 2 Comparison of Intersection Operations
No Build vs. Build Alternatives

Intersection	Am Peak Hour								PM Peak Hour							
	No Build		Alt 4		Alt 5		Alt 6		No Build		Alt 4		Alt 5		Alt 6	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Queen Kaahumanu/Waikoloa Beach Rd/Waikoloa Rd	56.4	E	45.4	D	43.2	D	52.0	D	74.5	E	53.7	D	53.7	D	77.1	E
Mamalahoa Hwy/Waikoloa Rd	55.0	D	19.5	B	16.4	B	16.4	B	40.9	D	33.8	C	22.7	C	22.7	C
Mamalahoa Hwy/SRX	28.5	C	41.6	D	50.7	D	50.7	D	146.0	F	86.7	F	69.4	E	70.0	E
Queen Kaahumanu/Waikoloa Beach Rd/SRX	36.7	D	45.6	D	50.8	D	50.8	D	23.6	C	37.2	D	37.2	D	34.5	C
Waikoloa Rd/Paniolo Dr/Pua Melia	20.7	C	10.7	B	20.4	C	20.4	C	18.4	B	11.3	B	28.0	C	28.0	C

IV. FINDINGS AND CONCLUSIONS

The main purpose of all of the Saddle Road Extension (SRX) Build alternatives is to provide a connection with a roadway of appropriate functional classification for regional traffic between the existing Daniel K. Inouye Highway (Saddle Road), the primary cross-island regional roadway and Queen Kaʻahumanu Highway, the primary regional roadway serving the west coast of the Big Island. In doing so, it reduces the impact of projected regional traffic increases on roadways less capable of handling regional traffic due to capacity constraints or functional intent. Various secondary benefits accrue to the SRX Build alternatives in the form of reduced requirements for intersection and roadway segment improvements on Māmalahoa Highway and Waikoloa Road and improved peak hour intersection operations at key intersections.

A. No Build Alternative

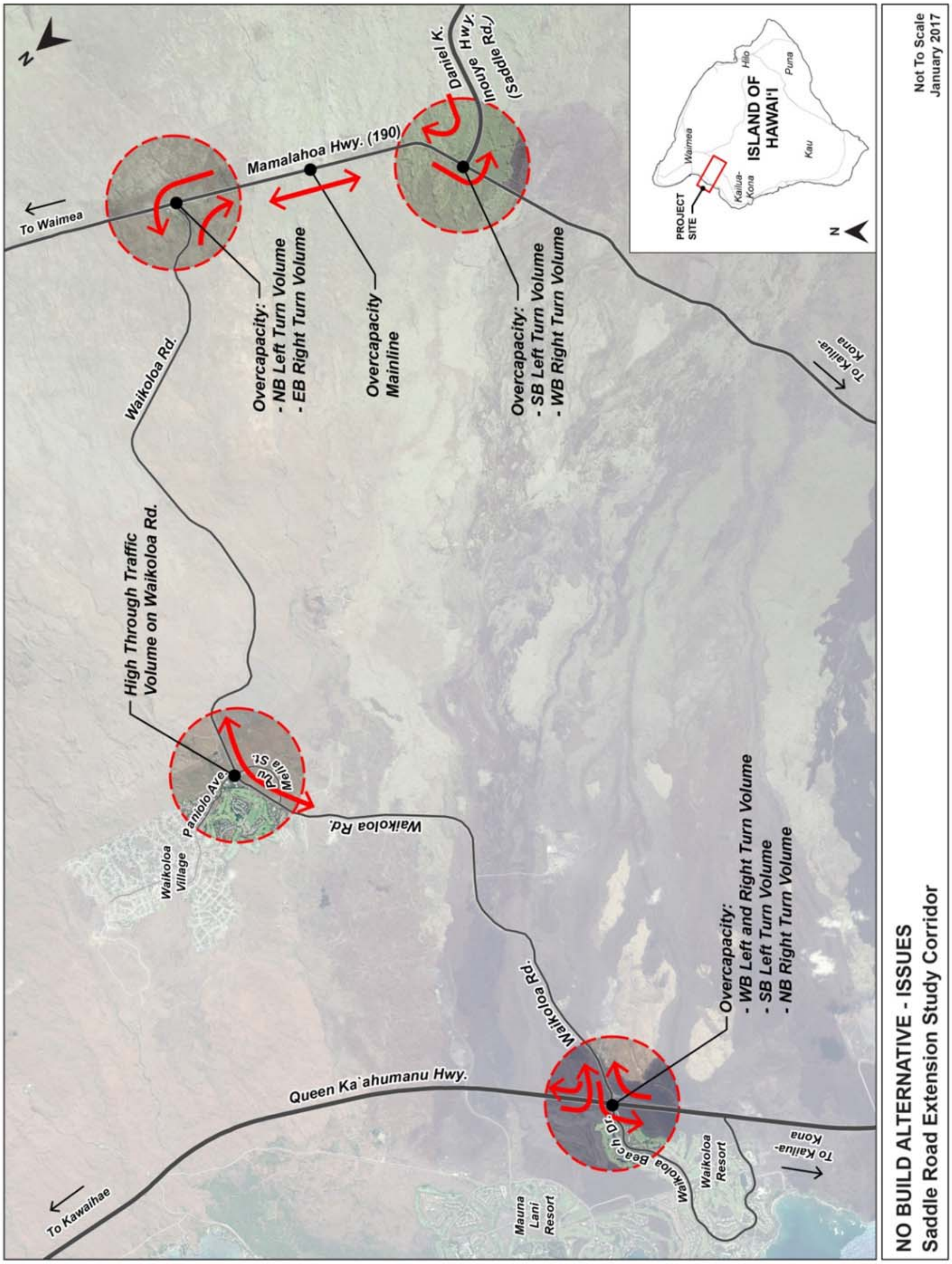
The projected increase in peak hour turning movements at the key intersections would impact the ability of the key intersections to maintain acceptable intersection operations for selected turning movements. Figure 17 summarizes these impacts.

As previously stated, regional traffic impact to Waikoloa Road interfere with its primary purpose to provide access to the Waikoloa Village community and future development along its corridor. The SRX would reduce the projected 2035 traffic volume using this corridor.

Additionally, the volume of projected 2035 traffic using the roadway system without the SRX stresses the intersections on Māmalahoa Highway at Saddle Road and at Waikoloa Road due to large turning movements. In the case of the Saddle Road intersection, it is the southbound to eastbound left-turn movement from Māmalahoa Highway to Saddle Road and at the Waikoloa Road intersection, it is the northbound to westbound left-turn movement from Māmalahoa Highway to Waikoloa Road. The projected demand for these left-turn movements are very large resulting in long vehicle queues for these movements and disruption of through traffic movements on Māmalahoa Highway. The vehicle queues for the left-turn movements would require extremely long left-turn storage lanes on Māmalahoa Highway which would, in turn, require widening of Māmalahoa Highway between Saddle Road and Waikoloa Road. Even then, the amount of traffic signal time required to service these left-turns would negatively impact the ability of Māmalahoa Highway to handle through traffic and traffic from the intersecting roadways. Finally, the amount of traffic volumes projected on the Māmalahoa Highway segment between Saddle Road and Waikoloa Road would exceed the capacity of the existing two-lane roadway.

Queen Kaʻahumanu Highway is assumed to be widened to 4 lanes per the HDOT LR Plan by the year 2035. As part of this widening, significant intersection geometry improvements are also assumed. These are beneficial in allowing Queen Kaʻahumanu Highway to fulfill its role as the primary regional roadway on the west side of the Big Island. Even so, without the SRX, all regional Saddle Road traffic desiring to connect to Queen Kaʻahumanu Highway would do so via Waikoloa Road. This configuration funnels the combined regional traffic and Waikoloa Village area traffic through the Queen Kaʻahumanu Highway/Waikoloa Road intersection, causing difficulties in handling the resulting large turning movement volumes. Especially significant is the large southbound to eastbound left-turn from Queen Kaʻahumanu Highway to Waikoloa Road. Even assuming a double left-turn configuration at this intersection does not mitigate the issues associated with this projected turn movement. The projected PM peak hour delay for this movement is more than twice the delay projected for most alternatives with the SRX which, in turn, would create traffic queuing issues on a major regional arterial roadway. As in the Māmalahoa Highway intersections, the traffic signal time required to service the large turn movements detract from the ability of Queen Kaʻahumanu Highway to handle through traffic.

Figure 17 Projected Year 2035 No Build Impacts



B. Build Alternative 4

The main benefit of Alternative 4 is that it would divide the traffic turning movement demands between the Waikoloa Road and the Waikoloa Beach Drive intersections on Queen Kaʻahumanu Highway. The SRX would allow regional Saddle Road traffic to access Queen Kaʻahumanu Highway directly. Waikoloa Village and surrounding area would continue to utilize Waikoloa Road. This would lessen the intensity of the turn movements at the existing Queen Kaʻahumanu/Waikoloa Road intersection, thereby improving projected intersection operations there. Similarly, the proposed SRX would reduce turn movements at the Māmalahoa Highway intersections at Waikoloa Road and Saddle Road, thereby mitigating projected left-turn movement issues identified for the No-Build alternative. This would, in turn, reduce the magnitude of improvements needed on Māmalahoa Highway between Saddle Road and Waikoloa Road. The addition of a fourth leg a the Māmalahoa Highway/Saddle Road/SRX intersection does lower the average intersection level of service (LOS) from the project LOS of the No Build alternative due to the need to accommodate through traffic between Saddle Road and SRX. However, these movements are able to be accommodated at acceptable levels for peak hour conditions without the extreme overcapacity conditions for the southbound left-turn movement that is identified for the No Build alternative.

Figure 18 illustrate these benefits.

C. Build Alternative 5

Alternative 5 preserves the Alternative 4 benefit of dividing turning movement demands between Waikoloa Road and Waikoloa Beach Drive intersections on Queen Kaʻahumanu Highway. It also has the added benefit of reducing the turning movement demand at the Māmalahoa Highway/Waikoloa Road intersection, since it is projected that the connection to Waikoloa Road between Māmalahoa and Queen Kaʻahumanu would attract Waikoloa Village and surrounding area-related Saddle Road traffic directly to the Saddle Road Extension. This would further reduce turning movements on Māmalahoa Highway at Waikoloa Road with a resultant improvement in operations. Like Alternative 4, Alternative 5 mitigates the extreme overcapacity conditions for the southbound left-turn movement at the Māmalahoa Highway/SRX intersection that is identified for the No Build alternative. The result is a further reduced amount of improvements needed on Māmalahoa Highway to accommodate projected traffic conditions. Alternative 5 also reduces the intensity of the southbound left-turn movement at the existing Queen Kaʻahumanu/Waikoloa Road intersection, thereby improving projected intersection operations there.

The Saddle Road Extension-Saddle Road through movement would increase because both regional and Waikoloa Village area traffic associated with Saddle Road are using the SRX. Consequently sufficient capacity needs to be provided for this through movement. Four lanes (two in each direction) are recommended on the Saddle Road/SRX approaches. These can be merged to two lanes (one lane in each direction) on Saddle Road and SRX away from the Māmalahoa Highway/Saddle Road/SRX intersection.

This alternative involves a connection between SRX and Waikoloa Road that does not exist in Alternative 4. This connection involves a short connector roadway between Waikoloa Road and SRX, resulting in two relatively closely spaced intersections at Connector/SRX and Connector/Waikoloa. Care needs to be taken in design to assure that the movements between these two intersections are efficiently handled and do not cause an issue.

Figure 19 illustrate these benefits.

Figure 18 Projected Year 2035 Alternative 4 Benefits

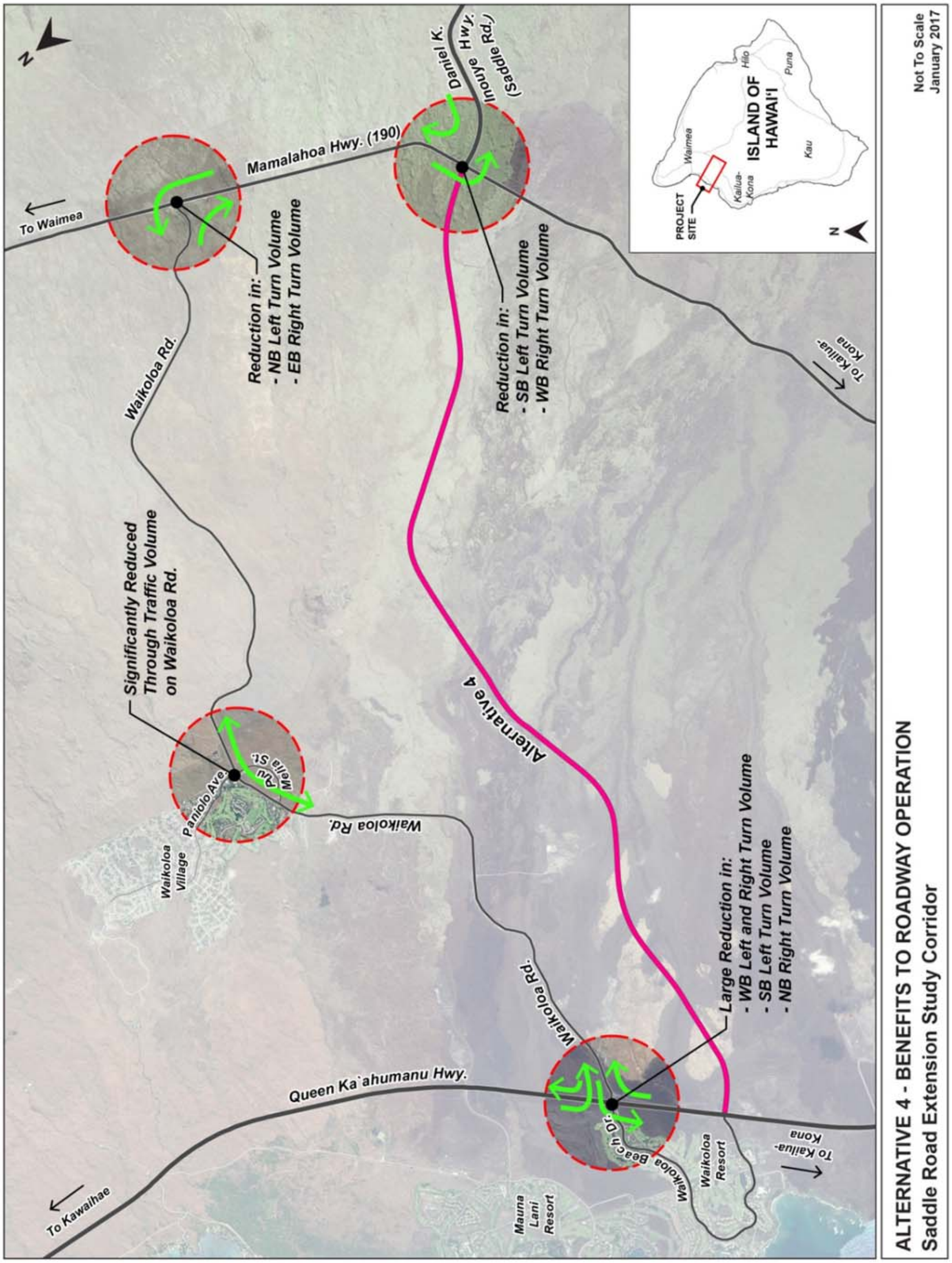
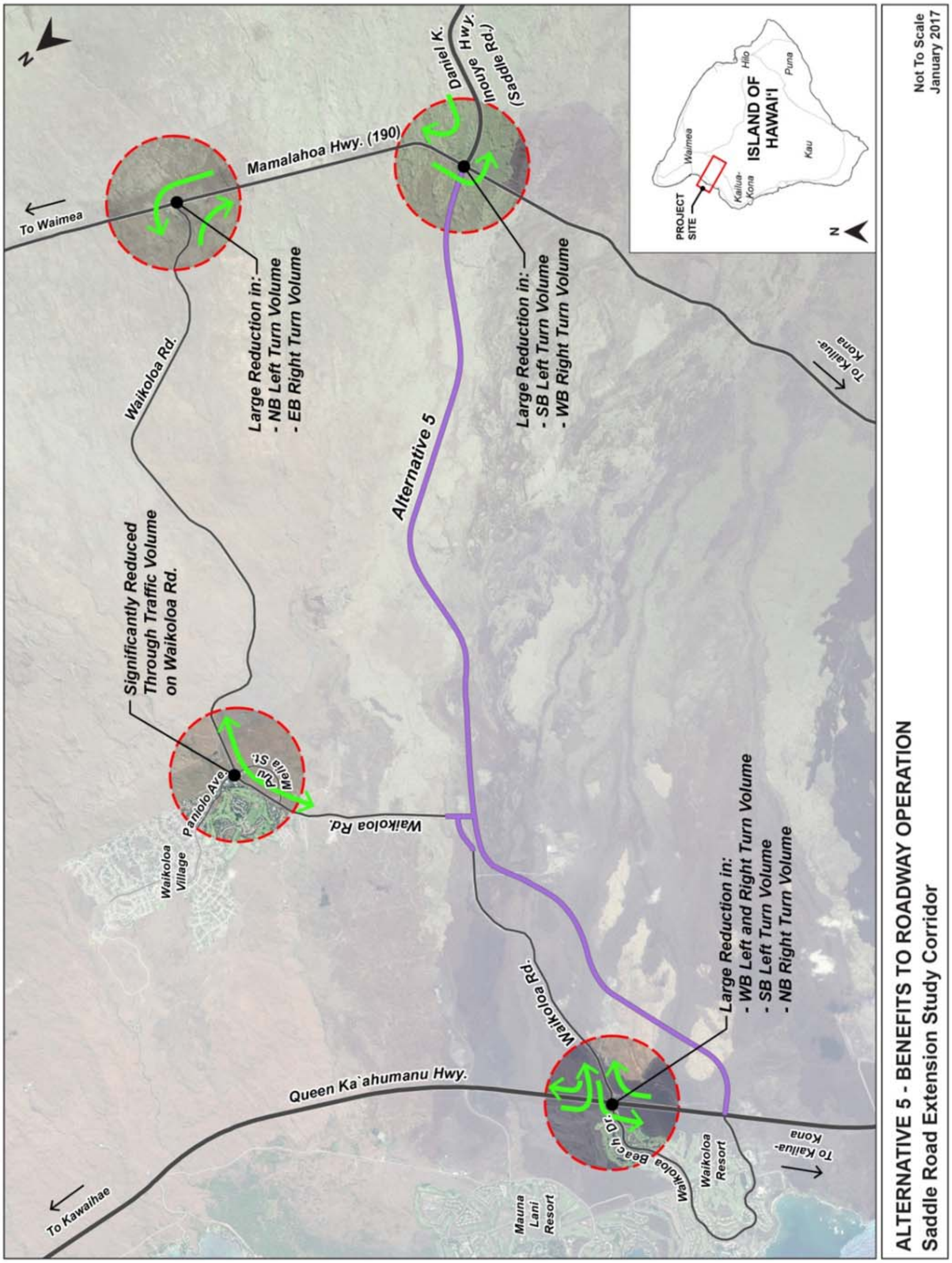


Figure 19 Projected Year 2035 Alternative 5 Benefits



D. Build Alternative 6

Alternative 6 achieves part of the benefits of dividing turning movement demands between Waikoloa Road and Waikoloa Beach Drive intersections on Queen Kaʻahumanu Highway. Because the Alternative 6 alignment utilizes the existing Waikoloa Road alignment to a point fairly close to Queen Kaʻahumanu Highway, it is projected that both regional traffic and Waikoloa Village area traffic would use the Waikoloa Road intersection to and from Kawaiahae and Kohala via Queen Kaʻahumanu Highway to the north. This would create capacity issues similar to the No Build alternative at the Queen Kaʻahumanu/Waikoloa Road intersection. Because both regional and Waikoloa Village area traffic is projected to utilize SRX to its intersection at Waikoloa Beach Drive to and from south Kohala coast and Kailua-Kona via Queen Kaʻahumanu Highway to the south, the capacity issues at the Waikoloa Road/Queen Kaʻahumanu Highway would not be as intense as in the No Build alternative. For the Māmalahoa Highway intersections, the results would be similar to the Alternative 5 results.

The connection between Waikoloa Road and SRX would be simpler in Alternative 6 than in Alternative 5. SRX would be the through roadway with Waikoloa Road intersecting it as the minor leg of a “T-intersection.” However, there would be an additional intersection on SRX where the remaining segment of Waikoloa Road would connect to Queen Kaʻahumanu Highway. This would be a longer segment than the connector road in Alternative 5, but care must be exercised in design to assure that the turning movements at SRX and at Queen Kaʻahumanu Highway are properly handled.

Figure 20 illustrate these benefits.

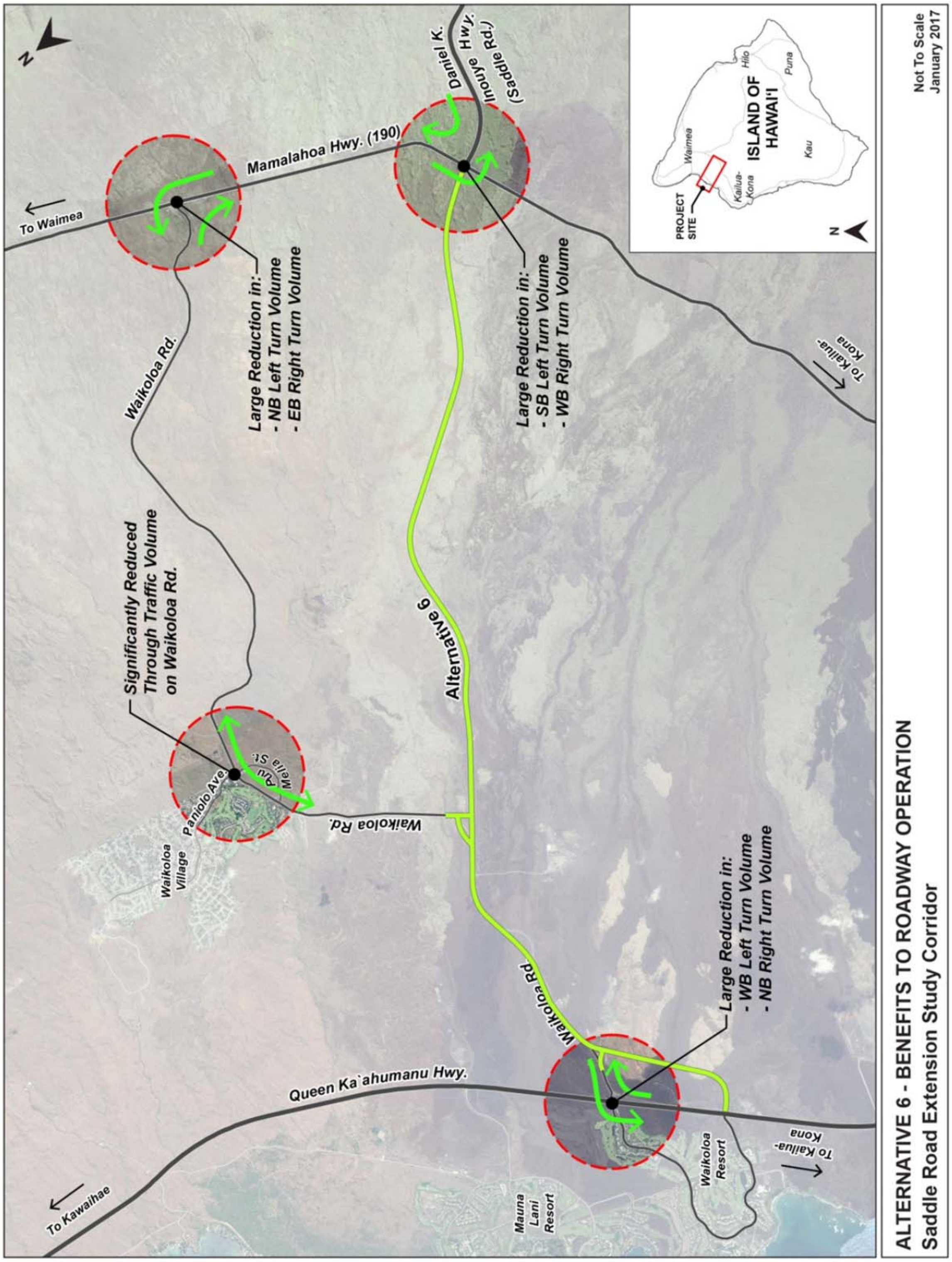
E. Recommended “Build” Alternative

Based on the results of the analysis, it is determined that the SRX will be a beneficial addition to the study area roadway network. Connection of the SRX to Queen Kaʻahumanu Highway does decrease intersection operational levels at that intersection due to increase traffic movements and volume, the intersection was found to operate acceptably for peak hour conditions. The overall benefit to the roadway system due to the SRX is positive and all build alternatives are projected to address the issues identified for the “No Build” alternative.

Of the “Build” alternatives evaluated, it appears that Alternative 5 provides the best overall forecasted traffic operations. Alternative 5 matches Alternatives 4 in its ability to divide the traffic demand traveling between Queen Kaʻahumanu Highway and Māmalahoa Highway between the Waikoloa Beach Drive/SRX and Waikoloa Road intersections, thereby reducing congestion the intersections. Alternative 6 does not adequately address the southbound to eastbound left-turn movement issue at the Queen Kaʻahumanu Highway/Waikoloa Road intersection.

Alternative 5 also matches Alternative 6 in its ability to reduce turning movement demand at the Māmalahoa Highway/Waikoloa Road and Māmalahoa Highway/Saddle Road/SRX intersections, thereby reducing projected congestion and reducing the amount of improvements needed at the intersection. Alternative 4 reduces turning movements at these intersections as well but not as well as Alternative 5 or Alternative 6.

Figure 20 Projected Year 2035 Alternative 6 Benefits



F. Recommended Roadway Improvements

The following intersection improvements should be included if the SRX project is selected to proceed:

- Implement full channelization of turn movements at the Māmalahoa Highway/SRX/ Saddle Road intersection;
- Signalize the intersections on Māmalahoa Highway at Saddle Road/SRX and at Waikoloa Road when traffic signal warrants are satisfied;
- Allow two lanes in each direction through traffic movements on the Saddle Road/SRX route at the Māmalahoa Highway intersection for "Build" Alternatives 5 and 6. SRX and Saddle Road can be transitioned back to one lane in each direction away from this intersection. For the long-range future, however, it would be desirable to allow for ultimate widening to four lanes on SRX and Saddle Road;
- Implement double left-turn lanes on Queen Kaʻahumanu Highway at both the Waikoloa Road and Waikoloa Beach Road/SRX intersections;
- Implement double left-turn lanes on the Waikoloa Road, SRX, and Waikoloa Beach Drive approaches to Queen Kaʻahumanu Highway;
- Signalize the connector intersections of Waikoloa Road/SRX when traffic signal warrants are satisfied.

Some of these improvements, such as increased turn lane channelization at Queen Kaʻahumanu Highway and Māmalahoa Highway intersection and signalization Māmalahoa Highway/Waikoloa Road intersection, may occur even without implementation of the SRX. However, this list includes features that should be included with the SRX to allow the sub-regional system to operate properly with the forecasted 2035 traffic volumes.

G. Potential Alternative Configuration for Māmalahoa Highway/Saddle Road/SRX Intersection

Allowing the projected regional traffic to move directly between Saddle Road and Queen Kaʻahumanu Highway via the SRX provides significant operational and functional benefits to the roadway network. It does, however, create significant through traffic movements between Saddle Road and SRX at Māmalahoa Highway.

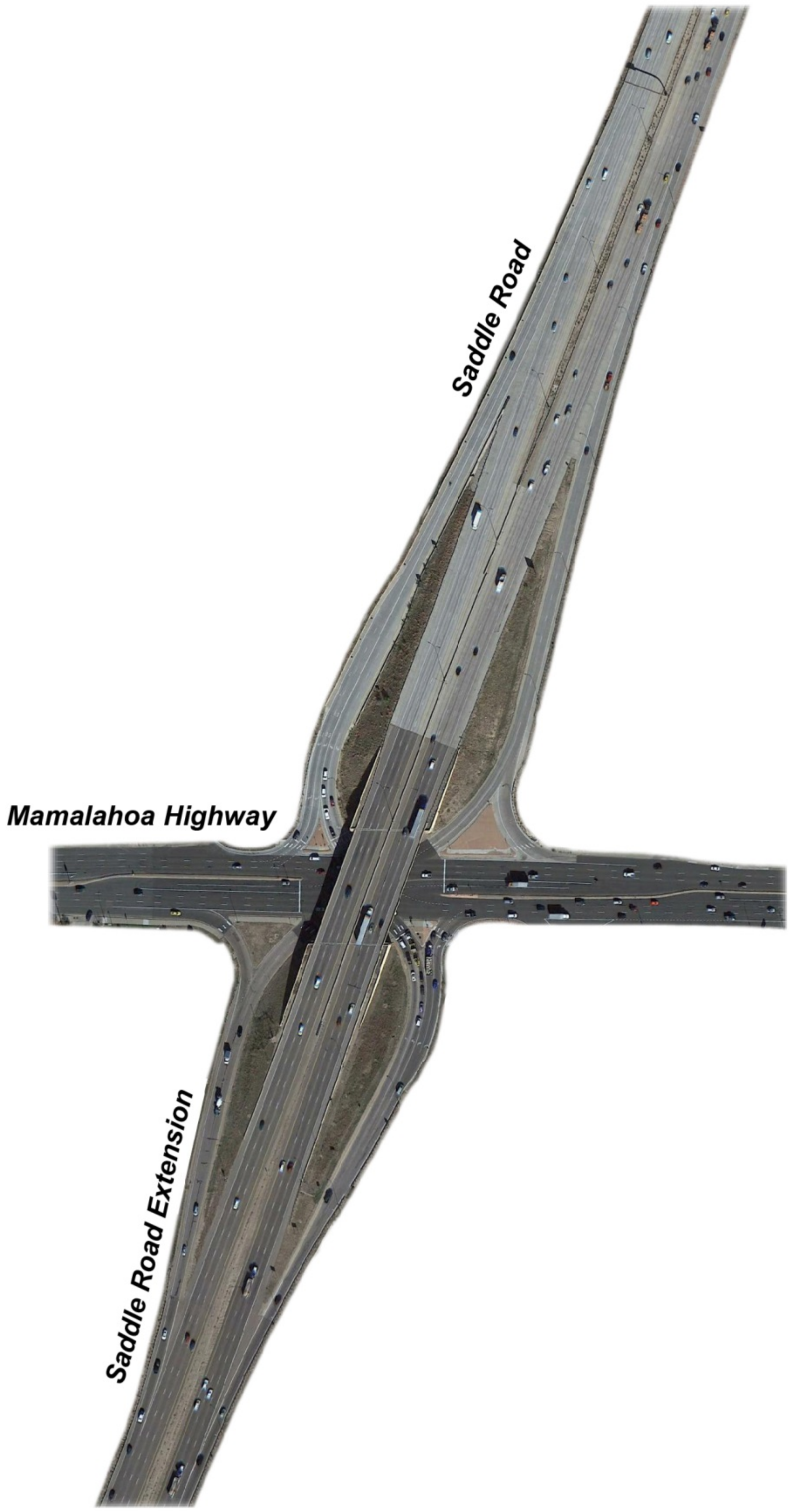
One way to manage this demand is to increase the number of through traffic lanes from two (one lane in each direction) to four (two lanes in each direction) on the Saddle Road/SRX approaches and departures at Māmalahoa Highway. The additional lanes would be needed only in the influence area of the intersection and would be transitioned in and out per standard lane add and lane drop designs.

An alternative way to handle this increase through movement is to grade-separate Saddle Road/SRX from Māmalahoa Highway. To allow for the turning movements at this intersection, interchange ramps would need to be implemented. A potential interchange configuration that appears appropriate for this location is known as a single-point, urban interchange (SPUI). In this type of interchange, all the on and off-ramps converge at a single intersection as opposed to two closely-spaced intersections on a typical "diamond interchange). Implementing the interchange would eliminate the need for additional lanes for the Saddle Road/SRX through movement and would significantly improve the intersection level of service at the single-point intersection on Māmalahoa Highway,

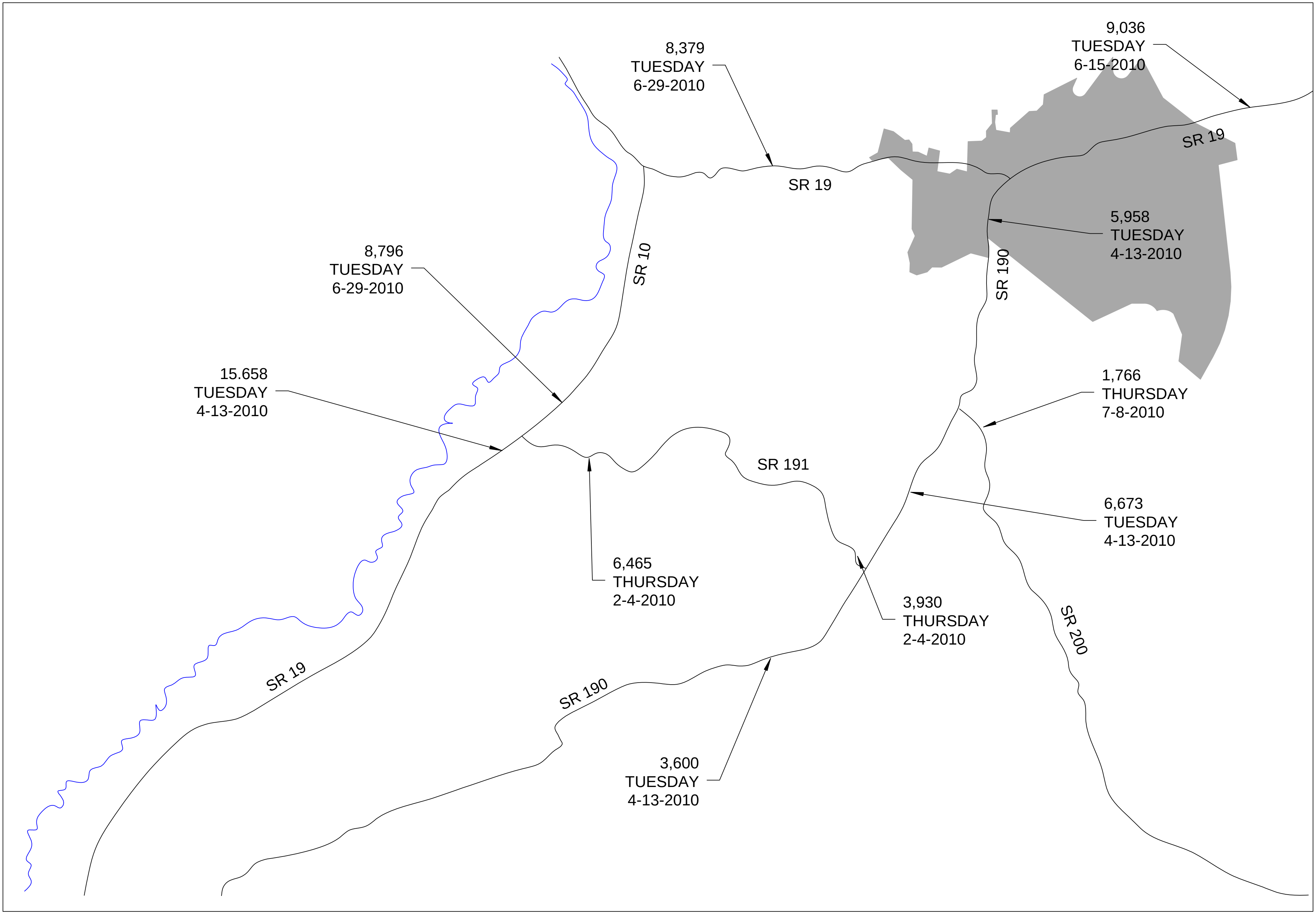
Figure 21 is a conceptual drawing of the SPUI alternative for the Māmalahoa Highway/Saddle Road/SRX intersection.

The SPUI is one alternative configuration that could be used at this location. There are other interchange configurations available. However, topographic constraints make the SPUI configuration worthy of serious consideration.

Figure 21 Single-Point Urban Interchange Concept

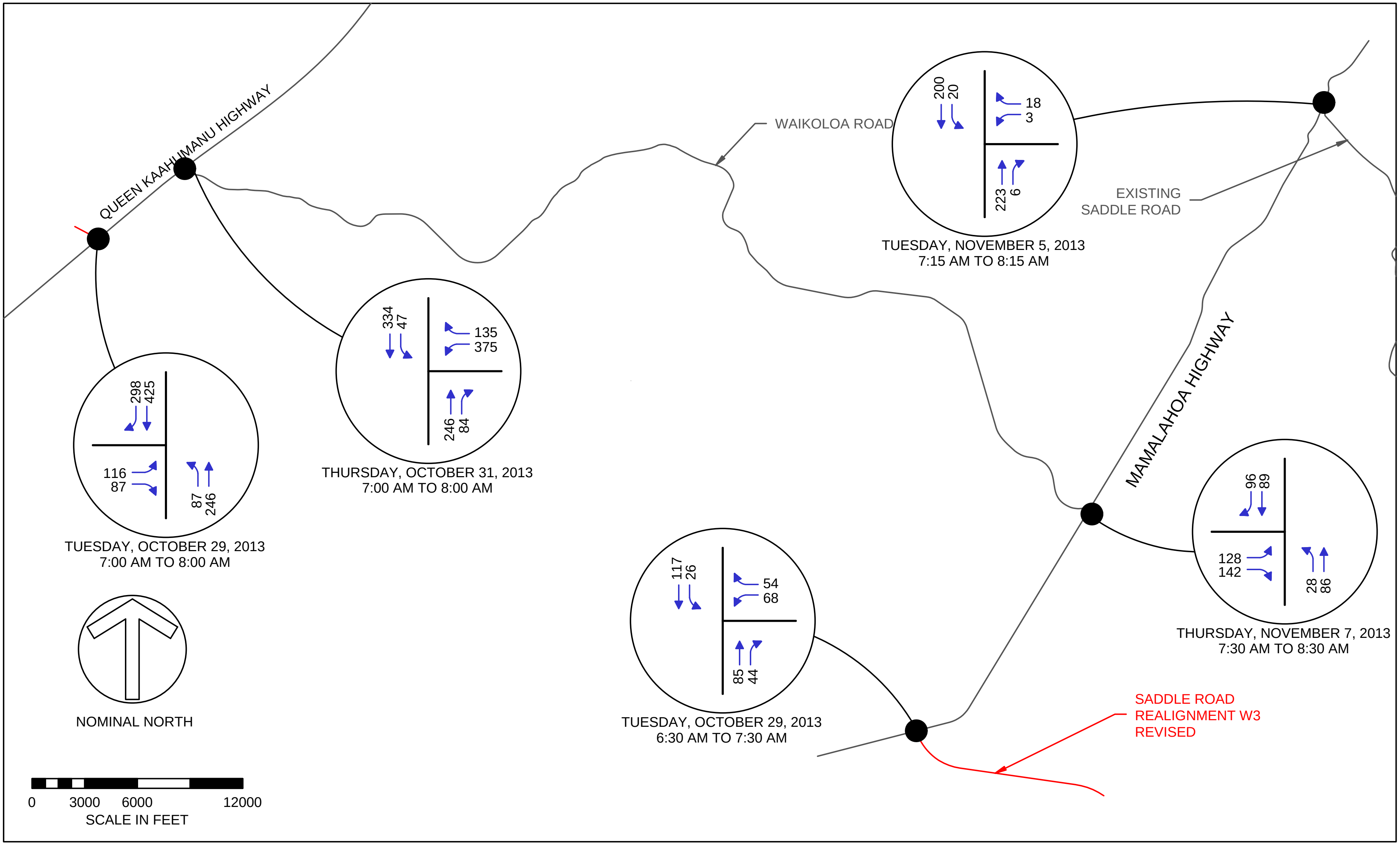


Appendix A – Base Year Traffic Volume Counts



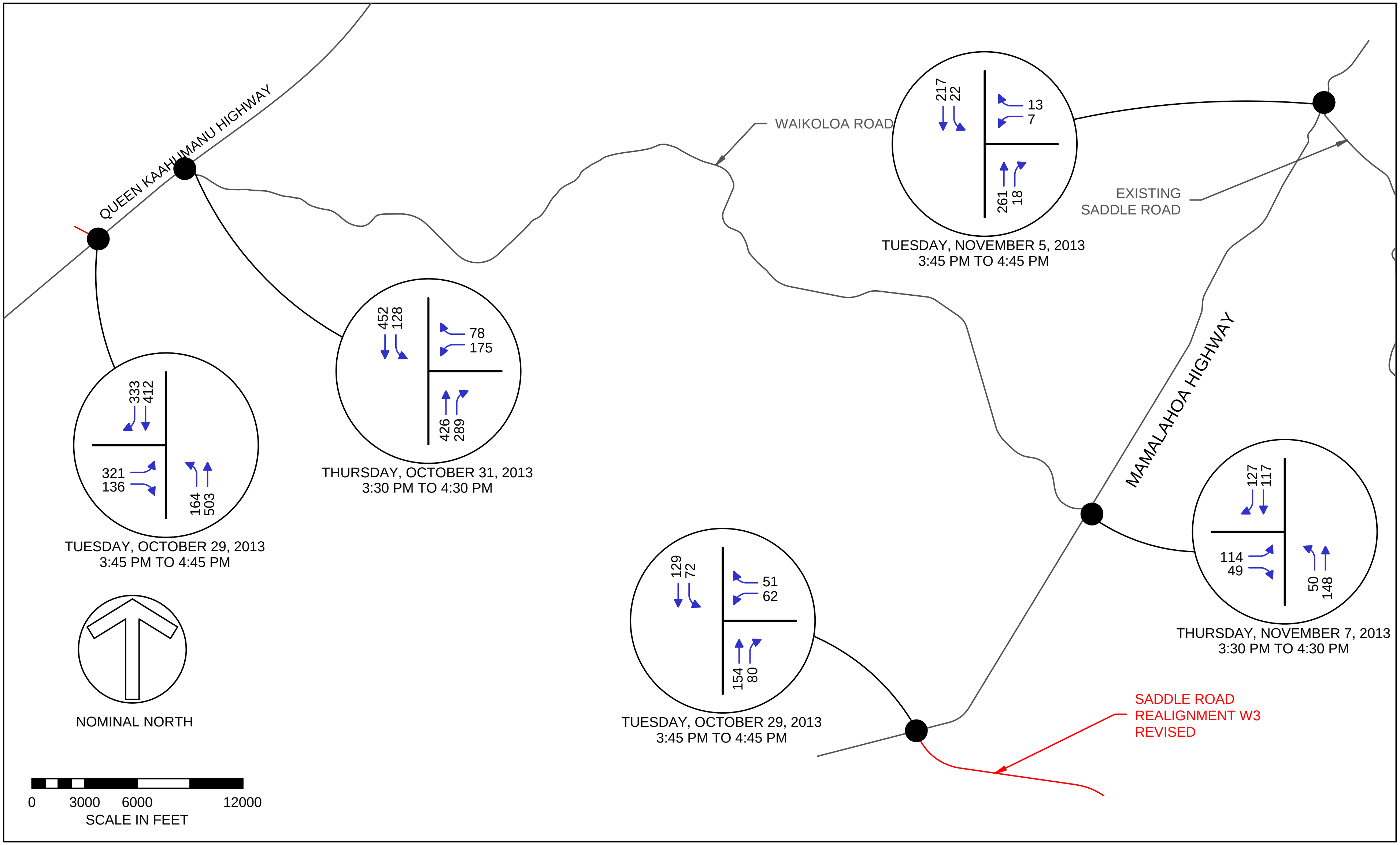
SOURCE: STATE OF HAWAII DEPARTMENT OF TRANSPORTATION, 2010

2010 DAILY TRAFFIC VOLUMES



2013 AM PEAK HOUR TRAFFIC VOLUMES

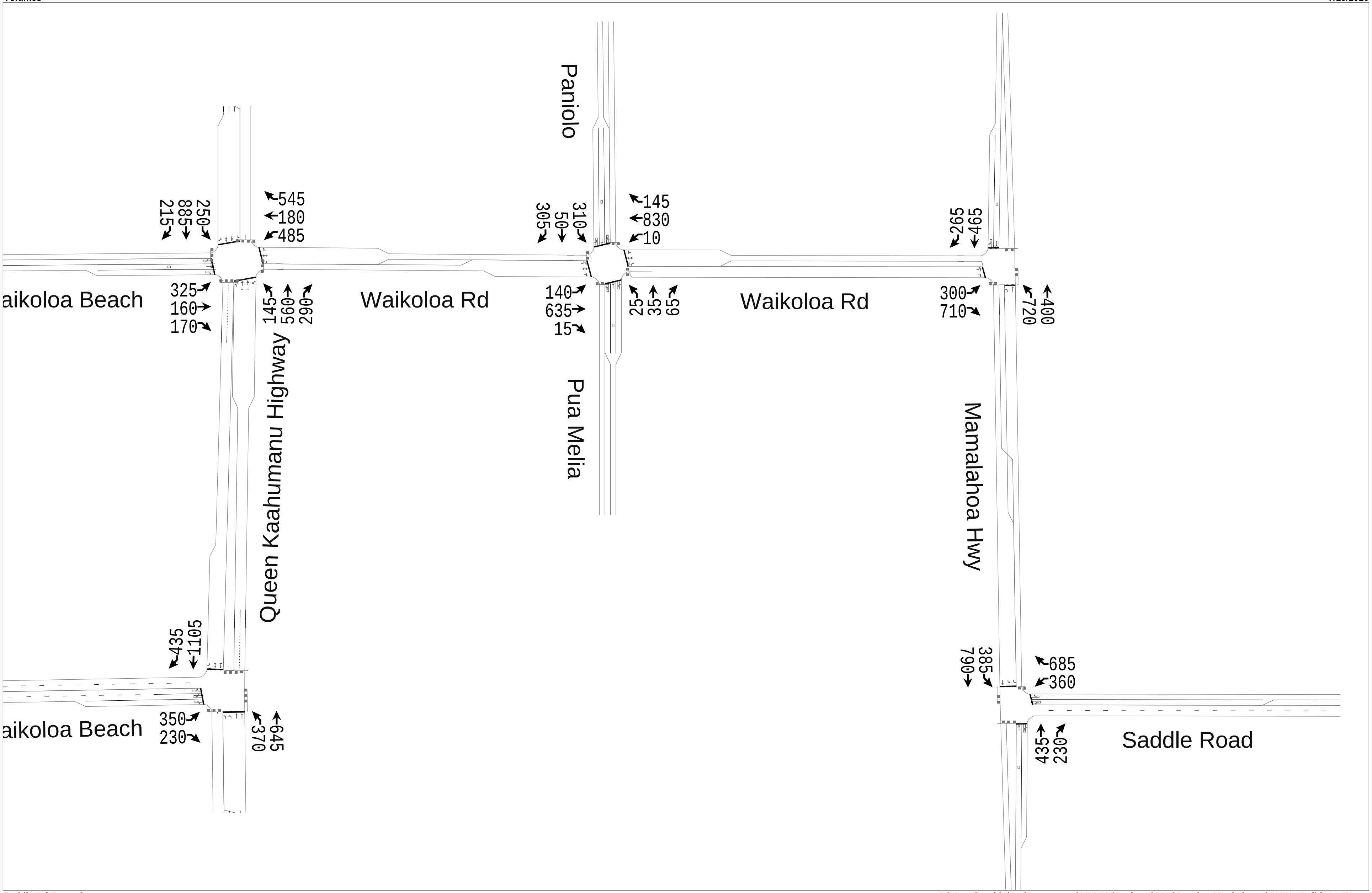
Phillip Rowell and Associates



2013 PM PEAK HOUR TRAFFIC VOLUMES

Phillip Rowell and Associates

Appendix B – Year 2035 Traffic Volume Projections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Waikoloa Rd
Waikoloa Rd
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Saddle Road
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885
250
545
180
485
325
160
170
145
560
290
305
50
310
145
830
10
140
635
15
25
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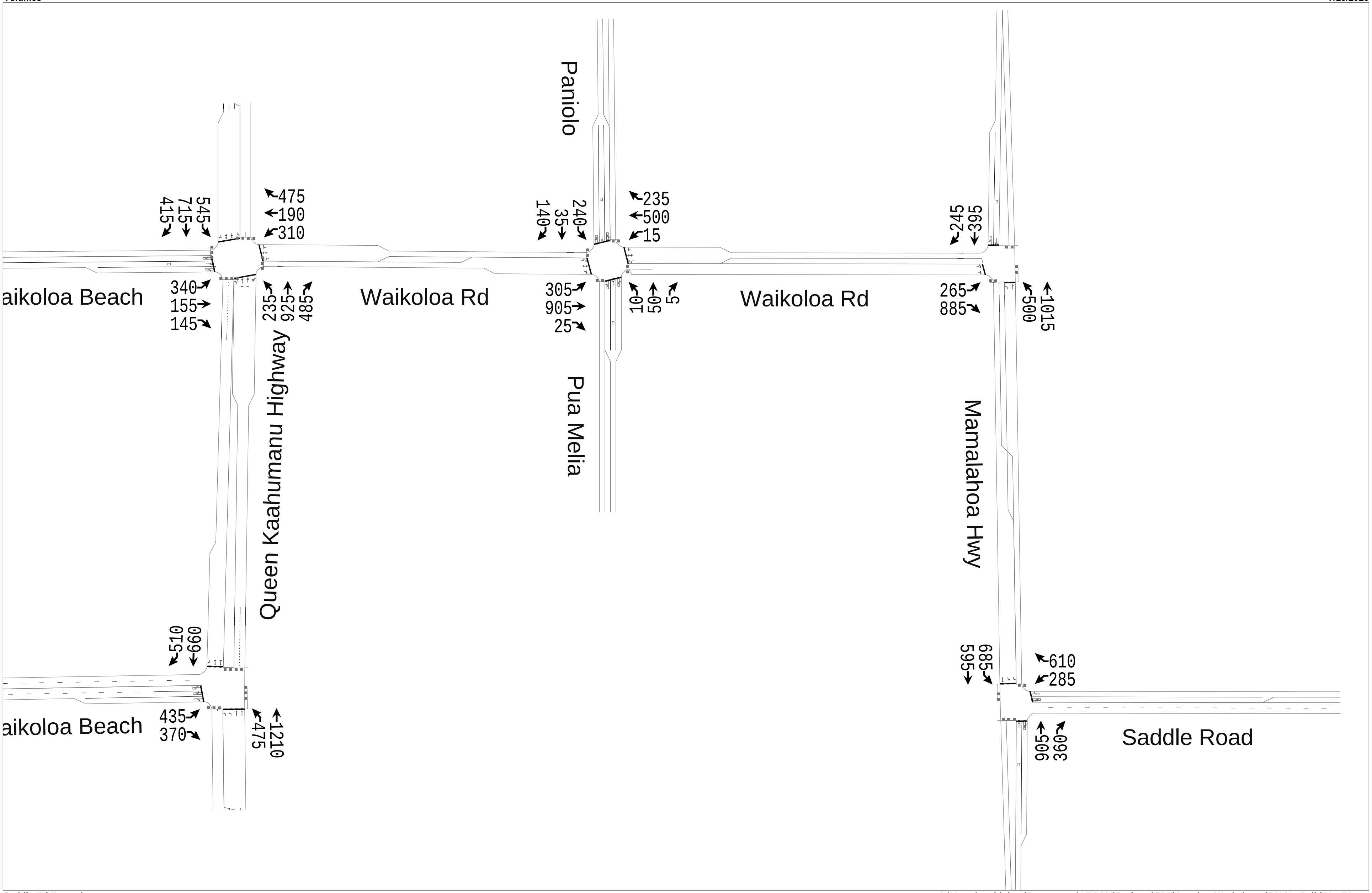
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145
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925
485
140
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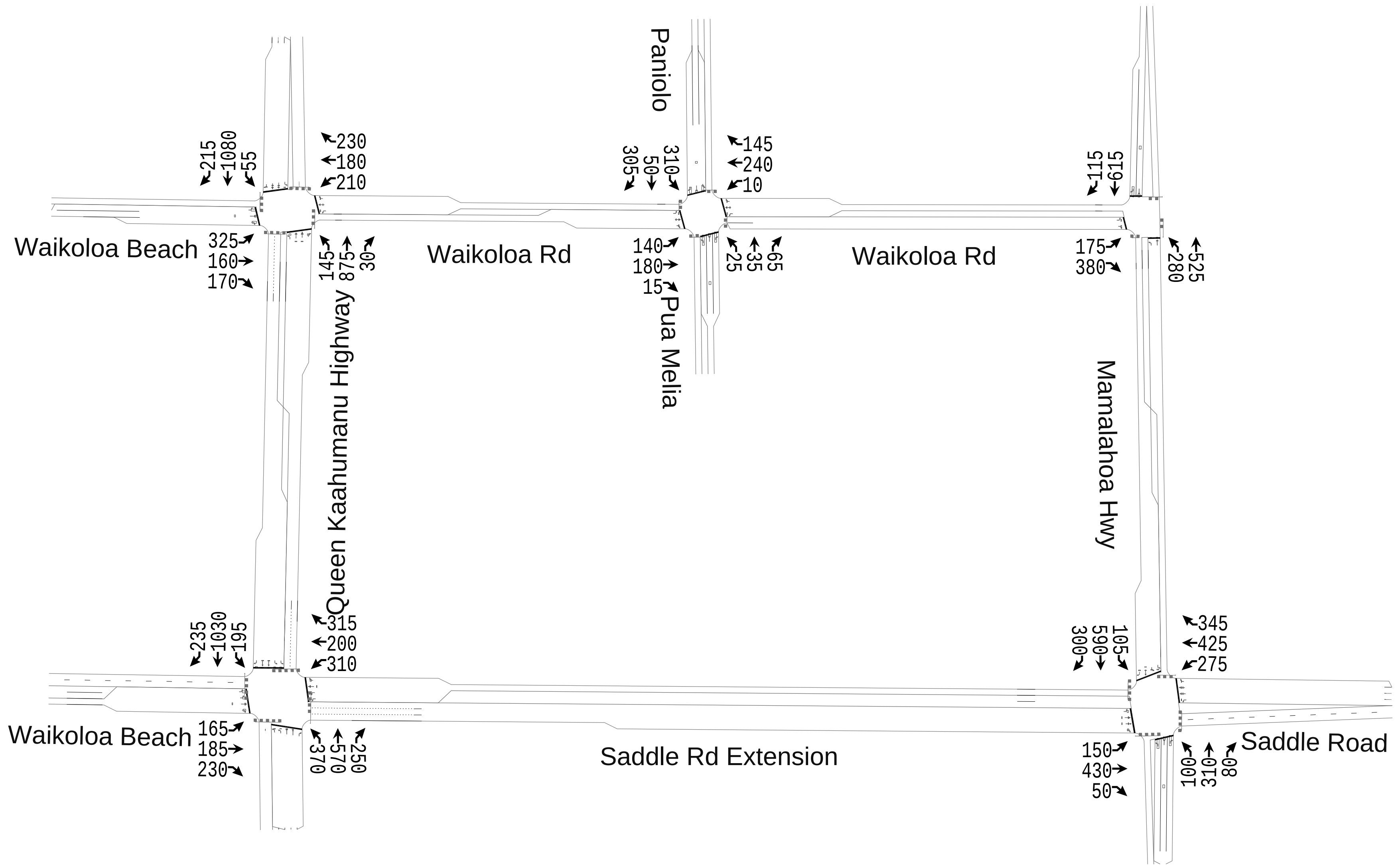
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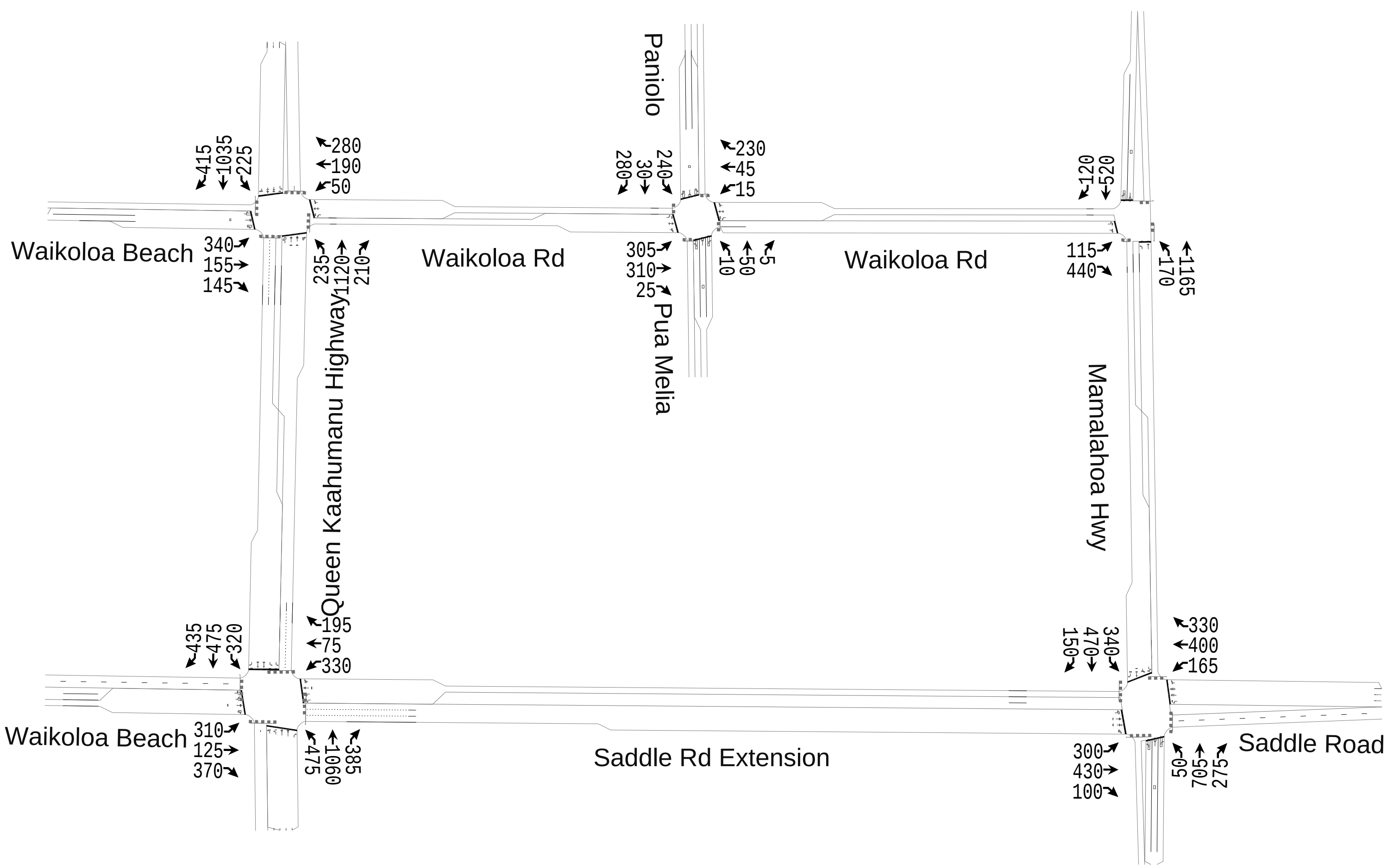
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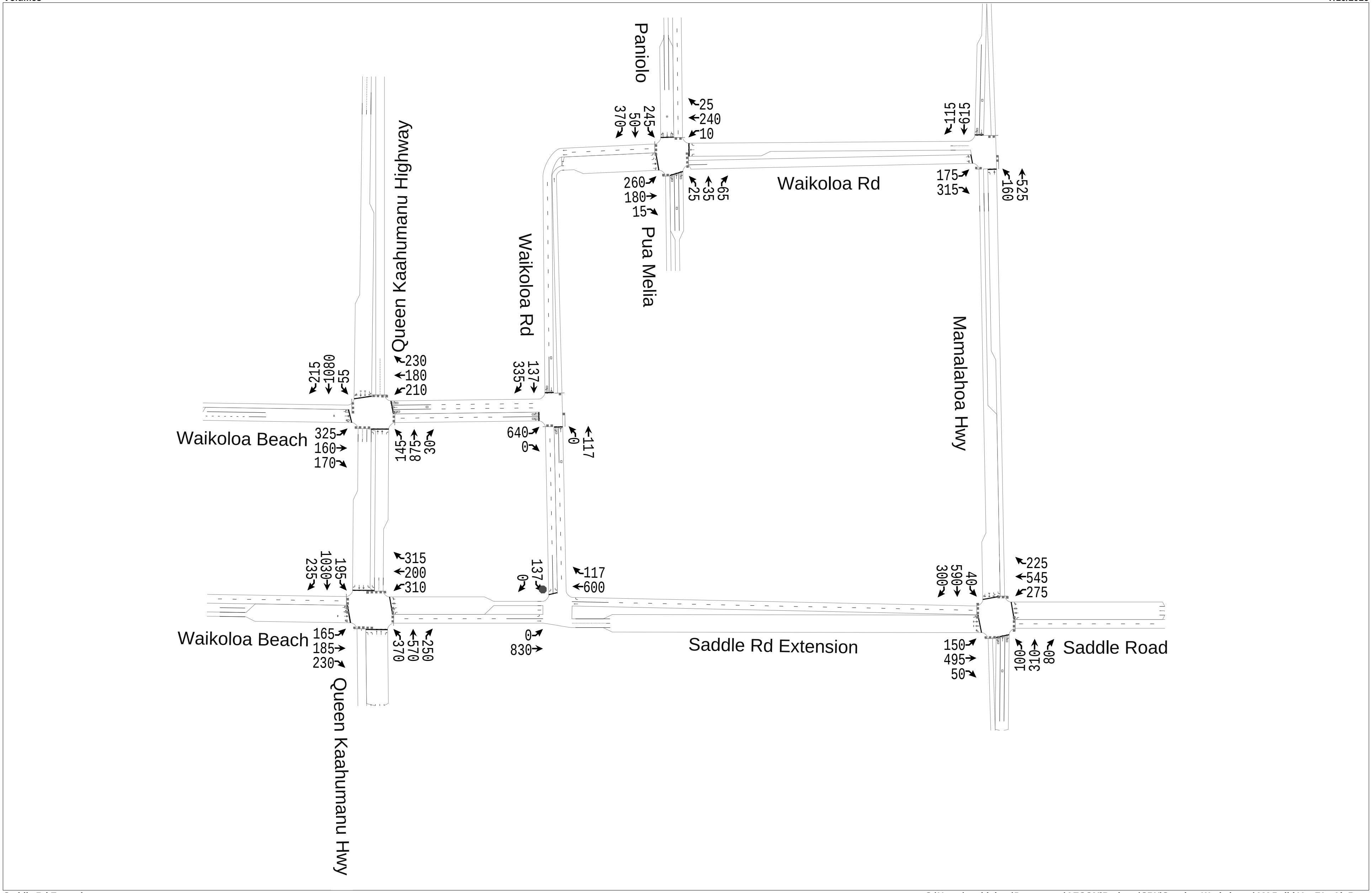
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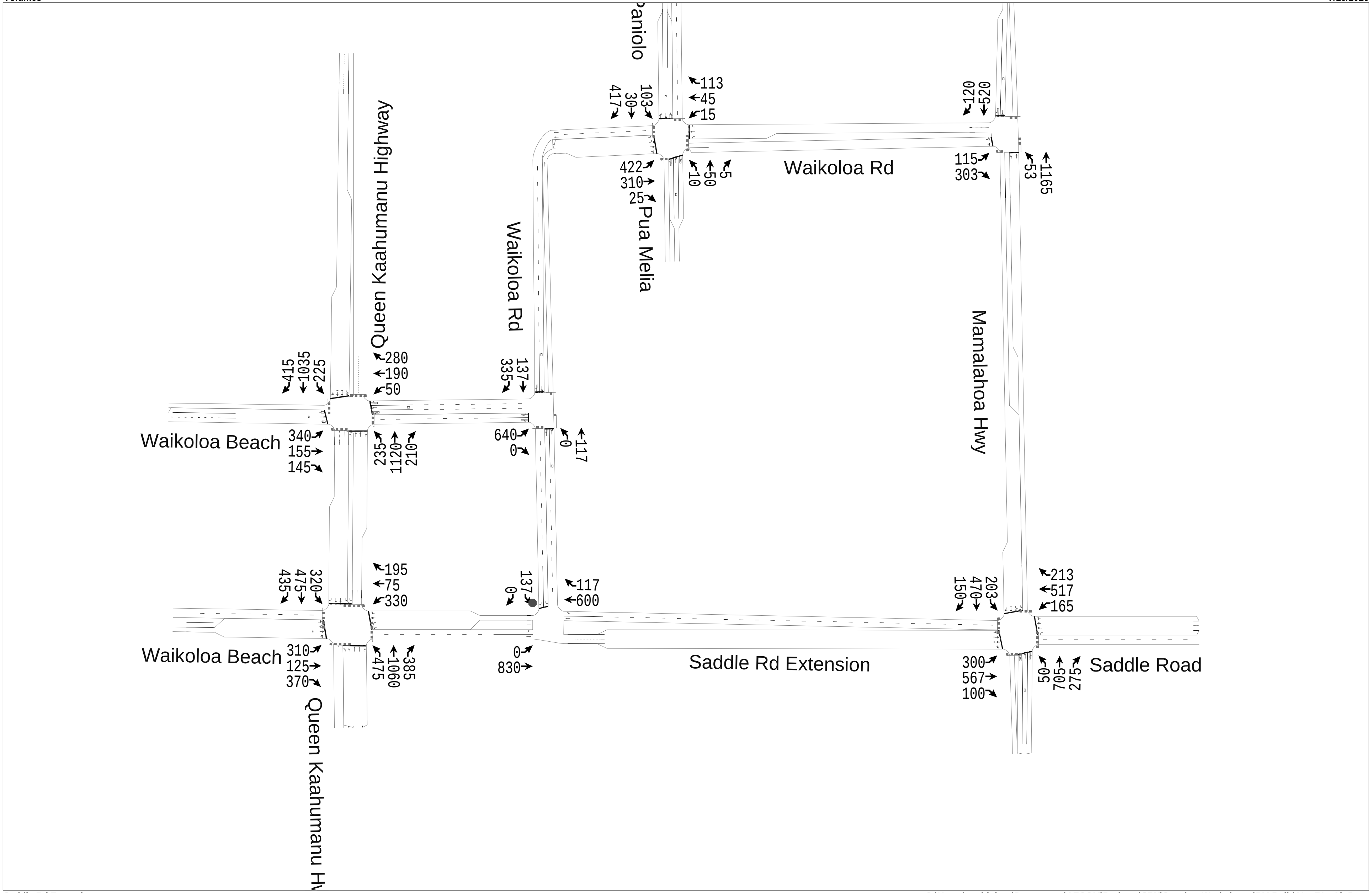
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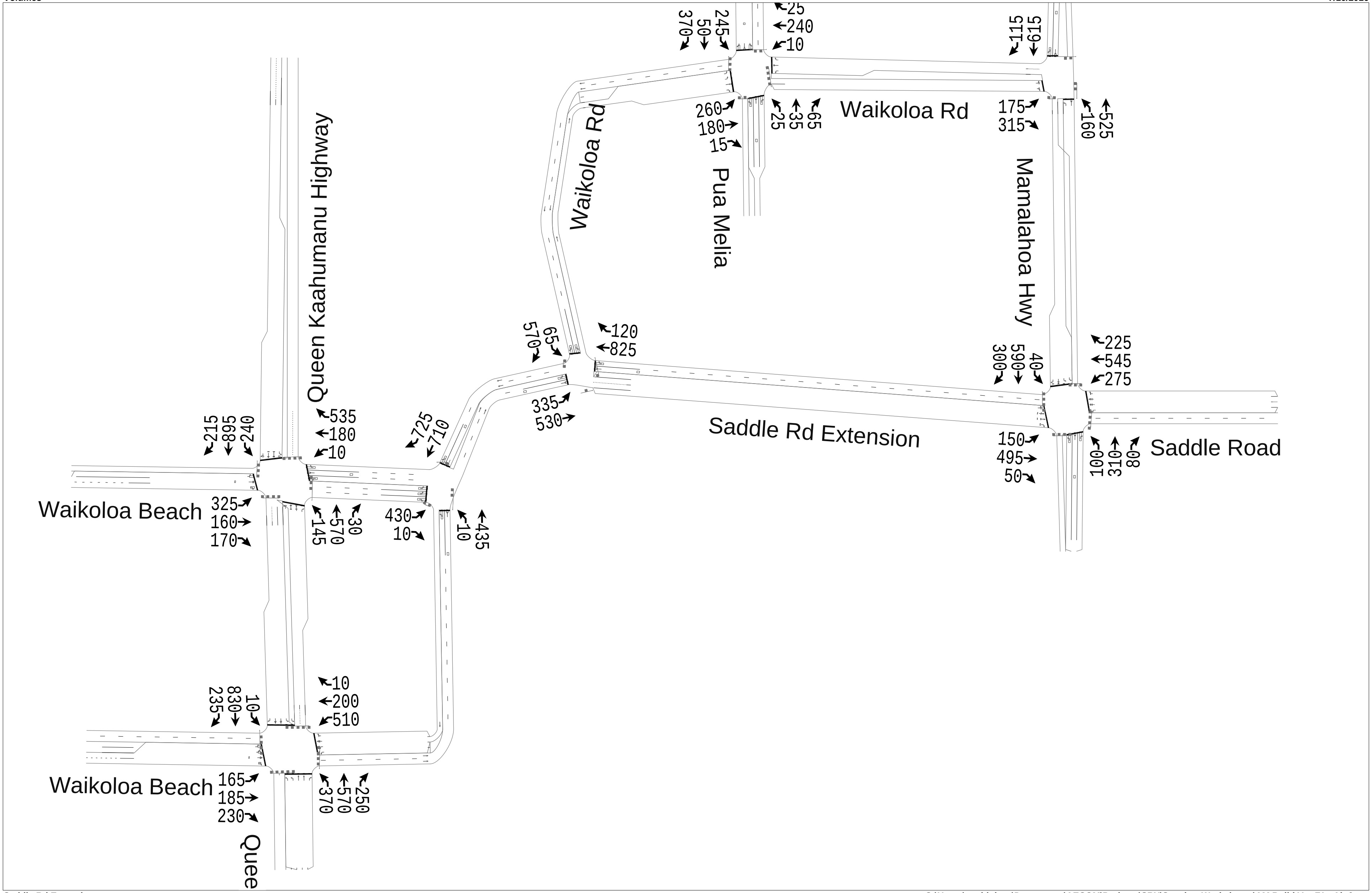
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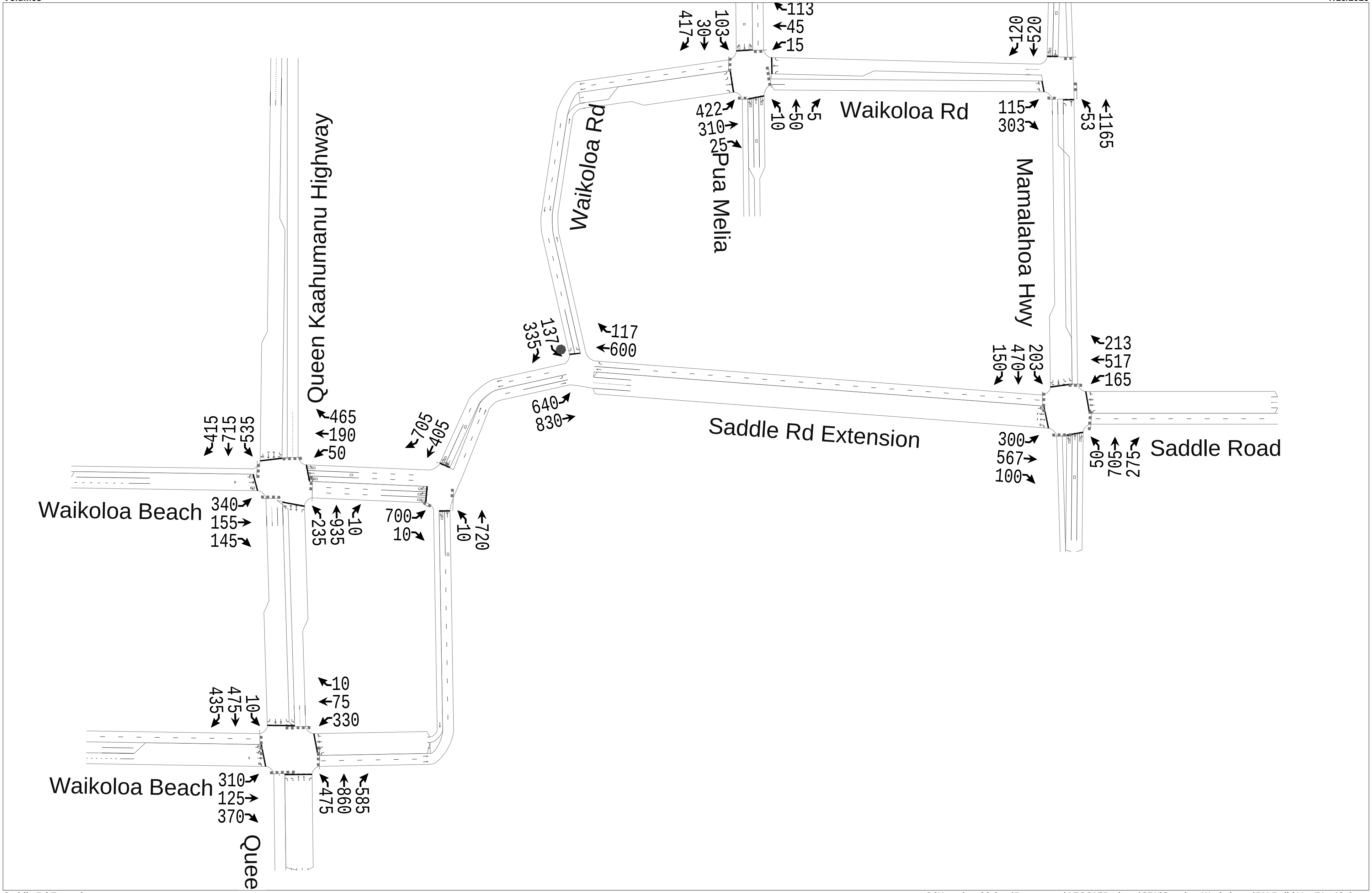
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NOTE:

SUB APPENDIX C OF TRAFFIC REPORT [SYNCHRO INTERSECTION ANALYSIS WORKSHEETS]

NOT INCLUDED IN ENVIRONMENTAL IMPACT STATEMENT BUT AVAILABLE

UPON REQUEST OF FHWA CENTRAL FEDERAL LANDS

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SADDLE ROAD EXTENSION
SOUTH KOHALA, HAWAI‘I

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Appendix G   Section 7 ESA Correspondence

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NEIL ABERCROMBIE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
FORD N. FUCHIGAMI
RANDY GRUNE
AUDREY HIDANO
JADINE URASAKI

IN REPLY REFER TO:

HWY-PA 2.6087

November 29, 2013

Mr. Loyal Mehrhoff
Field Supervisor
U. S. Department of the Interior
Fish & Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Blvd., Box 50088
Honolulu, Hawaii 96850

Dear Mr. Mehrhoff:

Subject: Saddle Road Extension, Queen Kaahumanu Highway to Mamalahoa Highway, Project No. DP-HI-0200(5), Hawaii Island, State of Hawaiʻi, Request for Species and Critical Habitat List under Section 7, Endangered Species Act

The Hawaii Department of Transportation (HDOT) and the Federal Highway Administration (FHWA) has initiated a planning process, including the preparation of an Environmental Impact Statement for the Saddle Road Extension Project. The project limits are from the intersection of Queen Kaahumanu Highway and Waikoloa Beach Road at its western terminus, to the intersection of the realigned Saddle Road (SR 200) and Mamalahoa Highway at the eastern terminus (see attached Figure 1). This project involves addressing the linkage between Saddle Road between Mamalahoa Highway and Queen Kaahumanu Highway. As shown in Figure 1, the project study area extends in an east-west direction for approximately 10.5 miles. In summary, the purpose and need of the Saddle Road Extension project is to:

- Improve the efficiency and operational level of traffic movement between East and West Hawaii, particularly for traffic on the realigned Saddle Road;
- Improve safety; and
- Support special needs of commercial truck traffic and military traffic.

In accordance with Section 7 of the Endangered Species Act (ESA), HDOT and FHWA are requesting a list of threatened and endangered plant and animal species, and critical habitats within the vicinity of the project, in order for an appropriate determination to be made for this project.

Furthermore, to assist us in our assessment, we also respectfully ask for the U.S. Fish and Wildlife Service's opinion on the likely impact of the project based on the potential issues of the location considering the proposed construction activities and schedule.

Your response within 30 calendar days of receipt of this letter, as outlined in the ESA Consultation Handbook, would be appreciated.

If you require additional information, please contact Dean Yanagisawa, Project Manager at (808) 587-2623 and reference letter no. HWY-PA 2.6087.

Very truly yours,

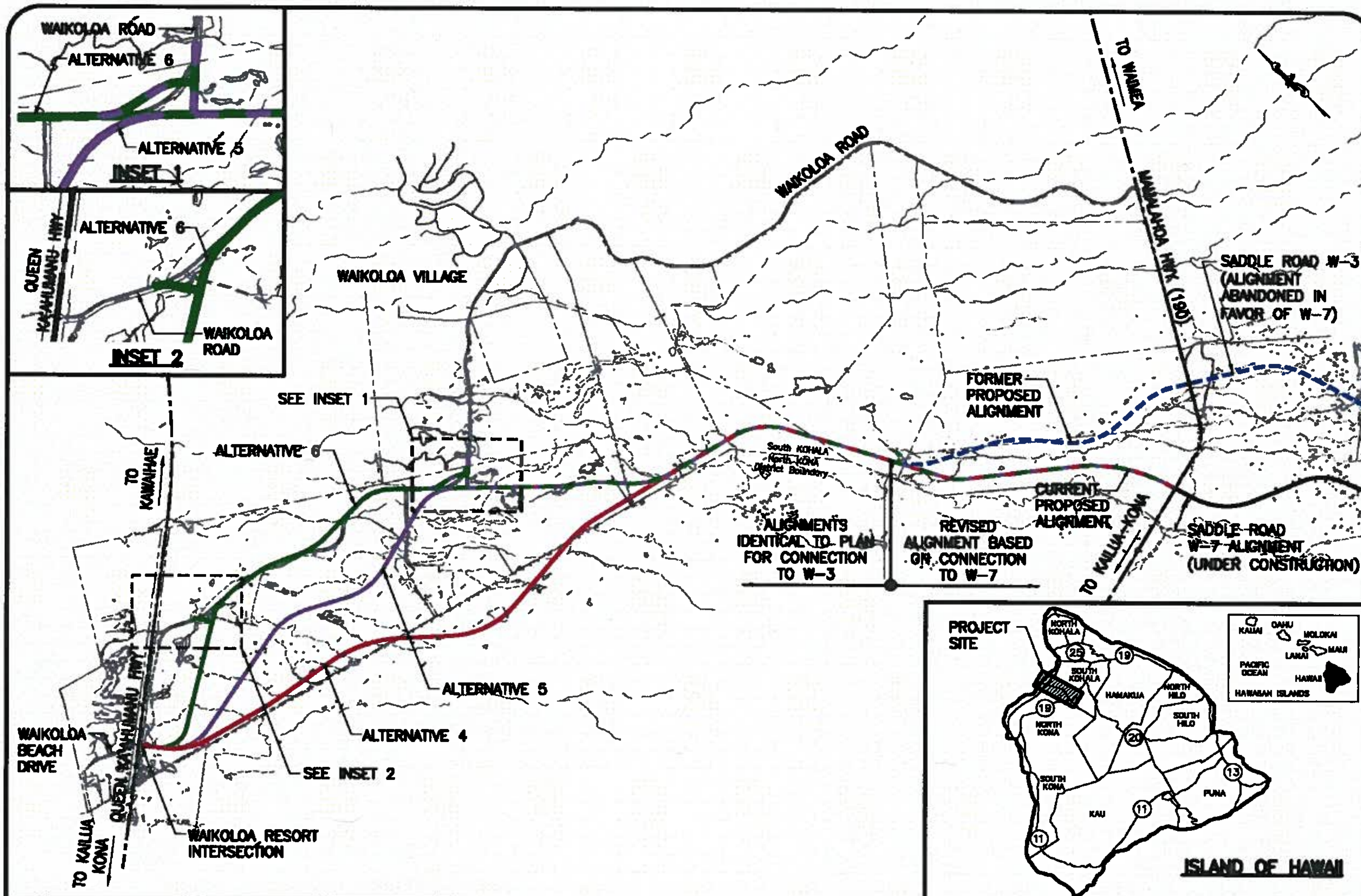
GLENN M. OKIMOTO, Ph.D.
Director of Transportation

Attachment

c: FHWA
Okahara and Associates
Geometrician Associates

bc: HWY-PA

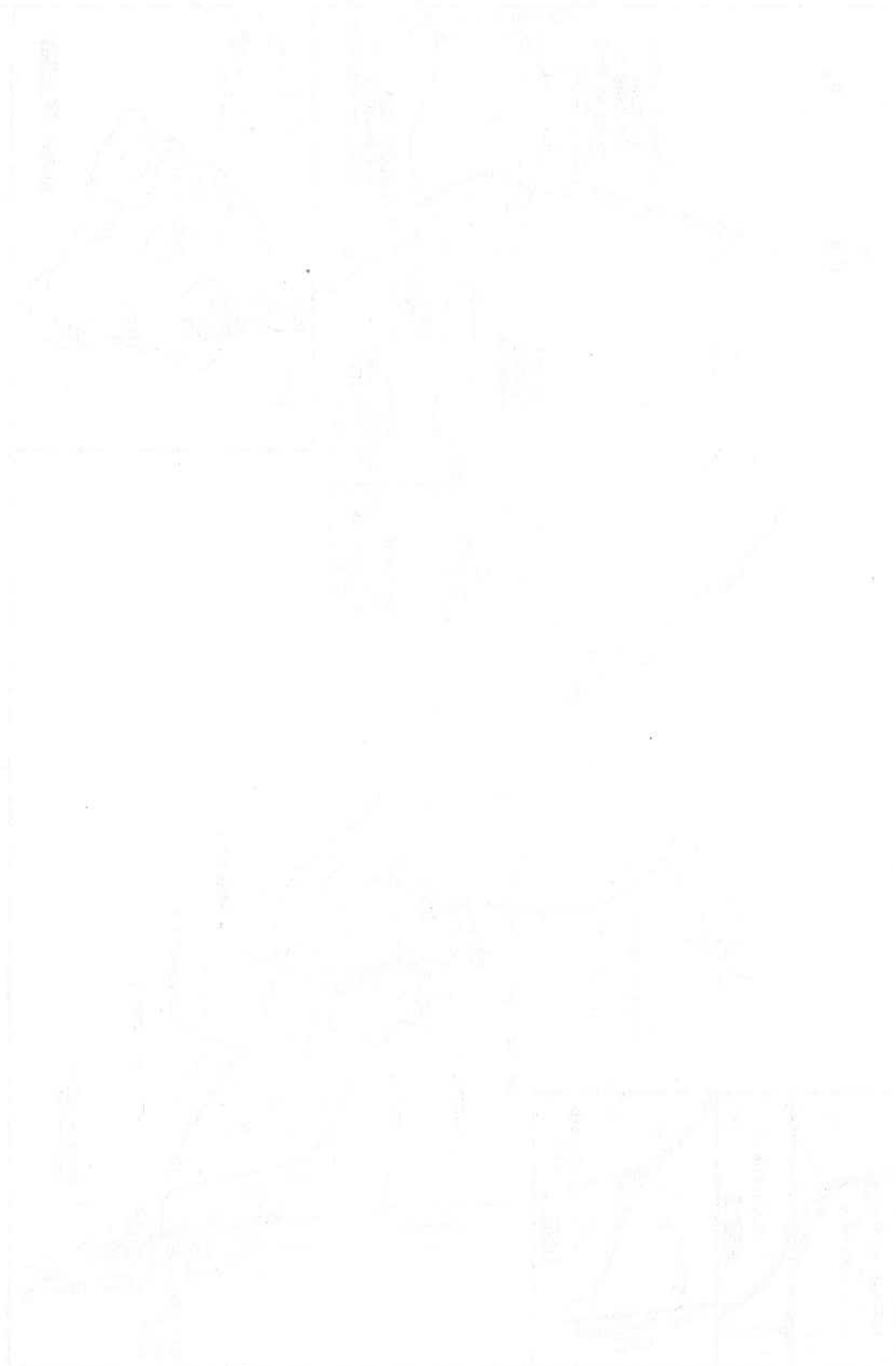
DKY:th



ALIGNMENT & ALTERNATIVES LOCATION MAP

SADDLE ROAD EXTENSION COORDINATION PLAN

FIGURE 1



Date: 12/19/2013

State of Hawaii
DEPARTMENT OF TRANSPORTATION

Log No: **DIR 1787**

Suspense: **01/02/2014**

FROM: DIRECTOR

Subject: SPECIES LIST FOR THE SADDLE ROAD EXTENSION FROM MAMALAHOA HIGHWAY TO QUEEN KAAHUMANU HIGHWAY, HAWAII

TO: HWY

- [x] DIR 1
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- [ ] LEG

HWY-H

FOR: APPROPRIATE ATTENTION & ACTION

- [x] Appropriate Attention & Action
- [ ] Arrange Meeting
- [ ] Investigate & Report Back
- [ ] Comments & Recommendations
- [ ] Draft Reply
- [ ] Final Reply for Gov's Sig
- [ ] Direct Action/Reply
- [ ] Information
- [ ] See Me
- [ ] Signature
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- [ ] Review
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- [ ] Phone Call __________
- [ ] Follow-up Interim Reply

RECEIVED
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2013 DEC 26 AM 8:02
HIGHWAYS DIVISION
HAWAII DISTRICT

DO NOT REMOVE FROM CORRESPONDENCE

HIGHWAYS DIVISION
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DEPT OF TRANSPORTATION

DEPUTY DIRECTOR
DEPT OF TRANSPORTATION
2013 DEC 19 P 4:24

DIR 1787

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawaii 96850

DIRECTOR'S OFFICE DEPT. OF TRANSPORTATION
2013 DEC 16 P 12:44

In Reply Refer To:
2014-SL-0095

D

Mr. Glenn M. Okimoto
State of Hawaii Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813-5097

Subject: Species list for the Saddle Road Extension from Mamalahoa Highway to Queen Kaahumana Highway, Hawaii

Dear Mr. Okimoto:

We are in receipt of your letter dated November 29, 2013, requesting a species list for the Saddle Road Extension. The Hawaii Department of Transportation and Federal Highway Administration are planning an extension of Saddle Road from the intersection of Queen Kaahumanu Highway and Waikoloa Beach road to the intersection of the realigned Saddle Road and Mamalahoa Highway. This response is in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Our databases, including data compiled by the Hawaii Biodiversity and Mapping Program, indicate the following listed species have been observed in the vicinity of the proposed project: (1) endangered Hawaiian goose (*Branta sandvicensis;* nene); (2) endangered Blackburn's sphinx moth (*Manduca blackburni;* BSM); (3) endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*); (4) threatened Hawaiian hawk (*Buteo solitaries*), and (5) listed plant species. To avoid and minimize impacts to these listed species, we recommend that you incorporate the following conservation measures into your project:

Nene

Nene are known to use habitats in the vicinity of the proposed project. In order to avoid impacts to the nene, we recommend that a biologist familiar with the nesting behavior of nene survey the area prior to the initiation of any work, or after any subsequent delay in work of three or more days (during which birds may attempt nesting). If a nest is discovered, work should cease immediately and our office should be contacted for further guidance. Furthermore, all on-site project personnel should be apprised that nene may be in the vicinity of the project at any time during the year. If a nene appears within 100 feet (30.5 meters) of ongoing work, all activity should be temporarily suspended until the animal leaves the area of its own accord.

Blackburn's sphinx moth

The Blackburn's sphinx moth has been found in the vicinity of the proposed project. The adult moth feeds on nectar from native plants including beach morning glory (*Ipomoea pescaprae*), iliee (*Plumbago zeylanica*), and maiapilo (*Capparis sandwichiana*). BSM larvae feed upon non-native tree tobacco (*Nicotiana glauca*), which occupies disturbed areas such as open fields and roadway margins, and the native aiea (*Nothocestrum sp.*), which is found in dry to moist forests at elevations ranging from 1,500 to 5,000 feet.

We recommend that a qualified biologist survey the project area for the presence of larval host plants. If larval host plants are detected and will be affected during project construction or operation, we recommend that the biologist document 1) general larval plant density; 2) proximity of larval plants to project sites; 3) average height of the larval plants; 4) signs of larval feeding damage on leaves; and 5) presence of BSM larvae on leaves. We recommend that surveys be conducted for BSM and potential host plants approximately four to eight weeks following significant rainfall and during the wettest portion of the year (usually November-April).

Hawaiian hawk

To avoid impacts to Hawaiian hawks, we recommend against clearing any brush or trees during their breeding season (March through September). If you are unable to avoid clearing vegetation during these months, we recommend you conduct surveys for nests prior to any clearing activity and contact our office for survey methodology and further recommendations to avoid impacting Hawaiian hawk nests.

Hawaiian hoary bat

The Hawaiian hoary bat roosts in both exotic and native woody vegetation and, while foraging, will leave young unattended in "nursery" trees and shrubs. If trees or shrubs suitable for bat roosting are cleared during the breeding season, there is a risk that young bats could inadvertently be harmed or killed. As a result, the Service recommends that woody plants greater than 15 feet tall should not be removed or trimmed from June 1 to September 15.

Listed plant species

We recommend that a qualified botanist conduct surveys for listed plant species within the project area. In addition, we recommend that the road alignment be planned to avoid the Waikoloa Dry Forest Preserve and the proposed lowland dry critical habitat unit in the same area.

General Comments

The proposed project is located on the dry leeward side of West Hawaii, where wildland fires may affect endangered species and critical habitat. Measures for wildland fire prevention and suppression should be included in project planning.

Construction of new transportation corridors can affect plant species composition, particularly the spread and establishment of invasive non-native plant species. Measures for minimizing the spread of alien invasive species should be included in project planning, including Hazard Analysis and Critical Control Point (HACCP) planning.

If it is determined that the proposed project may affect federally listed species, we recommend you contact our office early in the planning process so that we may assist you with the ESA compliance. If you have questions regarding the species list please contact Rachel Rounds (phone: 808-792-9400, email: Rachel_Rounds@fws.gov).

Sincerely,

Jess Newton

Jess Newton
Assistant Field Supervisor:
Maui Nui and Hawaii Islands

SADDLE ROAD EXTENSION
SOUTH KOHALA, HAWAI‘I

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Appendix H Noise Report

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ACOUSTIC STUDY FOR THE SADDLE ROAD EXTENSION, MAMALAHOA HIGHWAY TO QUEEN KAAHUMANU HIGHWAY WAIKOLOA, HAWAII

Prepared for:

OKAHARA & ASSOCIATES, INC.

Prepared by:

Y. EBISU & ASSOCIATES
1126 12th Avenue, Room 305
Honolulu, Hawaii 96816

JULY 2016

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CHAPTER I. SUMMARY

The existing and future traffic noise levels in the environs of the proposed Saddle Road Extension from Mamalahoa Highway to Queen Kaahumanu Highway on the island of Hawaii were studied to evaluate potential noise impacts associated with the Build Alternatives. Three possible alignments (4, 5, and 6) of the proposed Saddle Road Extension were evaluated, and their locations are shown in Figure 1. Noise measurements were obtained, traffic noise predictions developed, and noise abatement requirements discussed. All three alignment alternatives (Alignments 4, 5, and 6) will result in similar traffic noise levels along their Rights-of-Way.

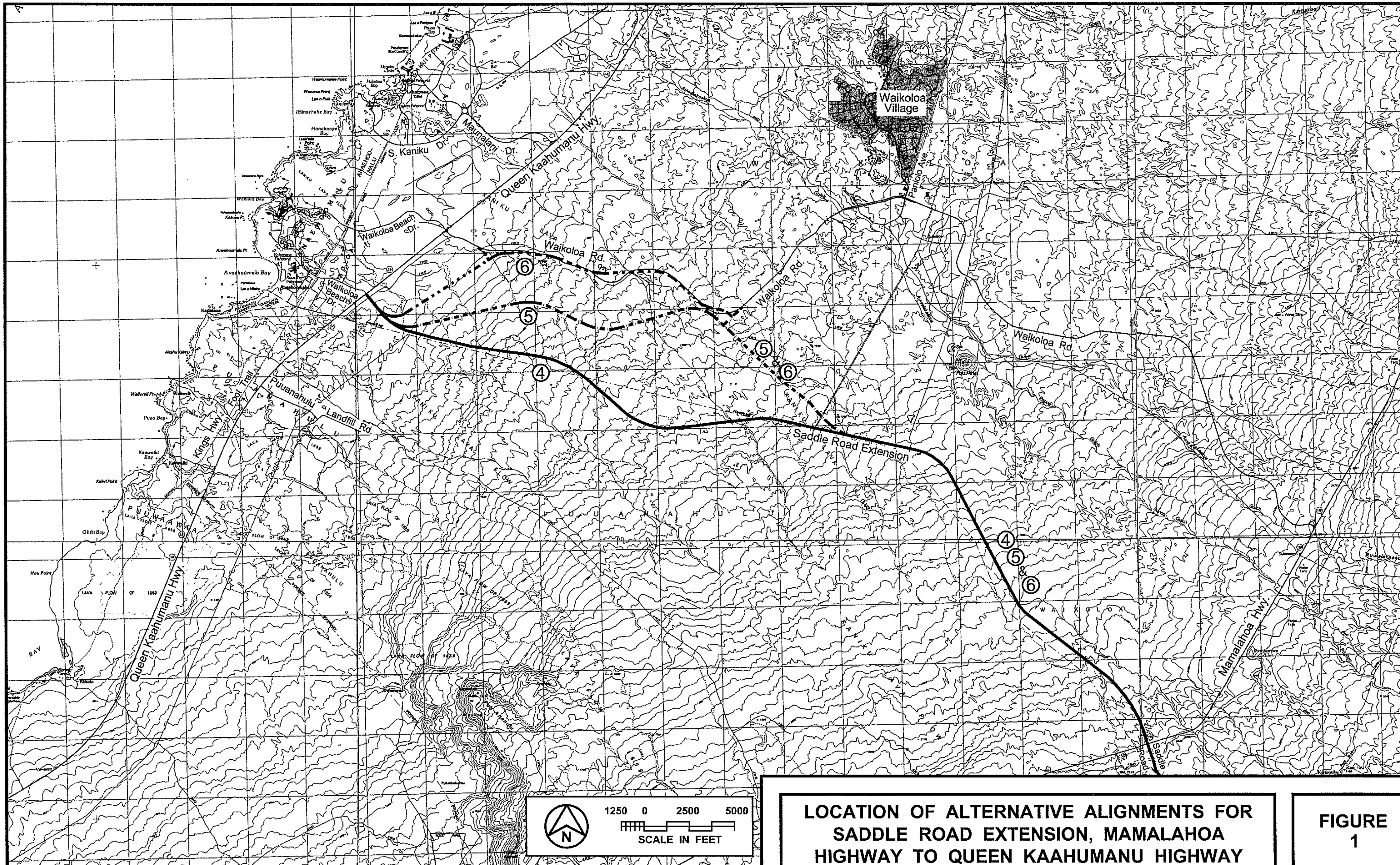
At locations along the three possible extension road alignments, existing traffic and background ambient noise levels in the project area currently do not exceed the U.S. Federal Highway Administration (FHWA) and Hawaii State Department of Transportation, Highways Division (HDOT) noise abatement criteria. Future (CY 2035) traffic noise levels will exceed the "66 Leq" and/or "15 dB increase" HDOT noise abatement criteria at distances within 469 feet of the selected extension road alignment, but traffic noise impacts should not occur due to the lack of noise sensitive, commercial, or park lands within one mile of the proposed Saddle Road Extension. No residences, commercial establishments, public use facilities, or park lands are expected to be adversely impacted by future traffic noise levels from the proposed extension road. Therefore, traffic noise mitigation measures should not be required for this project.

Reduction of future traffic volumes and resulting traffic noise are anticipated along the existing sections of Mamalahoa Highway and Waikoloa Road in the project area following completion of the Saddle Road Extension. This is a potential benefit from the Saddle Road Extension Project.

Potential short term construction noise impacts are possible during the project construction period due to the audibility of road construction noise at long distances. However, risks of adverse noise impacts from construction of the Saddle Road Extension are considered to be minimal, and minimizing these types of noise impacts is possible using standard curfew periods, properly muffled equipment, and administrative controls.

The following general conclusions can be made in respect to the number of impacted structures and lands which can be expected by CY 2035 under Alignment 4. Alignment 4 has the lowest risk of requiring future noise mitigation measures under the current HDOT noise policy. These conclusions are valid as long as the future vehicle volumes, mixes, and average speeds do not differ from the assumed values.

- The HDOT's ">15 dB increase" criteria for substantial change in traffic noise levels will not be exceeded at any existing or planned noise sensitive structure



LOCATION OF ALTERNATIVE ALIGNMENTS FOR SADDLE ROAD EXTENSION, MAMALAHOA HIGHWAY TO QUEEN KAAHUMANU HIGHWAY

FIGURE 1

for which a Hawaii County Building Permit is pending. Increases in existing background noise levels by 15 dB or more will typically occur at the first row of lots which front the proposed Saddle Road Extension Rights-of-Way.

- Because the first row of lots which front the Saddle Road Extension Alignment 4 are currently undeveloped and have no noise sensitive or other development pending for those lots, traffic noise mitigation measures along the proposed Saddle Road Extension are not required by current HDOT noise policy and abatement guidelines.

- Current HDOT noise abatement policy requires that a minimum number (75 percent) of noise impacted receptors within the first row of lots fronting the highway benefit from at least 7 dB of sound attenuation if sound attenuation walls are to be included in a highway project. While other requirements (cost, opinions of affected property owners and tenants, and ability to design and construct the sound walls) must also be met, the lack of noise impacted receptors within the front row lots on both sides of the Saddle Road Extension Alignment 4 eliminated the need for sound attenuating walls as a noise abatement measure on this project.

- No parks are located within the limits of project construction; therefore, none should be affected by the proposed project or require noise mitigation measures under the Build Alternative.

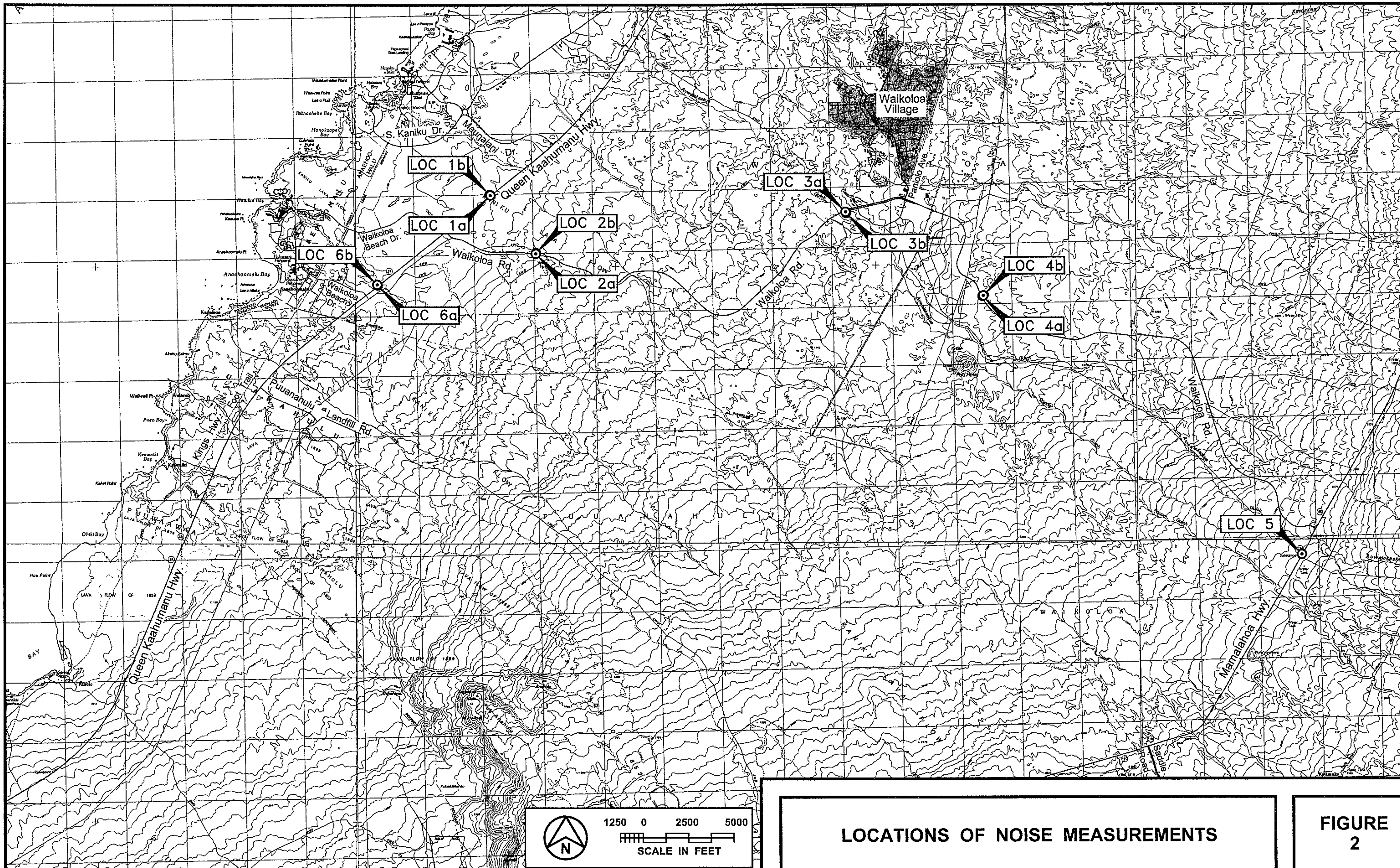
CHAPTER II. GENERAL STUDY METHODOLOGY

Noise Measurements. Traffic and background ambient noise levels at six locations in the project area were originally measured in October 1999. The traffic noise measurements were used to validate the FHWA Traffic Noise Model, Version 1.1, which was the noise model in use at that time. In April 2015, additional traffic and background noise measurements were obtained at eleven locations in the project area, and these measurements were used to validate the current FHWA Traffic Noise Model (TNM), Version 2.5. The current version of the FHWA TNM was used calculate the Base Year (CY 2013) and future (CY 2035) traffic noise levels under the No Build and three Build Alternatives. The background ambient noise measurements were also used to define existing noise levels at noise sensitive receptors which may be affected by the project. Also, the measurements were used in conjunction with forecast traffic noise levels to determine if future traffic noise levels are predicted to "substantially exceed" existing background ambient noise levels at these noise sensitive receptors, and therefore exceed FHWA and HDOT noise abatement criteria (see Reference 5).

The noise measurement locations are shown in Figure 2. Traffic and background noise measurements were obtained at Locations 1a, 1b, 2a, 2b, 3a, 3b, 4a, 4b, 5, 6a, and 6b. The results of the traffic and background ambient noise measurements are summarized in Table 1. In Table 1 and in subsequent tables, Leq represents the average (or equivalent), A-Weighted, Sound Level. A list and description of the acoustical terminology used are contained in Appendix B.

Traffic Noise Predictions. The Federal Highway Administration (FHWA) Traffic Noise Model, Version 2.5 (or TNM, see Reference 1) was used as the primary method of calculating Base Year and future traffic noise levels, with model parameters adjusted to reflect terrain, ground cover, and local shielding conditions. The traffic noise measurement Locations 1a through 6b along Queen Kaahumanu Highway, Waikoloa Road, and Mamalahoa Highway were used to validate the traffic noise model. At these traffic noise measurement locations, the measured traffic noise levels were compared with TNM model predictions to determine if the measured and calculated noise levels for the existing conditions were consistent and in general agreement. As indicated in Table 1, spot counts of traffic volumes were also obtained during the noise measurement periods and were used to generate the Equivalent Sound Level (Leq) predictions shown in the table. Traffic mix by vehicle types and average vehicle speeds for the various sections of the existing and future roadways were derived from observations during the traffic noise monitoring periods.

Measured and predicted traffic noise levels at Locations 1a through 6b were generally in good agreement at distances ranging from 33 to 150 feet from the centerlines of the roadways. The traffic noise measurements indicated that use of the "loose soil" propagation loss factor in the traffic noise model produced acceptable results. So for this study, TNM 2.5 model predictions of future traffic noise levels along the new roadway were expected to be reasonably accurate and acceptable for use on



LOCATIONS OF NOISE MEASUREMENTS

FIGURE 2

TABLE 1
TRAFFIC NOISE MEASUREMENT RESULTS

LOCATION	Time of Day (HRS)	Ave. Speed (MPH)	Hourly Traffic Volume AUTO	M.TRUCK	H.TRUCK	Measured Leq (dB)	Predicted Leq (dB)
1a. 50 FT from the center-line of Queen Kaahumanu Highway (04/15/15)	0700 TO 0800	56	787	28	59	71.8	70.9
1b. 100 FT from the center-line of Queen Kaahumanu Highway (04/15/15)	0700 TO 0800	56	787	28	59	63.8	65.7
1a. 50 FT from the center-line of Queen Kaahumanu Highway (04/15/15)	1530 TO 1630	56	1,112	26	40	71.3	71.3
2a. 50 FT from the center-line of Waikoloa Road (04/15/15)	0830 TO 0930	37	516	12	22	63.9	63.6
2b. 100 FT from the center-line of Waikoloa Road (04/15/15)	0830 TO 0930	37	516	12	22	58.0	58.3
2a. 50 FT from the center-line of Waikoloa Road (04/16/15)	1200 TO 1300	38	429	7	22	63.2	63.2

TABLE 1 (CONTINUED)
TRAFFIC NOISE MEASUREMENT RESULTS

LOCATION	Time of Day (HRS)	Ave. Speed (MPH)	------ Hourly Traffic Volume ------ AUTO	M.TRUCK	H.TRUCK	Measured Leq (dB)	Predicted Leq (dB)
2b. 100 FT from the center-line of Waikoloa Road (04/16/15)	1200 TO 1300	38	429	7	22	58.1	58.0
3a. 75 FT from the center-line of Waikoloa Road median (04/15/15)	1000 TO 1100	35	431	9	24	61.5	61.3
3b. 150 FT from the center-line of Waikoloa Road median (04/15/15)	1000 TO 1100	35	431	9	24	55.8	54.7
3a. 75 FT from the center-line of Waikoloa Road median (04/16/15)	1650 TO 1750	35	681	8	7	61.1	61.8
3b. 150 FT from the center-line of Waikoloa Road median (04/16/15)	1650 TO 1750	35	681	8	7	55.0	54.2
4a. 50 FT from the center-line of Waikoloa Road (04/15/15)	1135 TO 1235	43	198	4	19	61.7	62.2

TABLE 1 (CONTINUED)
TRAFFIC NOISE MEASUREMENT RESULTS

LOCATION	Time of Day (HRS)	Ave. Speed (MPH)	Hourly Traffic Volume AUTO	M.TRUCK	H.TRUCK	Measured Leq (dB)	Predicted Leq (dB)
4b. 100 FT from the center-line of Waikoloa Road (04/15/15)	1135 TO 1235	43	198	4	19	57.8	57.2
4a. 50 FT from the center-line of Waikoloa Road (04/16/15)	0915 TO 1015	43	211	5	24	62.4	62.9
4b. 100 FT from the center-line of Waikoloa Road (04/16/15)	0915 TO 1015	43	211	5	24	58.3	58.0
5. 33 FT from the center-line of Mamalahoa Hwy. median (04/15/15)	1700 TO 1800	48	296	6	11	66.1	66.0
5. 33 FT from the center-line of Mamalahoa Hwy. median (04/16/15)	0600 TO 0700	53	257	10	12	67.5	67.3
5. 33 FT from the center-line of Mamalahoa Hwy. median (04/16/15)	1030 TO 1130	48	204	4	22	66.2	66.2

TABLE 1 (CONTINUED)
TRAFFIC NOISE MEASUREMENT RESULTS

LOCATION	Time of Day (HRS)	Ave. Speed (MPH)	Hourly Traffic Volume AUTO	Hourly Traffic Volume M.TRUCK	Hourly Traffic Volume H.TRUCK	Measured Leq (dB)	Predicted Leq (dB)
6a. 50 FT from the center-line of Queen Kaahumanu Highway (04/16/15)	0738 TO 0838	56	966	30	84	72.9	72.2
6b. 100 FT from the center-line of Queen Kaahumanu Highway (04/16/15)	0738 TO 0838	56	966	30	84	65.9	66.7
6a. 50 FT from the center-line of Queen Kaahumanu Highway (04/16/15)	1330 TO 1430	40	1,105	26	60	69.4	67.9
6b. 100 FT from the center-line of Queen Kaahumanu Highway (04/16/15)	1330 TO 1430	40	1,105	26	60	61.1	62.8
6a. 50 FT from the center-line of Queen Kaahumanu Highway (04/16/15)	1530 TO 1630	45	1,349	18	48	71.3	69.2
6b. 100 FT from the center-line of Queen Kaahumanu Highway (04/16/15)	1530 TO 1630	45	1,349	18	48	61.7	64.1

this project.

Base Year background ambient noise levels along the three alternate roadway alignments (which are removed from existing roadways) were estimated from the residual background noise measurements obtained in April 2015 along Waikoloa Road and Mamalaloa Highway (see Table 2). Except for the roadway corridor sections which are located at or near existing roadways, the alternate roadway alignments are located in undeveloped areas where background ambient noise levels are controlled by distant traffic, and the natural sounds of birds or foliage movement with the wind. Existing background ambient noise levels in areas removed from Queen Kaahumanu Highway, Mamalahoa Highway, and Waikoloa Road can be described as being very low, which would be expected due to the undeveloped nature of those areas. Measured average (or Leq) background ambient noise levels were estimated to range from 35 to 45 dB, with instantaneous levels dropping below 20 dB during periods of low wind with no bird sounds. For the purposes of this project, existing background noise levels in the undeveloped areas in the vicinity of the alternate roadway alignments but away from existing roadways were estimated to be 40 dB (Leq) during the AM and PM peak hours.

Along Mamalahoa Highway and Waikoloa Road, existing traffic noise levels are moderate, and do not exceed the HDOT noise abatement criteria level of 66 dB at setback distances of 56 feet from the roadway centerlines. Traffic noise levels along Queen Kaahumanu Highway are higher, and typically exceed the HDOT noise abatement criteria level of 66 dB at a setback distance of 95 to 109 feet from the roadway centerline. Relatively high traffic noise levels along the Right-of-Way of a major roadway is a typical occurrence, with traffic noise levels decreasing with increasing distances from the roadway. Existing background ambient noise levels at receptor locations alongside Queen Kaahumanu Highway, Mamalahoa Highway, and Waikoloa Road were assumed to be controlled by traffic along these three roadways. The FHWA traffic noise model was used to calculate Base Year traffic noise levels at receptor locations alongside these three roadways using the modeling parameters established from the traffic noise measurements.

The Equivalent (or Average) Hourly Sound Level [Leq(h)] noise descriptor was used to calculate the Base Year and CY 2035 traffic noise levels as required by References 3 and 5. The project maps and visual survey of the developments alongside the existing roadways were used to determine terrain, ground cover, and local shielding effects and distances from building structures, which were entered into the noise prediction model. Receptor elevations were estimated using these maps as well as field observations.

Traffic mix by vehicle types and average vehicle speeds for the various sections of the existing and future roadways were derived from observations during the April 2015 noise monitoring periods. Determinations of the periods of highest hourly traffic volumes and noise levels along the project corridor were made after reviewing the AM

TABLE 2

TABULATION OF RESIDUAL BACKGROUND NOISE LEVELS AT NOISE MEASUREMENT LOCATIONS

Date	Time	Location		Leq	Lmax	Lmin	
04/15/2015	0830-0930	2b		42.4	44.4	35.4	
04/15/2015	1000-1100	3b		43.7	45.4	39.1	
04/15/2015	1135-1235	4b		45.8	47.4	38.1	
04/15/2015	1700-1800	5		43.5	45.1	38.8	
04/16/2015	0600-0700	5		39.5	42.3	29.9	
04/16/2015	0915-1015	4b		44.2	45.9	38.6	
04/16/2015	1030-1130	5		42.8	44.7	33.9	
04/16/2015	1200-1300	2b		42.6	44.9	33.9	
04/16/2015	1650-1750	3b		42.4	44.2	37.2	

Notes:

a. Leq = Average A-Weighted Sound Level (in dBA)
b. Lmax = Maximum A-Weighted Sound Level (in dBA)
c. Lmin = Minimum A-Weighted Sound Level (in dBA)

and PM peak hour traffic volumes and traffic noise level measurement results. As indicated in the traffic noise measurement results of Table 1, the highest traffic noise levels on Queen Kaahumanu Highway, were measured during the AM peak hour, even though the higher traffic volumes occurred during the PM peak hour. For the purposes of this study, the AM and PM peak hour traffic noise levels (as calculated using the data in References 2 and 4, and as indicated by the measurement data in Table 1) were used to determine the periods with the highest traffic noise levels.

Future year (2035) traffic noise levels were then developed for the No Build and Build (Saddle Road Extension) Alternatives along the three alternate roadway alignments using the future AM and PM peak hour volumes from References 2 and 4. Future traffic noise levels were calculated at reference distances of 50, 100, and 200 feet from the centerlines of the various roadways. The setback distances to the HDOT 66 Leq and 71 Leq noise abatement criteria levels were also calculated.

Residential or other noise sensitive structures or park lands are not located within one mile of the centerline of any of the three roadway extension alternatives. Noise sensitive receptors are located primarily along Waikoloa Road and in the vicinity of Waikoloa Village near noise measurement Locations 3a and 3b. Therefore, exceedance of the HDOT 66 Leq noise abatement criteria was not expected under any of the Saddle Road Extension Build Alternatives. The need to evaluate potential exceedances of the HDOT "15 dB increase" noise abatement criteria was examined by predicting future traffic noise levels at large distances from the Saddle Road Extension, and comparing them with the estimated background ambient noise level of 40 dB. In addition, the setback distance from the Saddle Road Extension required to not exceed 55 dB (or 15 dB greater than then existing background noise level of 40 dB) was also examined.

Impact Assessments and Mitigation. Following the calculation of the future traffic noise levels associated with the three Build Alternatives, evaluations of the future traffic noise levels and impacts at potential receptor locations along the Saddle Road Extension Alignment 4 and within the limits of project construction were made. Comparisons of predicted future traffic noise levels with FHWA and HDOT noise abatement criteria (see Table 3) were made to determine specific locations where the noise abatement criteria are expected to be exceeded. Alignment 4 (because of its remoteness) was considered to have the lowest risk of requiring future noise mitigation measures, and Alignment 6 (because of its use of Waikoloa Road) was considered to have the highest risk of requiring future noise mitigation measures under the current HDOT Noise Policy.

The HDOT "equal to or greater than 66 Leq(h)" noise abatement criteria and the HDOT "equal to or greater than 15 dB increase" criteria were applied to all noise sensitive receptor locations (see Categories B and C in Table 3) in the project environs. By Reference 5, the HDOT has replaced the FHWA 67 Leq(h) criteria with their 66 Leq(h) criteria for noise sensitive receptors in Activity Categories B and C. Along the

TABLE 3

FHWA & HDOT NOISE ABATEMENT CRITERIA
[Hourly A–Weighted Sound Level––Decibels (dBA)]

ACTIVITY CATEGORY	LEQ (h) (Note 2)	DESCRIPTION OF ACTIVITY CATEGORY
A	57 (Exterior)	Lands on which serenity and quiet are of extra–ordinary significance and serve an important public need and where the preservation of those qualities is essential if the areas are to continue to serve their intended purpose.
B (Note 1)	67 (Exterior)	Residential.
C (Note 1)	67 (Exterior)	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52 (Interior)	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or non profit institutional structures, radio studios, recording studios, schools, and television studios.
E (Note 1)	72 (Exterior)	Hotels, motels, offices, restaurants/bars, and other develped lands, properties or activities not included in A–D or F.
F	------	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	------	Undeveloped lands that are not permitted.

Notes:
1. Includes undeveloped lands permitted for this activity category.
2. The Hawaii State Department of Transportation, Highways Division, utilizes Leq criteria levels which are 1 Leq unit less than the FHWA values shown.

project roadway corridors, the locations of the 66 Leq(h) traffic noise contours, without the benefit of shielding from natural terrain or man-made sound barriers, were also used to identify noise sensitive receptor locations where the HDOT's "66 Leq" noise abatement criteria would not be exceeded, and which would not require more detailed evaluations. In addition, the HDOT's criteria of "equal to or greater than 15 dB increase above existing background noise levels" was also used as a noise abatement criteria for this project within the limits of project construction (from Reference 5). At receptor locations where the "66 Leq" or "15 dB increase" noise abatement criteria were exceeded, future traffic noise mitigation measures were to be evaluated in accordance with the requirements of Reference 5.

The "71 Leq" criteria is also used as a noise abatement criteria for lands which are in commercial, industrial, hotel, etc. uses as indicated in Table 3. While these land uses do not exist along the project corridor, the locations of the future 71 Leq traffic noise contours were included for completeness.

CHAPTER III. EXISTING ACOUSTICAL ENVIRONMENT

For the purposes of this study, 2013 was used as the Base Year for calculating changes in traffic and background ambient noise levels between the Base Year and 2035 under the Build Alternatives. The Base Year noise environment in the undeveloped areas near the three Saddle Road Extension alignments were estimated to be 40 dB during the AM or PM peak hour. In the developed areas along Queen Kaahumanu Highway, Mamalahoa Highway, and Waikoloa Road, the Base Year noise levels were controlled by roadway traffic during CY 2013. The 2013 average sound levels, expressed in decibels, along the existing roadways in the project area, represent the average levels of background ambient or traffic noise during the study's Base Year, and were calculated using the traffic noise model (FHWA TNM, Version 2.5). Traffic noise measurements obtained in April 2015 were used to validate the traffic noise model. Table 1 contains the traffic noise measurement results, and compares them with predictions from the traffic noise model. The eleven noise measurement locations are shown in Figure 2.

Tables 4A and 4B present the Base Year traffic noise levels along the existing roadways in the project area and at receptor locations of 50, 100, and 200 feet from the centerlines of these three roadways. The Base Year traffic volumes shown in Tables 4A and 4B were obtained from the project's traffic study (Reference 2), and the speed and mix assumptions were obtained from field observations in April 2015. "Loose Soil" propagation loss factor and unobstructed line-of-sight to the roadways were assumed.

The Base Year traffic noise levels along Queen Kaahumanu Highway exceeded the HDOT 66 Leq criteria at 95 to 109 feet distance from the highway's centerline. There were no developments in Activity Categories B or C within the 66 Leq contour along Queen Kaahumanu Highway and in the project environs during the Base Year.

The Base Year traffic noise levels along Mamalahoa Highway north of Waikoloa Road exceeded the HDOT 66 Leq criteria at 52 feet distance from the highway's centerline but not at 100 feet distance from the roadway's centerline. South of the Waikoloa Road intersection, Base Year traffic noise levels did not exceed the HDOT 66 Leq criteria at 50 feet distance from the highway's centerline. There were no developments in Activity Categories B or C within the 66 Leq contour along Mamalahoa Highway and in the project environs during the Base Year.

The Base Year traffic noise levels along Waikoloa Road near Waikoloa Village exceeded the HDOT 66 Leq criteria at 55 feet distance from the roadway's centerline but not at 100 feet distance from the roadway's centerline. This was due to the large (approximately 50 feet wide) median and four travel lanes present near the intersection with Paniolo Avenue and in the vicinity of noise measurement Locations 3a and 3b. Along the east and west sections of Waikoloa Road, which have two travel lanes, Base

TABLE 4A

EXISTING (CY 2013) TRAFFIC VOLUMES AND NOISE LEVELS ALONG ROADWAYS IN PROJECT AREA (AM PEAK HOUR)

LOCATION	SPEED (MPH)	TOTAL VPH	********** VOLUMES (VPH) *********** AUTOS	M TRUCKS	H TRUCKS	50' Leq	100' Leq	200' Leq
Q. Kaahumanu Hwy. N. of Waikoloa Rd.	56	762	686	24	52	70.4	65.1	59.4
Q. Kaahumanu Hwy. Between Waikoloa & Waikoloa Beach Dr.	56	1,062	949	30	83	72.0	66.7	61.1
Q. Kaahumanu Hwy. S. of Waikoloa Beach Dr.	56	845	755	24	66	71.0	65.7	60.1
Mamalahoa Hwy. N. of Waikoloa Rd.	53	399	368	14	17	66.4	60.3	54.2
Mamalahoa Hwy. Between Waikoloa and Saddle Rd. Ext.	53	314	290	11	13	65.3	59.2	53.2
Mamalahoa Hwy. S. of Saddle Rd. Ext.	53	314	289	11	14	65.4	59.3	53.3
Waikoloa Rd. At Q. Kaahumanu Hwy.	37	670	628	15	27	64.1	59.0	53.8
Waikoloa Rd. W. of Paniolo Ave.	35	663	616	13	34	66.9	60.0	53.8
Waikoloa Rd. Between Paniolo Ave. & Mamalahoa Hwy.	43	407	357	9	41	65.3	60.3	55.1
Saddle Rd. Ext. E. of Q. Kaahumanu Hwy.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Saddle Rd. Ext. W. of Mamalahoa Hwy.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Saddle Rd. Ext. E. of Mamalahoa Hwy.	55	192	178	4	10	63.7	58.4	52.6

Notes:

1. "Loose Soil" propagation loss characteristic assumed.
2. Free field conditions without obstructions assumed.

TABLE 4B

EXISTING (CY 2013) TRAFFIC VOLUMES AND NOISE LEVELS ALONG ROADWAYS IN PROJECT AREA (PM PEAK HOUR)

LOCATION	SPEED (MPH)	TOTAL VPH	********** VOLUMES (VPH) *********** AUTOS	M TRUCKS	H TRUCKS	50' Leq	100' Leq	200' Leq
Q. Kaahumanu Hwy. N. of Waikoloa Rd.	56	1,084	1,023	24	37	71.1	65.6	59.7
Q. Kaahumanu Hwy. Between Waikoloa & Waikoloa Beach Dr.	45	1,456	1,388	19	49	69.5	64.2	58.6
Q. Kaahumanu Hwy. S. of Waikoloa Beach Dr.	56	1,215	1,158	16	41	71.5	66.0	60.1
Mamalahoa Hwy. N. of Waikoloa Rd.	48	506	478	10	18	65.8	59.8	53.8
Mamalahoa Hwy. Between Waikoloa and Saddle Rd. Ext.	48	385	365	7	13	64.6	58.5	52.6
Mamalahoa Hwy. S. of Saddle Rd. Ext.	48	425	402	8	15	65.1	59.0	53.1
Waikoloa Rd. At Q. Kaahumanu Hwy.	37	670	628	15	27	64.3	59.2	54.0
Waikoloa Rd. W. of Paniolo Ave.	35	663	649	7	7	64.6	57.7	50.8
Waikoloa Rd. Between Paniolo Ave. & Mamalahoa Hwy.	43	380	334	8	38	65.0	59.9	54.8
Saddle Rd. Ext. E. of Q. Kaahumanu Hwy.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Saddle Rd. Ext. W. of Mamalahoa Hwy.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Saddle Rd. Ext. E. of Mamalahoa Hwy.	55	265	247	5	13	65.1	59.7	53.9

Notes:

1. "Loose Soil" propagation loss characteristic assumed.
2. Free field conditions without obstructions assumed.

Year traffic noise levels did not exceed the HDOT 66 Leq criteria at 50 feet distance from the roadway's centerline. There were no developments in Activity Categories B or C within the 66 Leq contour along Waikoloa Road near the Alternative 6 alignment during the Base Year. Noise sensitive developments are present along Waikoloa Road in the vicinity of Waikoloa Village, but these noise sensitive developments are approximately 2 miles from the closest alignments of the Alternatives 5 and 6.

In summary, Base Year traffic and background ambient noise levels in the project area did not exceed the FHWA 67 Leq or HDOT 66 Leq noise abatement criteria levels for Activity Categories B or C at noise sensitive receptors in the project area or along the possible alignments for the Saddle Road Extension, and were considered acceptable for the purposes of this project.

CHAPTER IV. DESCRIPTION OF FUTURE TRAFFIC NOISE LEVELS

The traffic noise levels along the three proposed Saddle Road Extension Alternatives during CY 2035 were evaluated for the Build Alternative. The same methodology that was used to validate the measured Base Year traffic noise levels in Table 1 was also used to calculate the Year 2035 noise levels under the three Build Alternatives. Predictions of future traffic noise levels along Alternate Alignments 4, 5, and 6 assumed the following for all three alternatives:

a. Traffic volumes during the AM and PM peak hours as contained in the project traffic study (References 2 and 4), and which are summarized in Appendices C1 through C3.

b. Average speed of 55 miles per hour, with future traffic mix of 93.0% automobiles, 2.0% medium trucks, and 5.0% heavy trucks and buses.

The predicted traffic noise levels at 50, 100, and 200 feet distance from the centerlines of the proposed three alignments are shown in Tables 5A through 5F, with the three alignments shown in Figure 1. Also included in the tables are the predicted traffic noise levels at 50, 100, and 200 feet from the centerlines of Queen Kaahumanu Highway, Mamalahoa Highway, and Waikoloa Road for CY 2035 for the three Build Alternatives.

Predicted traffic noise levels associated with forecasted traffic on the Saddle Road Extension alignments in 2035 are not expected to exceed 40 Leq at 2,903 feet distance from the centerlines of the proposed new roadways. At 469 feet distance from the centerline of the proposed new roadways, traffic noise levels in 2035 could exceed 55 Leq. Therefore, with current background ambient noise levels of 40 Leq or more in the undeveloped project areas, exceedance of the HDOT "15 dB increase" noise abatement criteria is not expected from traffic noise associated with the three Saddle Road Extension alignments at receptor locations which are at least 470 feet from the centerlines of the proposed alignments.

Tables 6A through 6F present the changes in setback distances to the 66 Leq and 71 Leq traffic noise contours along the various existing roadways in the project area for 2035 under the Build Alternative for each of the three Saddle Road Extension alternatives. Also shown in the tables are the predicted setback distances to the 66 Leq and 71 Leq traffic noise contours along the three Saddle Road Extension alignments. It should be noted that while the setback distances are expected to increase along existing roadways from 2013 to 2035, the increases in setback distances are predicted to be larger along Waikoloa Road and Mamalahoa Highway under the No Build Alternative. In other words, future traffic noise levels in 2035 along Waikoloa Road and Mamalahoa Highway are not expected to increase above their Base Year levels with the implementation of the Saddle Road Extension.

The following general conclusions can be made in respect to the potential noise

TABLE 5A

FUTURE (CY 2035) TRAFFIC VOLUMES AND NOISE LEVELS ALONG ROADWAYS IN PROJECT AREA WITH ALTERNATIVE 4 (AM PEAK HOUR)

LOCATION	SPEED (MPH)	TOTAL VPH	********** VOLUMES (VPH) *********** AUTOS	M TRUCKS	H TRUCKS	50' Leq	100' Leq	200' Leq
Q. Kaahumanu Hwy. N. of Waikoloa Rd.	56	2,780	2,502	89	189	76.0	70.7	65.0
Q. Kaahumanu Hwy. Between Waikoloa & Waikoloa Beach Dr.	56	2,510	2,244	70	196	75.7	70.4	64.8
Q. Kaahumanu Hwy. S. of Waikoloa Beach Dr.	56	2,760	2,468	77	215	76.1	70.8	65.2
Mamalahoa Hwy. N. of Waikoloa Rd.	53	1,430	1,318	51	61	71.9	65.8	59.8
Mamalahoa Hwy. Between Waikoloa and Saddle Rd. Ext.	53	1,800	1,658	65	77	72.9	66.8	60.8
Mamalahoa Hwy. S. of Saddle Rd. Ext.	53	1,405	1,294	51	60	71.8	65.7	59.7
Waikoloa Rd. At Q. Kaahumanu Hwy.	37	865	811	19	35	65.4	60.3	55.1
Waikoloa Rd. W. of Paniolo Ave.	35	905	841	17	47	68.1	61.3	55.2
Waikoloa Rd. Between Paniolo Ave. & Mamalahoa Hwy.	43	950	835	20	95	68.9	63.9	58.8
Saddle Rd. Ext. E. of Q. Kaahumanu Hwy.	55	1,455	1,353	29	73	72.5	67.1	61.3
Saddle Rd. Ext. W. of Mamalahoa Hwy.	55	1,455	1,353	29	73	72.5	67.1	61.3
Saddle Rd. Ext. E. of Mamalahoa Hwy.	55	1,660	1,544	33	83	73.0	67.7	61.9

Notes:

1. "Loose Soil" propagation loss characteristic assumed.
2. Free field conditions without obstructions assumed.

TABLE 5B

FUTURE (CY 2035) TRAFFIC VOLUMES AND NOISE LEVELS ALONG ROADWAYS IN PROJECT AREA WITH ALTERNATIVE 4 (PM PEAK HOUR)

LOCATION	SPEED (MPH)	TOTAL VPH	********** VOLUMES (VPH) *********** AUTOS	M TRUCKS	H TRUCKS	50' Leq	100' Leq	200' Leq
Q. Kaahumanu Hwy. N. of Waikoloa Rd.	56	3,415	3,224	75	116	76.0	70.6	64.7
Q. Kaahumanu Hwy. Between Waikoloa & Waikoloa Beach Dr.	45	2,795	2,664	36	95	72.3	67.0	61.4
Q. Kaahumanu Hwy. S. of Waikoloa Beach Dr.	56	3,095	2,950	40	105	75.5	70.1	64.1
Mamalahoa Hwy. N. of Waikoloa Rd.	48	1,920	1,817	36	67	71.6	65.5	59.6
Mamalahoa Hwy. Between Waikoloa and Saddle Rd. Ext.	48	2,295	2,171	44	80	72.3	66.0	60.2
Mamalahoa Hwy. S. of Saddle Rd. Ext.	48	1,765	1,669	34	62	71.2	65.2	59.2
Waikoloa Rd. At Q. Kaahumanu Hwy.	37	1,110	1,042	24	44	66.5	61.4	56.1
Waikoloa Rd. W. of Paniolo Ave.	35	975	954	11	10	66.5	59.5	52.6
Waikoloa Rd. Between Paniolo Ave. & Mamalahoa Hwy.	43	845	742	18	85	68.4	63.4	58.3
Saddle Rd. Ext. E. of Q. Kaahumanu Hwy.	55	1,430	1,329	29	72	72.4	67.0	61.3
Saddle Rd. Ext. W. of Mamalahoa Hwy.	55	1,430	1,329	29	72	72.4	67.0	61.3
Saddle Rd. Ext. E. of Mamalahoa Hwy.	55	1,940	1,804	39	97	73.7	68.3	62.6

Notes:

1. "Loose Soil" propagation loss characteristic assumed.
2. Free field conditions without obstructions assumed.

TABLE 5C

FUTURE (CY 2035) TRAFFIC VOLUMES AND NOISE LEVELS ALONG ROADWAYS IN PROJECT AREA WITH ALTERNATIVE 5 (AM PEAK HOUR)

LOCATION	SPEED (MPH)	TOTAL VPH	********** VOLUMES (VPH) *********** AUTOS	M TRUCKS	H TRUCKS	50' Leq	100' Leq	200' Leq
Q. Kaahumanu Hwy. N. of Waikoloa Rd.	56	2,780	2,502	89	189	76.1	70.6	64.7
Q. Kaahumanu Hwy. Between Waikoloa & Waikoloa Beach Dr.	56	2,510	2,244	70	196	75.8	70.4	64.6
Q. Kaahumanu Hwy. S. of Waikoloa Beach Dr.	56	2,760	2,468	77	215	76.2	70.8	65.0
Mamalahoa Hwy. N. of Waikoloa Rd.	53	1,430	1,318	51	61	71.8	65.5	59.6
Mamalahoa Hwy. Between Waikoloa and Saddle Rd. Ext.	53	1,615	1,488	58	69	72.4	66.0	60.1
Mamalahoa Hwy. S. of Saddle Rd. Ext.	53	1,405	1,294	51	60	71.8	65.4	59.5
Waikoloa Rd. At Q. Kaahumanu Hwy.	37	865	811	19	35	65.4	59.4	54.1
Waikoloa Rd. W. of Paniolo Ave.	35	1,090	1,012	21	57	66.2	60.5	55.4
Waikoloa Rd. Between Paniolo Ave. & Mamalahoa Hwy.	43	765	672	16	77	68.1	62.9	57.6
Saddle Rd. Ext. E. of Q. Kaahumanu Hwy.	55	1,455	1,353	29	73	72.5	67.1	61.3
Saddle Rd. Ext. W. of Mamalahoa Hwy.	55	1,640	1,525	33	82	73.0	67.6	61.8
Saddle Rd. Ext. E. of Mamalahoa Hwy.	55	1,660	1,544	33	83	73.0	67.7	61.9

Notes:

1. "Loose Soil" propagation loss characteristic assumed.
2. Free field conditions without obstructions assumed.

TABLE 5D

FUTURE (CY 2035) TRAFFIC VOLUMES AND NOISE LEVELS ALONG ROADWAYS IN PROJECT AREA WITH ALTERNATIVE 5 (PM PEAK HOUR)

LOCATION	SPEED (MPH)	TOTAL VPH	********** VOLUMES (VPH) ***********			50' Leq	100' Leq	200' Leq
			AUTOS	M TRUCKS	H TRUCKS			
Q. Kaahumanu Hwy. N. of Waikoloa Rd.	56	3,415	3,224	75	116	76.1	70.5	64.4
Q. Kaahumanu Hwy. Between Waikoloa & Waikoloa Beach Dr.	45	2,795	2,664	36	95	72.4	67.0	61.1
Q. Kaahumanu Hwy. S. of Waikoloa Beach Dr.	56	3,095	2,950	40	105	75.6	70.0	63.9
Mamalahoa Hwy. N. of Waikoloa Rd.	48	1,920	1,817	36	67	71.5	65.2	59.4
Mamalahoa Hwy. Between Waikoloa and Saddle Rd. Ext.	48	2,041	1,931	39	71	71.8	65.5	59.6
Mamalahoa Hwy. S. of Saddle Rd. Ext.	48	1,765	1,669	34	62	71.2	64.9	59.0
Waikoloa Rd. At Q. Kaahumanu Hwy.	37	1,110	1,042	24	44	66.4	60.5	55.2
Waikoloa Rd. W. of Paniolo Ave.	35	1,229	1,203	14	12	64.8	58.5	52.7
Waikoloa Rd. Between Paniolo Ave. & Mamalahoa Hwy.	43	591	520	12	59	66.9	61.8	58.5
Saddle Rd. Ext. E. of Q. Kaahumanu Hwy.	55	1,430	1,329	29	72	72.4	67.0	61.3
Saddle Rd. Ext. W. of Mamalahoa Hwy.	55	1,684	1,566	34	84	73.1	67.7	62.0
Saddle Rd. Ext. E. of Mamalahoa Hwy.	55	1,940	1,804	39	97	73.7	68.3	62.6

Notes:

1. "Loose Soil" propagation loss characteristic assumed.
2. Free field conditions without obstructions assumed.

TABLE 5E

FUTURE (CY 2035) TRAFFIC VOLUMES AND NOISE LEVELS ALONG ROADWAYS IN PROJECT AREA WITH ALTERNATIVE 6 (AM PEAK HOUR)

LOCATION	SPEED (MPH)	TOTAL VPH	********** VOLUMES (VPH) *********** AUTOS	M TRUCKS	H TRUCKS	50' Leq	100' Leq	200' Leq
Q. Kaahumanu Hwy. N. of Waikoloa Rd.	56	2,780	2,502	89	189	76.1	70.6	64.7
Q. Kaahumanu Hwy. Between Waikoloa & Waikoloa Beach Dr.	56	1,820	1,627	51	142	74.4	69.0	63.2
Q. Kaahumanu Hwy. S. of Waikoloa Beach Dr.	56	2,760	2,468	77	215	76.2	70.8	65.0
Mamalahoa Hwy. N. of Waikoloa Rd.	53	1,430	1,318	51	61	71.2	64.9	59.1
Mamalahoa Hwy. Between Waikoloa and Saddle Rd. Ext.	53	1,615	1,488	58	69	71.7	65.4	59.7
Mamalahoa Hwy. S. of Saddle Rd. Ext.	53	1,405	1,294	51	60	71.1	64.8	59.1
Waikoloa Rd. At Q. Kaahumanu Hwy.	37	1,155	1,084	25	46	66.6	60.7	55.4
Waikoloa Rd. W. of Paniolo Ave.	35	1,090	1,012	21	57	66.2	60.5	55.4
Waikoloa Rd. Between Paniolo Ave. & Mamalahoa Hwy.	43	765	672	16	77	68.0	62.1	57.0
Saddle Rd. Ext. E. of Q. Kaahumanu Hwy.	55	1,165	1,084	23	58	71.5	66.1	60.3
Saddle Rd. Ext. W. of Mamalahoa Hwy.	55	1,640	1,525	33	82	73.0	67.6	61.8
Saddle Rd. Ext. E. of Mamalahoa Hwy.	55	1,660	1,544	33	83	73.0	67.7	61.9

Notes:

1. "Loose Soil" propagation loss characteristic assumed.
2. Free field conditions without obstructions assumed.

TABLE 5F

FUTURE (CY 2035) TRAFFIC VOLUMES AND NOISE LEVELS ALONG ROADWAYS IN PROJECT AREA WITH ALTERNATIVE 6 (PM PEAK HOUR)

LOCATION	SPEED (MPH)	TOTAL VPH	********** VOLUMES (VPH) *********** AUTOS	M TRUCKS	H TRUCKS	50' Leq	100' Leq	200' Leq
Q. Kaahumanu Hwy. N. of Waikoloa Rd.	56	3,405	3,214	75	116	76.1	70.5	64.4
Q. Kaahumanu Hwy. Between Waikoloa & Waikoloa Beach Dr.	45	2,095	1,997	27	71	71.1	65.7	59.9
Q. Kaahumanu Hwy. S. of Waikoloa Beach Dr.	56	3,095	2,950	40	105	75.6	70.0	63.9
Mamalahoa Hwy. N. of Waikoloa Rd.	48	1,920	1,817	36	67	71.5	65.2	59.4
Mamalahoa Hwy. Between Waikoloa and Saddle Rd. Ext.	48	2,041	1,931	39	71	71.8	65.5	59.6
Mamalahoa Hwy. S. of Saddle Rd. Ext.	48	1,765	1,669	34	62	71.2	64.9	59.0
Waikoloa Rd. At Q. Kaahumanu Hwy.	37	1,405	1,318	31	56	67.5	61.5	56.2
Waikoloa Rd. W. of Paniolo Ave.	35	1,229	1,203	14	12	64.8	58.5	52.7
Waikoloa Rd. Between Paniolo Ave. & Mamalahoa Hwy.	43	591	520	12	59	66.8	61.0	55.8
Saddle Rd. Ext. E. of Q. Kaahumanu Hwy.	55	1,135	1,055	23	57	71.4	66.0	60.3
Saddle Rd. Ext. W. of Mamalahoa Hwy.	55	1,684	1,566	34	84	73.1	67.7	62.0
Saddle Rd. Ext. E. of Mamalahoa Hwy.	55	1,940	1,804	39	97	73.7	68.3	62.6

Notes:

1. "Loose Soil" propagation loss characteristic assumed.
2. Free field conditions without obstructions assumed.

TABLE 6A

YEAR 2013 AND 2035 DISTANCES TO 66 AND 71 LEQ CONTOURS (AM PEAK HOUR; ALTERNATIVE 4)

STREET SECTION	66 Leq SETBACK (FT) EXISTING	66 Leq SETBACK (FT) CY 2035	71 Leq SETBACK (FT) EXISTING	71 Leq SETBACK (FT) CY 2035
Q. Kaahumanu Hwy. N. of Waikoloa Rd.	89	177	46	96
Q. Kaahumanu Hwy. Between Waikoloa & Waikoloa Beach Dr.	109	172	57	92
Q. Kaahumanu Hwy. S. of Waikoloa Beach Dr.	96	181	50	97
Mamalahoa Hwy. N. of Waikoloa Rd.	52	98	30	55
Mamalahoa Hwy. Between Waikoloa and Saddle Rd. Ext.	46	110	26	62
Mamalahoa Hwy. S. of Saddle Rd. Ext.	47	97	26	55
Waikoloa Rd. At Q. Kaahumanu Hwy.	39	46	20	23
Waikoloa Rd. W. of Paniolo Ave.	55	62	33	37
Waikoloa Rd. Between Paniolo Ave. & Mamalahoa Hwy.	45	75	23	37
Saddle Rd. Ext. E. of Q. Kaahumanu Hwy.	N/A	114	N/A	61
Saddle Rd. Ext. W. of Mamalahoa Hwy.	N/A	114	N/A	61
Saddle Rd. Ext. E. of Mamalahoa Hwy.	37	123	19	65

Notes:

1. "Loose Soil" propagation loss characteristic assumed.
2. Free field conditions without obstructions assumed.

TABLE 6B

YEAR 2013 AND 2035 DISTANCES TO 66 AND 71 LEQ CONTOURS (PM PEAK HOUR; ALTERNATIVE 4)

STREET SECTION	66 Leq SETBACK (FT) EXISTING	66 Leq SETBACK (FT) CY 2035	71 Leq SETBACK (FT) EXISTING	71 Leq SETBACK (FT) CY 2035
Q. Kaahumanu Hwy. N. of Waikoloa Rd.	95	172	51	95
Q. Kaahumanu Hwy. Between Waikoloa & Waikoloa Beach Dr.	79	113	41	59
Q. Kaahumanu Hwy. S. of Waikoloa Beach Dr.	100	161	53	89
Mamalahoa Hwy. N. of Waikoloa Rd.	49	94	27	54
Mamalahoa Hwy. Between Waikoloa and Saddle Rd. Ext.	43	100	24	58
Mamalahoa Hwy. S. of Saddle Rd. Ext.	45	91	26	51
Waikoloa Rd. At Q. Kaahumanu Hwy.	40	54	20	27
Waikoloa Rd. W. of Paniolo Ave.	43	53	26	32
Waikoloa Rd. Between Paniolo Ave. & Mamalahoa Hwy.	44	70	22	35
Saddle Rd. Ext. E. of Q. Kaahumanu Hwy.	N/A	113	N/A	60
Saddle Rd. Ext. W. of Mamalahoa Hwy.	N/A	113	N/A	60
Saddle Rd. Ext. E. of Mamalahoa Hwy.	45	132	23	71

Notes:

1. "Loose Soil" propagation loss characteristic assumed.
2. Free field conditions without obstructions assumed.

TABLE 6C

YEAR 2013 AND 2035 DISTANCES TO 66 AND 71 LEQ CONTOURS (AM PEAK HOUR; ALTERNATIVE 5)

STREET SECTION	66 Leq SETBACK (FT)		71 Leq SETBACK (FT)	
	EXISTING	CY 2035	EXISTING	CY 2035
Q. Kaahumanu Hwy. N. of Waikoloa Rd.	89	172	46	95
Q. Kaahumanu Hwy. Between Waikoloa & Waikoloa Beach Dr.	109	169	57	93
Q. Kaahumanu Hwy. S. of Waikoloa Beach Dr.	96	177	50	97
Mamalahoa Hwy. N. of Waikoloa Rd.	52	95	30	55
Mamalahoa Hwy. Between Waikoloa and Saddle Rd. Ext.	46	100	26	58
Mamalahoa Hwy. S. of Saddle Rd. Ext.	47	94	26	55
Waikoloa Rd. At Q. Kaahumanu Hwy.	39	47	20	26
Waikoloa Rd. W. of Paniolo Ave.	55	51	33	28
Waikoloa Rd. Between Paniolo Ave. & Mamalahoa Hwy.	45	66	23	34
Saddle Rd. Ext. E. of Q. Kaahumanu Hwy.	N/A	114	N/A	61
Saddle Rd. Ext. W. of Mamalahoa Hwy.	N/A	121	N/A	65
Saddle Rd. Ext. E. of Mamalahoa Hwy.	37	123	19	65

Notes:

1. "Loose Soil" propagation loss characteristic assumed.
2. Free field conditions without obstructions assumed.

TABLE 6D

YEAR 2013 AND 2035 DISTANCES TO 66 AND 71 LEQ CONTOURS (PM PEAK HOUR; ALTERNATIVE 5)

STREET SECTION	66 Leq SETBACK (FT)		71 Leq SETBACK (FT)	
	EXISTING	CY 2037	EXISTING	CY 2037
Q. Kaahumanu Hwy. N. of Waikoloa Rd.	95	167	51	94
Q. Kaahumanu Hwy. Between Waikoloa & Waikoloa Beach Dr.	79	112	41	60
Q. Kaahumanu Hwy. S. of Waikoloa Beach Dr.	100	158	53	88
Mamalahoa Hwy. N. of Waikoloa Rd.	49	92	27	53
Mamalahoa Hwy. Between Waikoloa and Saddle Rd. Ext.	43	95	24	55
Mamalahoa Hwy. S. of Saddle Rd. Ext.	45	89	26	51
Waikoloa Rd. At Q. Kaahumanu Hwy.	40	52	20	29
Waikoloa Rd. W. of Paniolo Ave.	43	44	26	25
Waikoloa Rd. Between Paniolo Ave. & Mamalahoa Hwy.	44	57	22	29
Saddle Rd. Ext. E. of Q. Kaahumanu Hwy.	N/A	113	N/A	60
Saddle Rd. Ext. W. of Mamalahoa Hwy.	N/A	123	N/A	65
Saddle Rd. Ext. E. of Mamalahoa Hwy.	45	132	23	71

Notes:

1. "Loose Soil" propagation loss characteristic assumed.
2. Free field conditions without obstructions assumed.

TABLE 6E

YEAR 2013 AND 2035 DISTANCES TO 66 AND 71 LEQ CONTOURS (AM PEAK HOUR; ALTERNATIVE 6)

STREET SECTION	66 Leq SETBACK (FT) EXISTING	66 Leq SETBACK (FT) CY 2035	71 Leq SETBACK (FT) EXISTING	71 Leq SETBACK (FT) CY 2035
Q. Kaahumanu Hwy. N. of Waikoloa Rd.	89	172	46	95
Q. Kaahumanu Hwy. Between Waikoloa & Waikoloa Beach Dr.	109	143	57	77
Q. Kaahumanu Hwy. S. of Waikoloa Beach Dr.	96	177	50	97
Mamalahoa Hwy. N. of Waikoloa Rd.	52	89	30	51
Mamalahoa Hwy. Between Waikoloa and Saddle Rd. Ext.	46	94	26	54
Mamalahoa Hwy. S. of Saddle Rd. Ext.	47	88	26	51
Waikoloa Rd. At Q. Kaahumanu Hwy.	39	54	20	30
Waikoloa Rd. W. of Paniolo Ave.	55	51	33	28
Waikoloa Rd. Between Paniolo Ave. & Mamalahoa Hwy.	45	63	23	35
Saddle Rd. Ext. E. of Q. Kaahumanu Hwy.	N/A	101	N/A	53
Saddle Rd. Ext. W. of Mamalahoa Hwy.	N/A	121	N/A	65
Saddle Rd. Ext. E. of Mamalahoa Hwy.	37	123	19	65

Notes:

1. "Loose Soil" propagation loss characteristic assumed.
2. Free field conditions without obstructions assumed.

TABLE 6F

YEAR 2013 AND 2035 DISTANCES TO 66 AND 71 LEQ CONTOURS (PM PEAK HOUR; ALTERNATIVE 6)

STREET SECTION	66 Leq SETBACK (FT) EXISTING	66 Leq SETBACK (FT) CY 2037	71 Leq SETBACK (FT) EXISTING	71 Leq SETBACK (FT) CY 2037
Q. Kaahumanu Hwy. N. of Waikoloa Rd.	95	167	51	94
Q. Kaahumanu Hwy. Between Waikoloa & Waikoloa Beach Dr.	79	96	41	51
Q. Kaahumanu Hwy. S. of Waikoloa Beach Dr.	100	158	53	88
Mamalahoa Hwy. N. of Waikoloa Rd.	49	92	27	53
Mamalahoa Hwy. Between Waikoloa and Saddle Rd. Ext.	43	95	24	55
Mamalahoa Hwy. S. of Saddle Rd. Ext.	45	89	26	51
Waikoloa Rd. At Q. Kaahumanu Hwy.	40	59	20	33
Waikoloa Rd. W. of Paniolo Ave.	43	44	26	25
Waikoloa Rd. Between Paniolo Ave. & Mamalahoa Hwy.	44	55	22	30
Saddle Rd. Ext. E. of Q. Kaahumanu Hwy.	N/A	100	N/A	53
Saddle Rd. Ext. W. of Mamalahoa Hwy.	N/A	123	N/A	65
Saddle Rd. Ext. E. of Mamalahoa Hwy.	45	132	23	71

Notes:

1. "Loose Soil" propagation loss characteristic assumed.
2. Free field conditions without obstructions assumed.

impacts which can be expected by CY 2035 under the Build Alternative without noise mitigation measures. These conclusions are valid as long as the future vehicle mixes and average speeds do not differ from the assumed values.

- Under all three Build Alternatives 4, 5, & 6, future traffic noise levels from the proposed Saddle Road Extension are predicted to be below the HDOT's 66 Leq(h) and "15 dB increase" noise abatement criteria level at all receptor locations in Activity Categories B or C. The HDOT's 66 Leq(h) and "15 dB increase" criteria for substantial change in traffic noise levels will not be exceeded at any existing or permitted noise sensitive or public use structure in the project environs or within the limits of project construction.

- No office or commercial structures should experience future traffic noise levels which exceed HDOT noise abatement criteria of 71 Leq(h) for Activity Category E.

- No public use facilities or park lands should experience traffic noise levels from the proposed Saddle Road Extension which exceed 66 Leq(h) or which exceed existing background ambient noise levels by 15 dB.

- Future traffic volumes and noise levels are expected to be reduced along Mamalahoa Highway and Waikoloa Road following completion of the Saddle Road Extension due to diversion of traffic from these two existing roadways to the Saddle Road Extension. The anticipated reduction of traffic noise along Waikoloa Road associated with the Saddle Road Extension will benefit these future residences as well as existing ones near Waikoloa Village.

CHAPTER V. FUTURE TRAFFIC NOISE IMPACTS AND POSSIBLE NOISE MITIGATION MEASURES

In the quiet undeveloped areas along the proposed Saddle Road Extension, future traffic noise levels are predicted to exceed the HDOT "66 Leq(h)" and/or "15 dB increase" noise abatement criteria by CY 2035 at locations within 469 feet of the new roadway centerline. However, no existing or planned developments in Activity Categories B or C are located within 460 feet of the proposed Saddle Road Extension alternative alignments. Also, no permitted noise sensitive land uses are located within 469 feet of the proposed roadway's centerline. For these reasons, potential traffic noise impacts from the Saddle Road Extension project are not expected to occur, and traffic noise mitigation measures should not be required.

Tables 7A through 7F provide the anticipated increases in future traffic noise levels along the existing and proposed roadways in the project area resulting from both non-project and project traffic for Alternatives 4, 5, and 6. In the tables, the indicated traffic noise level increases associated with the three Saddle Road Extension roadway sections were calculated at 100 feet from the centerlines of the indicated roadway sections. As indicated in the tables, future traffic noise increases along Queen Kaahumanu Highway will be primarily due to non-project traffic. Along Mamalahoa Highway and Waikoloa Road, the three Saddle Road Extension alternatives are not expected to add to the future traffic noise level increases resulting from non-project traffic. The Saddle Road Extension Project should provide beneficial impacts by reducing future traffic noise level increases at existing and future noise sensitive and commercial developments along Waikoloa Road.

It is anticipated that potential noise impacts at any future noise sensitive properties located along the selected Saddle Road Extension alignment may be mitigated through the inclusion of sound walls or other noise mitigation measures within the individual lot development plans. In addition, any future public use facilities or housing units which may be planned alongside the selected Saddle Road Extension roadway represent areas of potential adverse noise impacts if adequate noise mitigation measures are not incorporated into the planning of these future projects. It is anticipated that the project's roadway improvements will be completed prior to any redevelopment of the presently open areas adjacent to the candidate roadway alignments, and that noise abatement measures such as adequate setbacks, sound attenuating walls or berms, or closure and air conditioning will be incorporated into these new developments along the selected Saddle Road Extension as required. In any event, new structures whose building permits were obtained after the date of this noise study will not qualify for noise abatement measures under existing HDOT procedures.

TABLE 7A

CALCULATIONS OF PROJECT AND NON-PROJECT TRAFFIC NOISE CONTRIBUTIONS (CY 2035) (ALTERNATIVE 4; AM PEAK HOUR)

ROADWAY SECTION	NOISE LEVEL INCREASE DUE TO: NON-PROJECT TRAFFIC	PROJECT TRAFFIC	
Q. Kaahumanu Hwy. N. of Waikoloa Rd.	5.6	0.0	
Q. Kaahumanu Hwy. Between Waikoloa & Waikoloa Beach Dr.	3.8	-0.1	
Q. Kaahumanu Hwy. S. of Waikoloa Beach Dr.	4.4	0.7	
Mamalahoa Hwy. N. of Waikoloa Rd.	5.5	0.0	
Mamalahoa Hwy. Between Waikoloa and Saddle Rd. Ext.	8.7	-1.1	
Mamalahoa Hwy. S. of Saddle Rd. Ext.	7.5	-1.1	
Waikoloa Rd. At Q. Kaahumanu Hwy.	4.8	-3.5	
Waikoloa Rd. W. of Paniolo Ave.	4.7	-3.4	
Waikoloa Rd. Between Paniolo Ave. & Mamalahoa Hwy.	6.9	-3.3	
Saddle Rd. Ext. E. of Q. Kaahumanu Hwy.	N/A	67.1	*
Saddle Rd. Ext. W. of Mamalahoa Hwy.	N/A	67.1	*
Saddle Rd. Ext. E. of Mamalahoa Hwy.	9.3	0.0	

Note:
* Traffic noise level at 100 feet from centerline of Saddle Road Extension.

TABLE 7B

CALCULATIONS OF PROJECT AND NON-PROJECT TRAFFIC NOISE CONTRIBUTIONS (CY 2035) (ALTERNATIVE 4; PM PEAK HOUR)

ROADWAY SECTION	NOISE LEVEL INCREASE DUE TO: NON-PROJECT TRAFFIC	PROJECT TRAFFIC	
Q. Kaahumanu Hwy. N. of Waikoloa Rd.	5.0	0.0	
Q. Kaahumanu Hwy. Between Waikoloa & Waikoloa Beach Dr.	2.9	-0.1	
Q. Kaahumanu Hwy. S. of Waikoloa Beach Dr.	3.5	0.6	
Mamalahoa Hwy. N. of Waikoloa Rd.	5.7	0.0	
Mamalahoa Hwy. Between Waikoloa and Saddle Rd. Ext.	8.7	-1.2	
Mamalahoa Hwy. S. of Saddle Rd. Ext.	7.0	-0.8	
Waikoloa Rd. At Q. Kaahumanu Hwy.	5.1	-2.9	
Waikoloa Rd. W. of Paniolo Ave.	4.6	-2.8	
Waikoloa Rd. Between Paniolo Ave. & Mamalahoa Hwy.	7.0	-3.5	
Saddle Rd. Ext. E. of Q. Kaahumanu Hwy.	N/A	67.0	*
Saddle Rd. Ext. W. of Mamalahoa Hwy.	N/A	67.0	*
Saddle Rd. Ext. E. of Mamalahoa Hwy.	8.6	0.0	

Note:
* Traffic noise level at 100 feet from centerline of Saddle Road Extension.

TABLE 7C

CALCULATIONS OF PROJECT AND NON-PROJECT TRAFFIC NOISE CONTRIBUTIONS (CY 2035) (ALTERNATIVE 5; AM PEAK HOUR)

ROADWAY SECTION	NOISE LEVEL INCREASE DUE TO: NON-PROJECT TRAFFIC	PROJECT TRAFFIC	
Q. Kaahumanu Hwy. N. of Waikoloa Rd.	5.6	-0.1	
Q. Kaahumanu Hwy. Between Waikoloa & Waikoloa Beach Dr.	3.8	-0.1	
Q. Kaahumanu Hwy. S. of Waikoloa Beach Dr.	4.4	0.7	
Mamalahoa Hwy. N. of Waikoloa Rd.	5.5	-0.3	
Mamalahoa Hwy. Between Waikoloa and Saddle Rd. Ext.	8.7	-1.9	
Mamalahoa Hwy. S. of Saddle Rd. Ext.	7.5	-1.4	
Waikoloa Rd. At Q. Kaahumanu Hwy.	4.8	-4.4	
Waikoloa Rd. W. of Paniolo Ave.	4.7	-4.2	
Waikoloa Rd. Between Paniolo Ave. & Mamalahoa Hwy.	6.9	-4.3	
Saddle Rd. Ext. E. of Q. Kaahumanu Hwy.	N/A	67.1	*
Saddle Rd. Ext. W. of Mamalahoa Hwy.	N/A	67.6	*
Saddle Rd. Ext. E. of Mamalahoa Hwy.	9.3	0.0	

Note:
* Traffic noise level at 100 feet from centerline of Saddle Road Extension.

TABLE 7D

CALCULATIONS OF PROJECT AND NON-PROJECT TRAFFIC NOISE CONTRIBUTIONS (CY 2035) (ALTERNATIVE 5; PM PEAK HOUR)

ROADWAY SECTION	NOISE LEVEL INCREASE DUE TO: NON-PROJECT TRAFFIC	PROJECT TRAFFIC	
Q. Kaahumanu Hwy. N. of Waikoloa Rd.	5.0	-0.1	
Q. Kaahumanu Hwy. Between Waikoloa & Waikoloa Beach Dr.	2.9	-0.1	
Q. Kaahumanu Hwy. S. of Waikoloa Beach Dr.	3.5	0.5	
Mamalahoa Hwy. N. of Waikoloa Rd.	5.7	-0.3	
Mamalahoa Hwy. Between Waikoloa and Saddle Rd. Ext.	8.7	-1.7	
Mamalahoa Hwy. S. of Saddle Rd. Ext.	7.0	-1.1	
Waikoloa Rd. At Q. Kaahumanu Hwy.	5.1	-3.8	
Waikoloa Rd. W. of Paniolo Ave.	4.6	-3.8	
Waikoloa Rd. Between Paniolo Ave. & Mamalahoa Hwy.	7.0	-5.1	
Saddle Rd. Ext. E. of Q. Kaahumanu Hwy.	N/A	67.0	*
Saddle Rd. Ext. W. of Mamalahoa Hwy.	N/A	67.7	*
Saddle Rd. Ext. E. of Mamalahoa Hwy.	8.6	0.0	

Note:
* Traffic noise level at 100 feet from centerline of Saddle Road Extension.

TABLE 7E

CALCULATIONS OF PROJECT AND NON-PROJECT TRAFFIC NOISE CONTRIBUTIONS (CY 2035) (ALTERNATIVE 6; AM PEAK HOUR)

ROADWAY SECTION	NOISE LEVEL INCREASE DUE TO: NON-PROJECT TRAFFIC	PROJECT TRAFFIC
Q. Kaahumanu Hwy. N. of Waikoloa Rd.	5.6	-0.1
Q. Kaahumanu Hwy. Between Waikoloa & Waikoloa Beach Dr.	3.8	-1.5
Q. Kaahumanu Hwy. S. of Waikoloa Beach Dr.	4.4	0.7
Mamalahoa Hwy. N. of Waikoloa Rd.	5.5	-0.9
Mamalahoa Hwy. Between Waikoloa and Saddle Rd. Ext.	8.7	-2.5
Mamalahoa Hwy. S. of Saddle Rd. Ext.	7.5	-2.0
Waikoloa Rd. At Q. Kaahumanu Hwy.	4.8	-3.1
Waikoloa Rd. W. of Paniolo Ave.	4.7	-4.2
Waikoloa Rd. Between Paniolo Ave. & Mamalahoa Hwy.	6.9	-5.1
Saddle Rd. Ext. E. of Q. Kaahumanu Hwy.	N/A	66.1 *
Saddle Rd. Ext. W. of Mamalahoa Hwy.	N/A	67.6 *
Saddle Rd. Ext. E. of Mamalahoa Hwy.	9.3	0.0

Note:
* Traffic noise level at 100 feet from centerline of Saddle Road Extension.

TABLE 7F

CALCULATIONS OF PROJECT AND NON-PROJECT TRAFFIC NOISE CONTRIBUTIONS (CY 2035) (ALTERNATIVE 6; PM PEAK HOUR)

ROADWAY SECTION	NOISE LEVEL INCREASE DUE TO: NON-PROJECT TRAFFIC	PROJECT TRAFFIC
Q. Kaahumanu Hwy. N. of Waikoloa Rd.	5.0	-0.1
Q. Kaahumanu Hwy. Between Waikoloa & Waikoloa Beach Dr.	2.9	-1.4
Q. Kaahumanu Hwy. S. of Waikoloa Beach Dr.	3.5	0.5
Mamalahoa Hwy. N. of Waikoloa Rd.	5.7	-0.3
Mamalahoa Hwy. Between Waikoloa and Saddle Rd. Ext.	8.7	-1.7
Mamalahoa Hwy. S. of Saddle Rd. Ext.	7.0	-1.1
Waikoloa Rd. At Q. Kaahumanu Hwy.	5.1	-2.8
Waikoloa Rd. W. of Paniolo Ave.	4.6	-3.8
Waikoloa Rd. Between Paniolo Ave. & Mamalahoa Hwy.	7.0	-5.9
Saddle Rd. Ext. E. of Q. Kaahumanu Hwy.	N/A	66.0 *
Saddle Rd. Ext. W. of Mamalahoa Hwy.	N/A	67.7 *
Saddle Rd. Ext. E. of Mamalahoa Hwy.	8.6	0.0

Note:
* Traffic noise level at 100 feet from centerline of Saddle Road Extension.

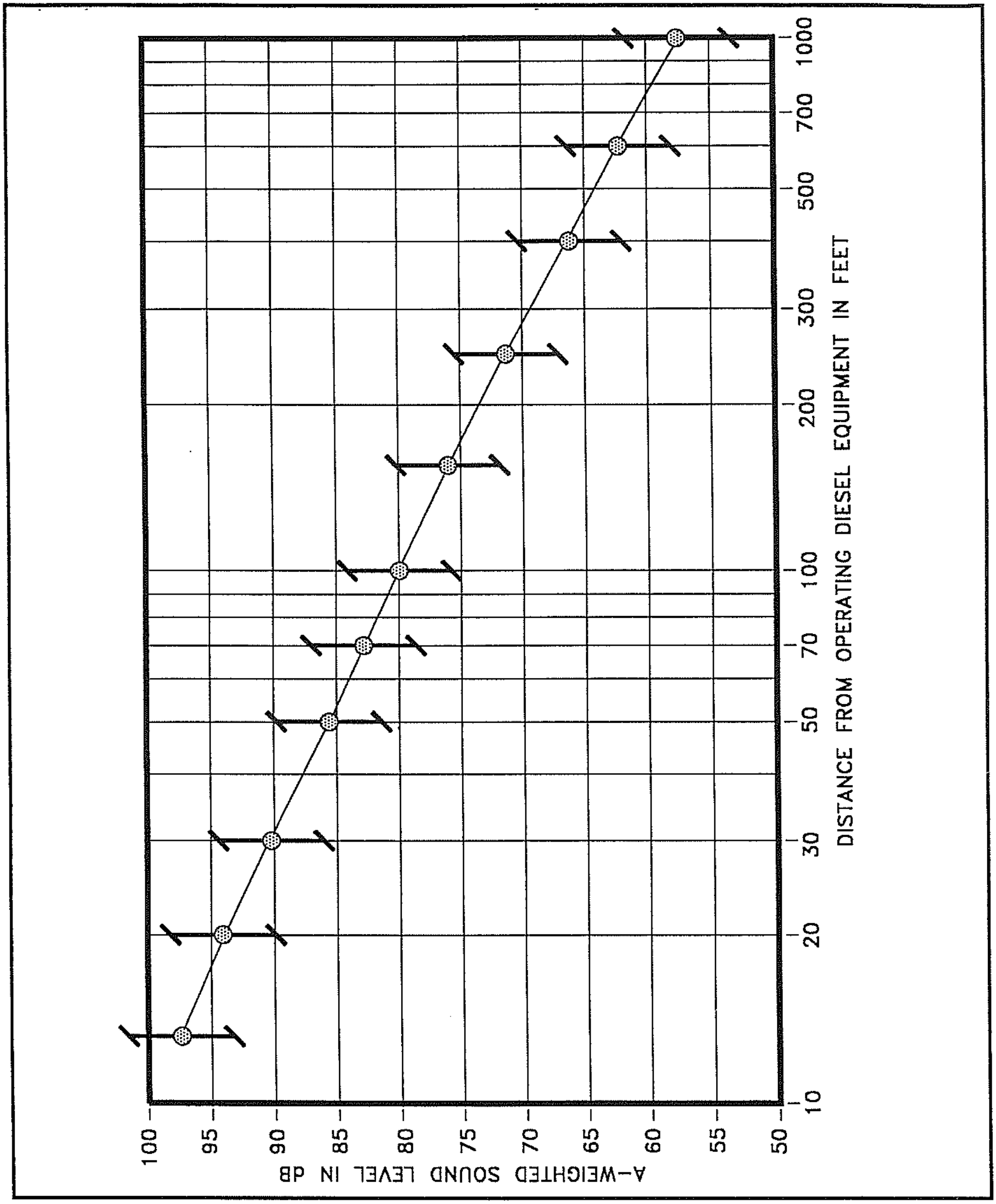
CHAPTER VI. CONSTRUCTION NOISE IMPACTS

Short-term noise impacts associated with construction activities along portions of the selected Saddle Road Extension alignment are considered to be unlikely due to the large buffer distances between the alternate alignments and existing noise sensitive developments. Construction noise may be audible as a result of the low background ambient noise levels in the project area and the relatively high noise levels of heavy construction equipment. The total duration of the construction period for the proposed project is not known, but noise exposure from construction activities at any one receptor location is not expected to be continuous during the total construction period.

Noise levels of diesel powered construction equipment typically range from 80 to 90 dB at 50 FT distance. Typical levels of noise from construction activity (excluding pile driving activity) are shown in Figure 3. Adverse impacts from construction noise are not expected to be in the "public health and welfare" category due to the temporary nature of the work and due to the administrative controls available for its regulation. Instead, these impacts will probably be limited to the temporary degradation of the quality of the acoustic environment at locations within audible range of the construction noise.

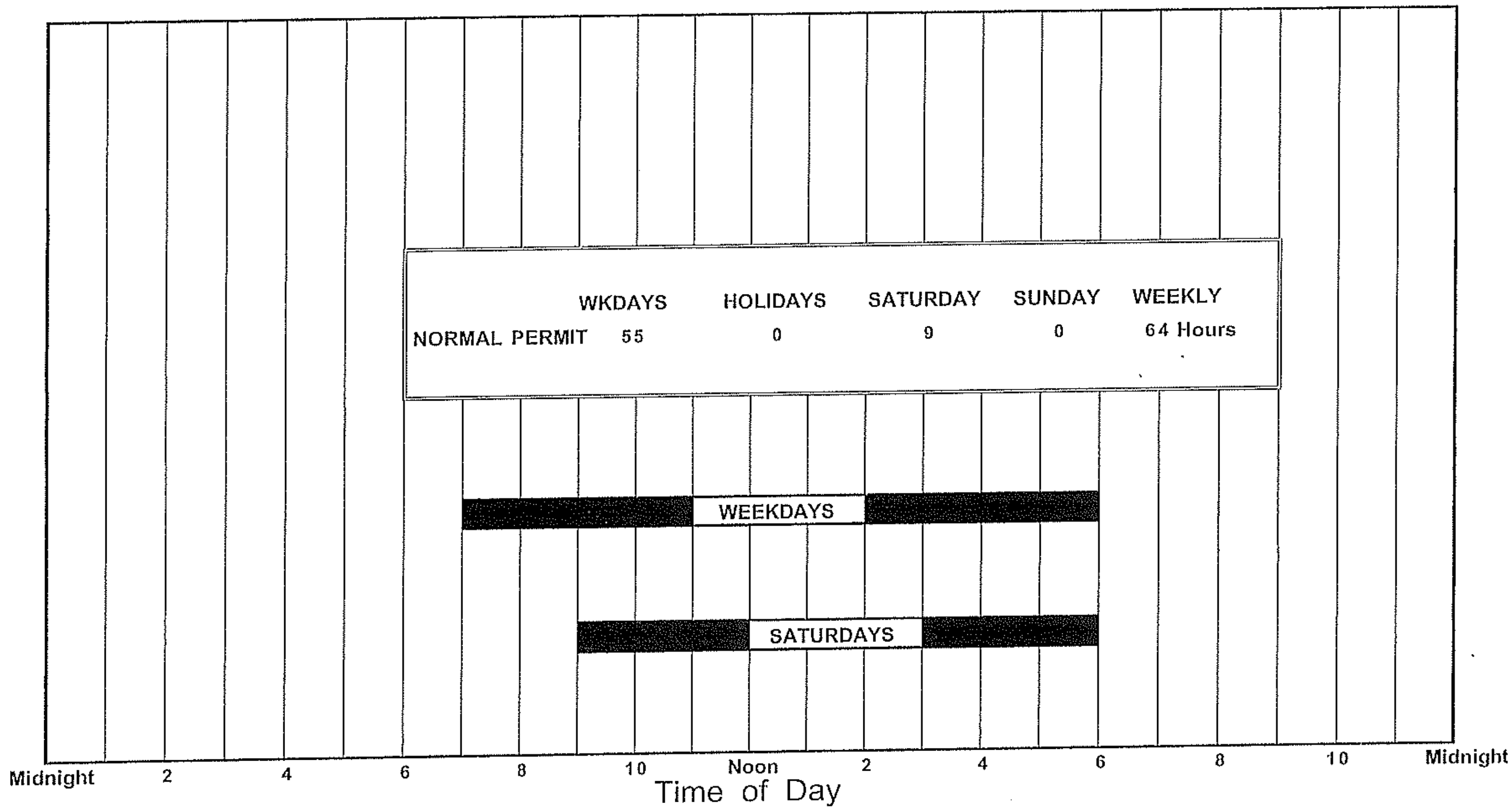
The State Department of Health currently regulates noise from construction activities under a permit system (Reference 6). Under current permit procedures (see Figure 4), noisy construction activities are restricted to hours between 7:00 AM and 6:00 PM, from Monday through Friday, and exclude certain holidays. Noisy construction activities are normally restricted to the hours of 9:00 AM to 6:00 PM on Saturdays, with construction not permitted on Sundays. These restrictions would minimize construction noise impacts on noise sensitive residences within audible range of the construction activities, and have generally been successfully applied. In this way, construction noise impacts on noise sensitive residences can be minimized. Construction activities during the evening and nighttime hours are possible but require the issuance of a noise variance by the State Department of Health.

If construction work is allowed by the issuance of a noise variance and conducted during the normal curfew periods shown in Figure 4, the use of heavy excavation or rock breaking equipment should be avoided during the curfew periods shown in Figure 4. Heavy truck and equipment staging areas should also be located at areas which are as far from noise sensitive properties as feasible. Truck routes which avoid residential communities should be identified wherever possible.



ANTICIPATED RANGE OF CONSTRUCTION NOISE LEVELS VS. DISTANCE

FIGURE 3



AVAILABLE WORK HOURS UNDER DOH PERMIT PROCEDURES FOR CONSTRUCTION NOISE

FIGURE 4

APPENDIX A. REFERENCES

(1) "FHWA Highway Traffic Noise Model User's Guide;" FHWA-PD-96-009, Federal Highway Administration; Washington, D.C.; January 1998 and Version 2.5 Upgrade (April 14, 2004).

(2) Base Year, 2035 No Build, and 2035 Build Alignment 4, Turning Movement Diagrams; AECOM Technical Services, Inc.; December 3, 2015.

(3) Federal Highway Administration; "Highway Traffic Noise: Analysis and Abatement Guidance;" June 2010, Revised January 2011.

(4) 2035 No Build and Build Alignments 4, 5, and 6, Turning Movement Diagrams; AECOM Technical Services, Inc.; July 16, 2016.

(5) "Highway Noise Policy and Abatement Guidelines;" State of Hawaii, Department of Transportation, Highways Division and U.S. Department of Transportation, Federal Highway Administration; April 18, 2016.

(6) "Title 11, Administrative Rules, Chapter 46, Community Noise Control;" Hawaii State Department of Health; September 23, 1996.

APPENDIX B

EXCERPTS FROM EPA'S ACOUSTIC TERMINOLOGY GUIDE

Descriptor Symbol Usage

The recommended symbols for the commonly used acoustic descriptors based on A-weighting are contained in Table I. As most acoustic criteria and standards used by EPA are derived from the A-weighted sound level, almost all descriptor symbol usage guidance is contained in Table I.

Since acoustic nomenclature includes weighting networks other than "A" and measurements other than pressure, an expansion of Table I was developed (Table II). The group adopted the ANSI descriptor-symbol scheme which is structured into three stages. The first stage indicates that the descriptor is a level (i.e., based upon the logarithm of a ratio), the second stage indicates the type of quantity (power, pressure, or sound exposure), and the third stage indicates the weighting network (A, B, C, D, E.....). If no weighting network is specified, "A" weighting is understood. Exceptions are the A-weighted sound level and the A-weighted peak sound level which require that the "A" be specified. For convenience in those situations in which an A-weighted descriptor is being compared to that of another weighting, the alternative column in Table II permits the inclusion of the "A". For example, a report on blast noise might wish to contrast the LCdn with the LAdn.

Although not included in the tables, it is also recommended that "Lpn" and "LepN" be used as symbols for perceived noise levels and effective perceived noise levels, respectively.

It is recommended that in their initial use within a report, such terms be written in full, rather than abbreviated. An example of preferred usage is as follows:

The A-weighted sound level (LA) was measured before and after the installation of acoustical treatment. The measured LA values were 85 and 75 dB respectively.

Descriptor Nomenclature

With regard to energy averaging over time, the term "average" should be discouraged in favor of the term "equivalent". Hence, Leq, is designated the "equivalent sound level". For Ld, Ln, and Ldn, "equivalent" need not be stated since the concept of day, night, or day-night averaging is by definition understood. Therefore, the designations are "day sound level", "night sound level", and "day-night sound level", respectively.

The peak sound level is the logarithmic ratio of peak sound pressure to a reference pressure and not the maximum root mean square pressure. While the latter is the maximum sound pressure level, it is often incorrectly labelled peak. In that sound level meters have "peak" settings, this distinction is most important.

"Background ambient" should be used in lieu of "background", "ambient", "residual", or "indigenous" to describe the level characteristics of the general background noise due to the contribution of many unidentifiable noise sources near and far.

With regard to units, it is recommended that the unit decibel (abbreviated dB) be used without modification. Hence, DBA, PNdB, and EPNdB are not to be used. Examples of this preferred usage are: the Perceived Noise Level (Lpn was found to be 75 dB. Lpn = 75 dB). This decision was based upon the recommendation of the National Bureau of Standards, and the policies of ANSI and the Acoustical Society of America, all of which disallow any modification of bel except for prefixes indicating its multiples or submultiples (e.g., deci).

Noise Impact

In discussing noise impact, it is recommended that "Level Weighted Population" (LWP) replace "Equivalent Noise Impact" (ENI). The term "Relative Change of Impact" (RCI) shall be used for comparing the relative differences in LWP between two alternatives.

Further, when appropriate, "Noise Impact Index" (NII) and "Population Weighed Loss of Hearing" (PHL) shall be used consistent with CHABA Working Group 69 Report Guidelines for Preparing Environmental Impact Statements (1977).

APPENDIX B (CONTINUED)

TABLE I

A–WEIGHTED RECOMMENDED DESCRIPTOR LIST

	TERM	SYMBOL
1.	A–Weighted Sound Level	L_A
2.	A–Weighted Sound Power Level	L_{WA}
3.	Maximum A–Weighted Sound Level	L_{max}
4.	Peak A–Weighted Sound Level	L_{Apk}
5.	Level Exceeded x% of the Time	L_x
6.	Equivalent Sound Level	L_{eq}
7.	Equivalent Sound Level over Time (T) [(1)]	$L_{eq(T)}$
8.	Day Sound Level	L_d
9.	Night Sound Level	L_n
10.	Day–Night Sound Level	L_{dn}
11.	Yearly Day–Night Sound Level	$L_{dn(Y)}$
12.	Sound Exposure Level	L_{SE}

(1) Unless otherwise specified, time is in hours (e.g. the hourly equivalent level is $L_{eq(1)}$). Time may be specified in non-quantitative terms (e.g., could be specified a $L_{eq(WASH)}$ to mean the washing cycle noise for a washing machine).

SOURCE: EPA ACOUSTIC TERMINOLOGY GUIDE, BNA 8–14–78,

APPENDIX B (CONTINUED)

TABLE II

RECOMMENDED DESCRIPTOR LIST

TERM	A-WEIGHTING	ALTERNATIVE[1] A-WEIGHTING	OTHER[2] WEIGHTING	UNWEIGHTED
1. Sound (Pressure)[3] Level	L_A	L_{pA}	L_B, L_{pB}	L_p
2. Sound Power Level	L_{WA}		L_{WB}	L_W
3. Max. Sound Level	L_{max}	L_{Amax}	L_{Bmax}	L_{pmax}
4. Peak Sound (Pressure) Level	L_{Apk}		L_{Bpk}	L_{pk}
5. Level Exceeded x% of the Time	L_x	L_{Ax}	L_{Bx}	L_{px}
6. Equivalent Sound Level	L_{eq}	L_{Aeq}	L_{Beq}	L_{peq}
7. Equivalent Sound Level (4) Over Time(T)	$L_{eq(T)}$	$L_{Aeq(T)}$	$L_{Beq(T)}$	$L_{peq(T)}$
8. Day Sound Level	L_d	L_{Ad}	L_{Bd}	L_{pd}
9. Night Sound Level	L_n	L_{An}	L_{Bn}	L_{pn}
10. Day-Night Sound Level	L_{dn}	L_{Adn}	L_{Bdn}	L_{pdn}
11. Yearly Day-Night Sound Level	$L_{dn(Y)}$	$L_{Adn(Y)}$	$L_{Bdn(Y)}$	$L_{pdn(Y)}$
12. Sound Exposure Level	L_S	L_{SA}	L_{SB}	L_{Sp}
13. Energy Average Value Over (Non-Time Domain) Set of Observations	$L_{eq(e)}$	$L_{Aeq(e)}$	$L_{Beq(e)}$	$L_{peq(e)}$
14. Level Exceeded x% of the Total Set of (Non-Time Domain) Observations	$L_{x(e)}$	$L_{Ax(e)}$	$L_{Bx(e)}$	$L_{px(e)}$
15. Average L_x Value	L_x	L_{Ax}	L_{Bx}	L_{px}

(1) "Alternative" symbols may be used to assure clarity or consistency.

(2) Only B-weighting shown. Applies also to C,D,E,.....weighting.

(3) The term "pressure" is used only for the unweighted level.

(4) Unless otherwise specified, time is in hours (e.g., the hourly equivalent level is Leq(1). Time may be specified in non-quantitative terms (e.g., could be specified as Leq(WASH) to mean the washing cycle noise for a washing machine.

APPENDIX C1

SUMMARY OF BASE YEAR AND FUTURE YEAR TRAFFIC VOLUMES (ALTERNATIVE 4)

ROADWAY LANES	**** CY 2013 *****		CY 2035 (NO BUILD)		CY 2035 (BUILD)	
	AM VPH	PM VPH	AM VPH	PM VPH	AM VPH	PM VPH
Q. Kaahumanu Hwy. S. of Waikoloa Bch. Dr. (NB)	333	667	1,015	1,685	1,190	1,920
Q. Kaahumanu Hwy. S. of Waikoloa Bch. Dr. (SB)	512	548	1,335	1,030	1,570	1,175
Two-Way	845	1,215	2,350	2,715	2,760	3,095
Q. Kaahumanu Hwy. N. of Waikoloa Bch. Dr. (NB)	362	824	995	1,645	1,050	1,565
Q. Kaahumanu Hwy. N. of Waikoloa Bch. Dr. (SB)	723	745	1,540	1,170	1,460	1,230
Two-Way	1,085	1,569	2,535	2,815	2,510	2,795
Q. Kaahumanu Hwy. S. of Waikoloa Rd. (NB)	330	715	995	1,645	1,050	1,565
Q. Kaahumanu Hwy. S. of Waikoloa Rd. (SB)	709	627	1,540	1,170	1,460	1,230
Two-Way	1,039	1,342	2,535	2,815	2,510	2,795
Q. Kaahumanu Hwy. N. of Waikoloa Rd. (NB)	381	504	1,430	1,740	1,430	1,740
Q. Kaahumanu Hwy. N. of Waikoloa Rd. (SB)	381	580	1,350	1,675	1,350	1,675
Two-Way	762	1,084	2,780	3,415	2,780	3,415
Waikoloa Rd. E. of Q. Kaahumanu Hwy (EB)	131	417	700	1,185	245	590
Waikoloa Rd. E. of Q. Kaahumanu Hwy (WB)	510	253	1,210	975	620	520
Two-Way	641	670	1,910	2,160	865	1,110
Waikoloa Rd. W. of Paniolo Ave. (EB)	193	470	790	1,235	335	640
Waikoloa Rd. W. of Paniolo Ave. (WB)	470	193	1,160	650	570	335
Two-Way	663	663	1,950	1,885	905	975
Waikoloa Rd. E. of Paniolo Ave. (EB)	175	245	1,010	1,150	555	555
Waikoloa Rd. E. of Paniolo Ave. (WB)	245	175	985	750	395	290
Two-Way	420	420	1,995	1,900	950	845
Waikoloa Rd. W. of Mamalahoa Hwy. (EB)	270	163	1,010	1,150	555	555
Waikoloa Rd. W. of Mamalahoa Hwy. (WB)	124	177	985	745	395	290
Two-Way	394	340	1,995	1,895	950	845
Mamalahoa Hwy. N. of Waikoloa Rd. (NB)	214	262	700	1,280	700	1,280
Mamalahoa Hwy. N. of Waikoloa Rd. (SB)	185	244	730	640	730	640
Two-Way	399	506	1,430	1,920	1,430	1,920
Mamalahoa Hwy. S. of Waikoloa Rd. (NB)	114	198	1,120	1,515	805	1,335
Mamalahoa Hwy. S. of Waikoloa Rd. (SB)	231	166	1,175	1,280	995	960
Two-Way	345	364	2,295	2,795	1,800	2,295

APPENDIX C1 (CONTINUED)

SUMMARY OF BASE YEAR AND FUTURE YEAR
TRAFFIC VOLUMES (ALTERNATIVE 4)

ROADWAY LANES	**** CY 2013 *****		CY 2035 (NO BUILD)		CY 2035 (BUILD)	
	AM VPH	PM VPH	AM VPH	PM VPH	AM VPH	PM VPH
Mamalahoa Hwy. N. of Saddle R. Ext. (NB)	139	205	1,120	1,515	805	1,335
Mamalahoa Hwy. N. of Saddle R. Ext. (SB)	143	201	1,175	1,280	995	960
Two-Way	282	406	2,295	2,795	1,800	2,295
Mamalahoa Hwy. S. of Saddle R. Ext. (NB)	129	234	665	1,265	490	1,030
Mamalahoa Hwy. S. of Saddle R. Ext. (SB)	185	191	1,150	880	915	735
Two-Way	314	425	1,815	2,145	1,405	1,765
Saddle Rd. Ext. E. of Q. Kaahumanu Hwy. (EB)	N/A	N/A	N/A	N/A	630	830
Saddle Rd. Ext. E. of Q. Kaahumanu Hwy. (WB)	N/A	N/A	N/A	N/A	825	600
Two-Way	N/A	N/A	N/A	N/A	1,455	1,430
Saddle Rd. Ext. W. of Mamalahoa Hwy. (EB)	N/A	N/A	N/A	N/A	630	830
Saddle Rd. Ext. W. of Mamalahoa Hwy. (WB)	N/A	N/A	N/A	N/A	825	600
Two-Way	N/A	N/A	N/A	N/A	1,455	1,430
Saddle Rd. E. of Mamalahoa Hwy. (EB)	70	152	615	1,045	615	1,045
Saddle Rd. E. of Mamalahoa Hwy. (WB)	122	113	1,045	895	1,045	895
Two-Way	192	265	1,660	1,940	1,660	1,940

APPENDIX C2

SUMMARY OF BASE YEAR AND FUTURE YEAR TRAFFIC VOLUMES (ALTERNATIVE 5)

ROADWAY LANES	**** CY 2013 *****		CY 2035 (NO BUILD)		CY 2035 (BUILD)	
	AM VPH	PM VPH	AM VPH	PM VPH	AM VPH	PM VPH
Q. Kaahumanu Hwy. S. of Waikoloa Bch. Dr. (NB)	333	667	1,015	1,685	1,190	1,920
Q. Kaahumanu Hwy. S. of Waikoloa Bch. Dr. (SB)	512	548	1,335	1,030	1,570	1,175
Two-Way	845	1,215	2,350	2,715	2,760	3,095
Q. Kaahumanu Hwy. N. of Waikoloa Bch. Dr. (NB)	362	824	995	1,645	1,050	1,565
Q. Kaahumanu Hwy. N. of Waikoloa Bch. Dr. (SB)	723	745	1,540	1,170	1,460	1,230
Two-Way	1,085	1,569	2,535	2,815	2,510	2,795
Q. Kaahumanu Hwy. S. of Waikoloa Rd. (NB)	330	715	995	1,645	1,050	1,565
Q. Kaahumanu Hwy. S. of Waikoloa Rd. (SB)	709	627	1,540	1,170	1,460	1,230
Two-Way	1,039	1,342	2,535	2,815	2,510	2,795
Q. Kaahumanu Hwy. N. of Waikoloa Rd. (NB)	381	504	1,430	1,740	1,430	1,740
Q. Kaahumanu Hwy. N. of Waikoloa Rd. (SB)	381	580	1,350	1,675	1,350	1,675
Two-Way	762	1,084	2,780	3,415	2,780	3,415
Waikoloa Rd. E. of Q. Kaahumanu Hwy (EB)	131	417	700	1,185	245	590
Waikoloa Rd. E. of Q. Kaahumanu Hwy (WB)	510	253	1,210	975	620	520
Two-Way	641	670	1,910	2,160	865	1,110
Waikoloa Rd. W. of Paniolo Ave. (EB)	193	470	790	1,235	455	757
Waikoloa Rd. W. of Paniolo Ave. (WB)	470	193	1,160	650	635	472
Two-Way	663	663	1,950	1,885	1,090	1,229
Waikoloa Rd. E. of Paniolo Ave. (EB)	175	245	1,010	1,150	490	418
Waikoloa Rd. E. of Paniolo Ave. (WB)	245	175	985	750	275	173
Two-Way	420	420	1,995	1,900	765	591
Waikoloa Rd. W. of Mamalahoa Hwy. (EB)	270	163	1,010	1,150	490	418
Waikoloa Rd. W. of Mamalahoa Hwy. (WB)	124	177	985	745	275	173
Two-Way	394	340	1,995	1,895	765	591
Mamalahoa Hwy. N. of Waikoloa Rd. (NB)	214	262	700	1,280	700	1,280
Mamalahoa Hwy. N. of Waikoloa Rd. (SB)	185	244	730	640	730	640
Two-Way	399	506	1,430	1,920	1,430	1,920
Mamalahoa Hwy. S. of Waikoloa Rd. (NB)	114	198	1,120	1,515	685	1,218
Mamalahoa Hwy. S. of Waikoloa Rd. (SB)	231	166	1,175	1,280	930	823
Two-Way	345	364	2,295	2,795	1,615	2,041

APPENDIX C2 (CONTINUED)

SUMMARY OF BASE YEAR AND FUTURE YEAR TRAFFIC VOLUMES (ALTERNATIVE 5)

ROADWAY LANES	**** CY 2013 *****		CY 2035 (NO BUILD)		CY 2035 (BUILD)	
	AM VPH	PM VPH	AM VPH	PM VPH	AM VPH	PM VPH
Mamalahoa Hwy. N. of Saddle R. Ext. (NB)	139	205	1,120	1,515	685	1,218
Mamalahoa Hwy. N. of Saddle R. Ext. (SB)	143	201	1,175	1,280	930	823
Two-Way	282	406	2,295	2,795	1,615	2,041
Mamalahoa Hwy. S. of Saddle R. Ext. (NB)	129	234	665	1,265	490	1,030
Mamalahoa Hwy. S. of Saddle R. Ext. (SB)	185	191	1,150	880	915	735
Two-Way	314	425	1,815	2,145	1,405	1,765
Saddle Rd. Ext. E. of Q. Kaahumanu Hwy. (EB)	N/A	N/A	N/A	N/A	630	830
Saddle Rd. Ext. E. of Q. Kaahumanu Hwy. (WB)	N/A	N/A	N/A	N/A	825	600
Two-Way	N/A	N/A	N/A	N/A	1,455	1,430
Saddle Rd. Ext. W. of Mamalahoa Hwy. (EB)	N/A	N/A	N/A	N/A	695	967
Saddle Rd. Ext. W. of Mamalahoa Hwy. (WB)	N/A	N/A	N/A	N/A	945	717
Two-Way	N/A	N/A	N/A	N/A	1,640	1,684
Saddle Rd. Ext. E. of Mamalahoa Hwy. (EB)	70	152	615	1,045	615	1,045
Saddle Rd. Ext. E. of Mamalahoa Hwy. (WB)	122	113	1,045	895	1,045	895
Two-Way	192	265	1,660	1,940	1,660	1,940

APPENDIX C3

SUMMARY OF BASE YEAR AND FUTURE YEAR TRAFFIC VOLUMES (ALTERNATIVE 6)

ROADWAY LANES	**** CY 2013***** AM VPH	**** CY 2013***** PM VPH	CY 2035 (NO BUILD) AM VPH	CY 2035 (NO BUILD) PM VPH	CY 2035 (BUILD) AM VPH	CY 2035 (BUILD) PM VPH
Q. Kaahumanu Hwy. S. of Waikoloa Bch. Dr. (NB)	333	667	1,015	1,685	1,190	1,920
Q. Kaahumanu Hwy. S. of Waikoloa Bch. Dr. (SB)	512	548	1,335	1,030	1,570	1,175
Two-Way	845	1,215	2,350	2,715	2,760	3,095
Q. Kaahumanu Hwy. N. of Waikoloa Bch. Dr. (NB)	362	824	995	1,645	745	1,180
Q. Kaahumanu Hwy. N. of Waikoloa Bch. Dr. (SB)	723	745	1,540	1,170	1,075	920
Two-Way	1,085	1,569	2,535	2,815	1,820	2,100
Q. Kaahumanu Hwy. S. of Waikoloa Rd. (NB)	330	715	995	1,645	745	1,180
Q. Kaahumanu Hwy. S. of Waikoloa Rd. (SB)	709	627	1,540	1,170	1,075	910
Two-Way	1,039	1,342	2,535	2,815	1,820	2,090
Q. Kaahumanu Hwy. N. of Waikoloa Rd. (NB)	381	504	1,430	1,740	1,430	1,740
Q. Kaahumanu Hwy. N. of Waikoloa Rd. (SB)	381	580	1,350	1,675	1,350	1,665
Two-Way	762	1,084	2,780	3,415	2,780	3,405
Waikoloa Rd. E. of Q. Kaahumanu Hwy (EB)	131	417	700	1,185	430	700
Waikoloa Rd. E. of Q. Kaahumanu Hwy (WB)	510	253	1,210	975	725	705
Two-Way	641	670	1,910	2,160	1,155	1,405
Waikoloa Rd. W. of Paniolo Ave. (EB)	193	470	790	1,235	455	757
Waikoloa Rd. W. of Paniolo Ave. (WB)	470	193	1,160	650	635	472
Two-Way	663	663	1,950	1,885	1,090	1,229
Waikoloa Rd. E. of Paniolo Ave. (EB)	175	245	1,010	1,150	490	418
Waikoloa Rd. E. of Paniolo Ave. (WB)	245	175	985	750	275	173
Two-Way	420	420	1,995	1,900	765	591
Waikoloa Rd. W. of Mamalahoa Hwy. (EB)	270	163	1,010	1,150	490	418
Waikoloa Rd. W. of Mamalahoa Hwy. (WB)	124	177	985	745	275	173
Two-Way	394	340	1,995	1,895	765	591
Mamalahoa Hwy. N. of Waikoloa Rd. (NB)	214	262	700	1,280	700	1,280
Mamalahoa Hwy. N. of Waikoloa Rd. (SB)	185	244	730	640	730	640
Two-Way	399	506	1,430	1,920	1,430	1,920
Mamalahoa Hwy. S. of Waikoloa Rd. (NB)	114	198	1,120	1,515	685	1,218
Mamalahoa Hwy. S. of Waikoloa Rd. (SB)	231	166	1,175	1,280	930	823
Two-Way	345	364	2,295	2,795	1,615	2,041

APPENDIX C3 (CONTINUED)

SUMMARY OF BASE YEAR AND FUTURE YEAR TRAFFIC VOLUMES (ALTERNATIVE 6)

ROADWAY LANES	**** CY 2013*****		CY 2035 (NO BUILD)		CY 2035 (BUILD)	
	AM VPH	PM VPH	AM VPH	PM VPH	AM VPH	PM VPH
Mamalahoa Hwy. N. of Saddle R. Ext. (NB)	139	205	1,120	1,515	685	1,218
Mamalahoa Hwy. N. of Saddle R. Ext. (SB)	143	201	1,175	1,280	930	823
Two-Way	282	406	2,295	2,795	1,615	2,041
Mamalahoa Hwy. S. of Saddle R. Ext. (NB)	129	234	665	1,265	490	1,030
Mamalahoa Hwy. S. of Saddle R. Ext. (SB)	185	191	1,150	880	915	735
Two-Way	314	425	1,815	2,145	1,405	1,765
Saddle Rd. Ext. E. of Q. Kaahumanu Hwy. (EB)	N/A	N/A	N/A	N/A	445	720
Saddle Rd. Ext. E. of Q. Kaahumanu Hwy. (WB)	N/A	N/A	N/A	N/A	720	415
Two-Way	N/A	N/A	N/A	N/A	1,165	1,135
Saddle Rd. Ext. W. of Mamalahoa Hwy. (EB)	N/A	N/A	N/A	N/A	695	967
Saddle Rd. Ext. W. of Mamalahoa Hwy. (WB)	N/A	N/A	N/A	N/A	945	717
Two-Way	N/A	N/A	N/A	N/A	1,640	1,684
Saddle Rd. Ext. E. of Mamalahoa Hwy. (EB)	70	152	615	1,045	615	1,045
Saddle Rd. Ext. E. of Mamalahoa Hwy. (WB)	122	113	1,045	895	1,045	895
Two-Way	192	265	1,660	1,940	1,660	1,940

SADDLE ROAD EXTENSION
SOUTH KOHALA, HAWAI‘I

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Appendix I Air Quality Report

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Draft

AIR QUALITY STUDY

FOR THE PROPOSED

SADDLE ROAD EXTENSION PROJECT

WAIKOLOA, HAWAII

Prepared for:

Okahara and Associates, Inc.

March 2017

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1.0 SUMMARY

The Hawaii Department of Transportation in cooperation with the Federal Highways Administration is proposing highway improvements in the vicinity of Waikoloa on the island of Hawaii. These improvements involve extending Saddle Road approximately 10 miles from Mamalahoa Highway to Queen Kaahumanu Highway at or near Waikoloa Road or Waikoloa Beach Drive. The proposed improvements are needed to more efficiently move regional traffic through the area and to accommodate the expected increase in traffic volumes at least through the year 2035.

This study examines the potential short- and long-term air quality impacts that could occur because of construction and use of the proposed highway facilities. Mitigative measures are suggested where possible and appropriate to lessen any impacts from the project.

Both federal and state standards have been established to maintain ambient air quality. At the present time, seven parameters are regulated including: particulate matter, sulfur dioxide, hydrogen sulfide, nitrogen dioxide, carbon monoxide, ozone and lead. Hawaii air quality standards are generally comparable to the national standards although the state standards for carbon monoxide are more stringent than the national standards.

Regional and local climate, together with the amount and type of human activity, generally dictate the air quality of a given location. The climate of the project area is very much affected by its leeward location. Northeast trade winds occur much of the time and tend to be channeled through the area by the terrain. Local winds (such as land/sea breezes and upslope/downslope winds) affect the wind flow when the trade winds are weak or absent. Temperatures in the project area are generally very consistent and warm at the lower elevations and cooler at the higher locations. Rainfall in the project area is sparse with an average of about 10 to 20 inches per year.

Except for periodic impacts from volcanic emissions (vog) and possibly occasional localized impacts from traffic congestion, the present air quality of the project area is believed to be relatively good. Air pollution from vog may sometimes contribute to elevated concentrations of fine particulate matter, and occasional wild fires may cause short-term high concentrations of particulate matter and carbon monoxide. Also, some traffic-congested locations may have occasional higher concentrations of carbon monoxide. There is very little air quality monitoring data available from the Hawaii Department of Health for the project area, but the limited data that are available suggest that concentrations are generally within state and national air quality standards.

If the proposed project is given the necessary approvals to proceed, it is inevitable that some short- and long-term impacts on air quality will unavoidably occur either directly or indirectly as a consequence of project construction and use. Short-term impacts from fugitive dust will likely occur during the project construction phase. To a lesser extent, exhaust emissions from stationary and mobile construction equipment and from the disruption of traffic may also affect air quality during the period of construction. State air pollution control regulations require that there be no visible fugitive dust emissions at the project boundary. Hence, an effective dust control plan should be implemented to ensure compliance with state regulations. Fugitive dust emissions can be controlled to a large extent by watering of active work areas, using wind screens, keeping adjacent paved roads clean, and by covering of open-bodied trucks. Other dust control measures could include limiting the area that can be disturbed at any given time and/or mulching or chemically stabilizing inactive areas that have been worked. Paving and landscaping of project areas early in the construction schedule will also reduce dust emissions. Excess exhaust emissions from traffic disruption can be mitigated by moving construction equipment and workers to and from the project area during off-peak traffic hours and by minimizing road closures during peak traffic periods.

To assess the potential long-term impact of emissions from vehicles operating on roadways within the project area, both mesoscale and microscale analyses were performed, and a qualitative assessment of mobile source air toxics was prepared. The mesoscale analysis was designed to provide estimates of air pollution emissions from traffic for the overall project area, while the microscale analyses assessed ambient air quality impacts near selected intersections within the project study area. The mesoscale analyses considered an existing case and four alternatives for the design year (2035). The design year alternatives included a no-action scenario and three alternatives with the project with different roadway alignments (designated as Alternatives 4, 5 and 6). The microscale analyses were performed for similar scenarios.

The mesoscale analysis indicated that for existing conditions the estimated totals of emissions from traffic within the study area were 420 tons per year of carbon monoxide, 230 tons per year of nitrogen oxides and 20 tons per year of volatile organic compounds. Without the project in the year 2035, it was estimated that carbon monoxide emissions would decrease by 9 percent, volatile organic compounds emissions would decrease by 70 percent and nitrogen oxides emissions would decrease by 59 percent. These substantial decreases in emissions would occur despite the projected substantial increase in traffic volumes. This is due to the expected significant reduction in average tailpipe emissions over time as older, more polluting vehicles are retired. With Alternatives 4, 5 or 6 in the year 2035 compared to the without-project alternative, emissions of carbon monoxide, volatile organic compounds and nitrogen oxides were estimated to decrease by about an additional 10 to 15 percent. Of the three build alternatives, Alternative 6 would likely yield the largest emission reductions but the difference amongst the three alternatives is slight.

The microscale analyses performed for this project involved the use of computerized emission and atmospheric dispersion models to estimate existing and future (year 2035) worst-case 1-hour average ambient concentrations of carbon monoxide during peak travel hours at several intersections in the project study area. The highest worst-case carbon monoxide concentration for existing conditions was predicted to occur at the intersection of Waikoloa Road and Queen Kaahumanu Highway during the afternoon. The predicted 1-hour concentration at this location reached 1.4 parts per million (ppm), which is well within the state standard of 9 ppm and the national standard of 35 ppm. In the year 2035 without the project, the predicted highest worst-case 1-hour concentration in the project study area decreased (improved) to 0.9 ppm. Although it is expected that there would be significantly more traffic and congestion by the year 2035 without roadway improvements, much of the excess emissions would be offset by the retirement of older vehicles with less efficient emissions control systems. In the year 2035 with project Alternatives 4, 5 or 6, worst-case concentrations were predicted to be either lower (better) or unchanged compared to the without project case. Insofar as the microscale analysis is concerned, there is no significant difference amongst the three with-project alternatives studied.

A qualitative assessment of the potential impacts from mobile source air toxics (MSATs) indicated in the design year (2035) that Alternatives 4, 5 or 6 could result in slightly higher MSAT emissions compared to the without-project alternative based on vehicle miles of travel estimates. However, it is probable that MSAT emissions will decrease in the future compared to existing emissions, with or without the project, due to fleet turnover and as new vehicle and fuel regulations are implemented.

Based on the results of the analyses of the potential long-term impacts of the project, it may be concluded that the proposed roadway improvements would likely have either a slight net positive impact or no impact on the long-term air quality of the area, and any difference amongst the three with-project alternatives is very small. Although options are available to mitigate long-term traffic-related air quality impacts, requiring these be implemented is probably unnecessary and unwarranted in this case.

2.0 INTRODUCTION AND PROJECT DESCRIPTION

The State of Hawaii Department of Transportation (HDOT), in cooperation with the Federal Highway Administration (FHWA), is proposing the extension of Saddle Road (State Route 200) from Mamalahoa Highway to Queen Kaahumanu Highway in the vicinity of Waikoloa on the island of Hawaii (see Figure 1 for general project location). The Saddle Road has been officially renamed as the Daniel K. Inouye (DKI) Highway but is often still referred to as the Saddle Road. The purpose of the project is to provide facilities to convey traffic more directly between Saddle Road and Queen Kaahumanu Highway, which is the regional arterial roadway. The study area includes the existing western terminus of Saddle Road at Mamalahoa Highway, Mamalahoa Highway to Waikoloa Road, Waikoloa Road to Queen Kaahumanu Highway, and Queen Kaahumanu Highway to Waikoloa Beach Drive.

The planning period for the project is through the year 2035. Four alternatives are being contemplated. These include a no-build case which assumes existing roadway conditions with changes made only due to projects already scheduled to be completed by 2035, and three alternative project alignments designated as Alternatives 4, 5 and 6.

The purpose of this study was to evaluate the potential air quality impacts of the proposed project and recommend mitigative measures, if possible and appropriate, to reduce or eliminate any project-related degradation of air quality in the area. Before examining the potential impacts of the project, a discussion of ambient air quality standards is presented and background information concerning the regional and local climatology and the present air quality of the project area is provided.

3.0 AMBIENT AIR QUALITY STANDARDS

Ambient concentrations of air pollution are regulated by both national and state ambient air quality standards (AAQS). National AAQS are specified in Section 40, Part 50 of the Code of Federal Regulations (CFR), while State of Hawaii AAQS are defined in Chapter 11-59 of the Hawaii Administrative Rules. Table 1 summarizes both the national and the state AAQS that are specified in the cited documents. As indicated in the table, national and state AAQS have been established for particulate matter, sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone and lead. The state has also set a standard for hydrogen sulfide. National AAQS are stated in terms of both primary and secondary standards for most of the regulated air pollutants. National primary standards are designed to protect the public health with an "adequate margin of safety". National secondary standards, on the other hand, define levels of air quality necessary to protect the public welfare from "any known or anticipated adverse effects of a pollutant". Secondary public welfare impacts may include such effects as decreased visibility, diminished comfort levels, or other potential injury to the natural or man-made environment, e.g., soiling of materials, damage to vegetation or other economic damage. In contrast to the national AAQS, Hawaii State AAQS are given in terms of a single standard that is designed "to protect public health and welfare and to prevent the significant deterioration of air quality".

Each of the regulated air pollutants has the potential to create or exacerbate some form of adverse health effect or to produce environmental degradation when present in sufficiently high concentration for prolonged periods of time. The AAQS specify a maximum allowable concentration for a given air pollutant for one or more averaging times to prevent harmful effects. Averaging times vary from one hour to one year depending on the pollutant and type of exposure necessary to cause adverse effects. In the case of the short-term (i.e., 1- to 24-hour) AAQS, both national and state standards allow a specified number of exceedances each year.

The Hawaii AAQS are in some cases considerably more stringent than the comparable national AAQS. In particular, the Hawaii 1-hour AAQS for carbon monoxide is four times more stringent than the comparable national limit. On the other hand, the current Hawaii AAQS for sulfur dioxide are probably less stringent than the national standards. During the early part of 2010, the national primary annual and 24-hour standards for sulfur dioxide were revoked in favor of a new national 1-hour standard which is considered to be more stringent than the Hawaii short-term standards. The Hawaii AAQS for sulfur dioxide have not yet been updated to bring them in line with the national standards.

In 1993, the state revised its particulate standards to follow those set by the federal government. During 1997, the federal government again revised its standards for particulate, but the new standards were challenged in federal court. A Supreme Court ruling was issued during February 2001, and as a result, the new standards for particulate were finally implemented during 2005. To date, the Hawaii Department of Health has not updated the state particulate standards.

In September 2001, the state vacated the state 1-hour standard for ozone and an 8-hour standard was adopted that was the same as the national standard. During recent years, the national standard for ozone has again been revised and made more stringent. The Hawaii standard for ozone has not yet been amended to follow the national standard.

During the latter part of 2008, EPA revised the standard for lead making the standard more stringent. So far, the Hawaii Department of Health has not revised the corresponding state standard for lead.

During early 2010, a national 1-hour primary standard for nitrogen dioxide was implemented. To date, Hawaii has not promulgated a 1-hour standard for nitrogen dioxide, but the Hawaii annual standard for this pollutant is more stringent than the national annual standard.

4.0 REGIONAL AND LOCAL CLIMATOLOGY

Regional and local climatology significantly affect the air quality of a given location. Wind, temperature, atmospheric turbulence, mixing height and rainfall all influence air quality. Although the climate of Hawaii is relatively moderate throughout most of the state and most of the year, significant differences in these parameters may occur from one location to another. Most differences in regional and local climates within the state are caused by the mountainous topography.

Waikoloa, the site of the proposed project, is located on the northwestern side of the island of Hawaii. The topography of the island is dominated by the great volcanic masses of Mauna Loa (13,653 feet), Mauna Kea (13,796 feet), and of Hualalai, the Kohala Mountains and Kilauea. The island consists entirely of the slopes of these mountains and of the broad saddles between them. Mauna Loa and Kilauea, located on the southern half of the island, are still active volcanoes. The area of the proposed project occupies a portion of the lower slopes of Mauna Loa, ranging in elevation from about 2500 feet down to about 100 feet.

Hawaii lies well within the belt of northeasterly trade winds generated by the semi-permanent Pacific high-pressure cell to the north and east. Much of the western coast of the island of Hawaii, however, is sheltered from the trade winds by high mountains, except when unusually strong trade winds sweep through the saddle between the Kohala Mountains and Mauna Kea and reach the areas to the lee. Although there are no published wind data for the specific project area, the approximate wind conditions can be reasonably ascertained. When the trade winds are strong and more easterly, the wind flow tends to push through the gap between the Kohala Mountains and Mauna Kea and into the Waikoloa area to the west. When the trade winds become more northerly, the Kohala Mountains tend to shelter the area from the wind. When the trade winds are weak or absent, local winds such as land/sea breezes and/or upslope/ downslope winds tend to dominate the wind pattern. At night and during the early morning hours, winds are often drainage winds which move downslope and out to sea.

Air pollution emissions from motor vehicles, the formation of photochemical smog and smoke plume rise all depend in part on air temperature. In Hawaii, the annual and daily variation of temperature depends to a large degree on elevation above sea level, distance inland and exposure to the trade winds. Average temperatures at locations near sea level generally are warmer than those at higher elevations. Areas exposed to the trade wind tend to have the least temperature variation, while inland and leeward areas often have the most. The project site's low to mid-level elevation results in a relatively warm to moderate temperature profile compared to windward locations near sea level. At Kamuela, located a few miles from the project area and at an elevation of about 2700 feet, average daily minimum and maximum temperatures are 55°F and 73°F, respectively [1]. The extreme minimum temperature on record at this location is 34°F, and the extreme maximum is 90°F. Temperatures at the upper elevations of the project area are probably similar while the lower elevations are warmer.

Small scale, random motions in the atmosphere (turbulence) cause air pollutants to be dispersed as a function of distance or time from the point of emission. Turbulence is caused by both mechanical and thermal forces in the atmosphere. It is oftentimes measured and described in terms of Pasquill-Gifford stability class. Stability class 1 is the most turbulent and class 6 the least. Thus, air pollution dissipates the best during stability class 1 conditions and the worst when stability class 6 prevails. In the Waikoloa area, stability class 5 or 6 is generally the highest stability class that occurs, developing during clear, calm nighttime or early morning hours when temperature inversions form either due to radiational cooling or to downslope winds that push warmer air aloft. Stability classes 1 through 4 occur during the daytime, depending mainly on the amount of cloud cover and incoming solar radiation and the onset and extent of the sea breeze.

Mixing height is defined as the height above the surface through which relatively vigorous vertical mixing occurs. Low mixing heights can result in high ground-level air pollution concentrations because contaminants emitted from or near the surface can become trapped within the mixing layer. In Hawaii, minimum mixing heights tend to be high because of mechanical mixing caused by the trade winds and because of the temperature moderating effect of the surrounding ocean. Low mixing heights may sometimes occur, however, at inland locations and even at times along coastal areas early in the morning following a clear, cool, windless night. Coastal areas may also experience low mixing levels during sea breeze conditions when cooler ocean air rushes in over warmer land. Although there is no mixing height data for the Waikoloa area, mixing heights elsewhere in the state typically are above 3000 feet (1000 meters).

Rainfall can have a beneficial effect on the air quality of an area in that it helps to suppress fugitive dust emissions, and it may also "washout" gaseous contaminants that are water soluble. Rainfall in Hawaii is highly variable depending on elevation and on location with respect to the trade wind. The lower elevations of South Kohala are some of the driest areas in the state. The probable annual rainfall in the project area varies from about 20 inches at the higher elevations to about 10 inches at the lower heights.

5.0 PRESENT AIR QUALITY

Present air quality in the project area is mostly affected by air pollutants from vehicular, industrial, natural and/or agricultural sources. Table 2 presents an air pollutant emission summary for the island of Hawaii for calendar year 1993. This data has not been updated in many years and has become very dated, but it may still provide some useful information for discussion. The emission rates shown in the table pertain to manmade emissions only, i.e., emissions from natural sources are not included. As suggested in the table, much of the manmade particulate emissions on Hawaii tend to originate from area sources, such as the mineral products industry and agriculture. Manmade sulfur oxides are emitted almost exclusively by point sources, such as power plants and other fuel-burning industries. Nitrogen oxides emissions emanate predominantly from area sources (mostly motor vehicle traffic), although industrial point sources contribute a significant share. The majority of carbon monoxide emissions occur from area sources (motor vehicle traffic), while hydrocarbons are emitted mainly from point sources. Since this emissions data was compiled, sugar cane cultivation has ceased, the island population has increased, and fossil fuel usage has increased. Thus, the present emissions inventory for Hawaii County is probably different today.

Hawaii Island is unique from the other islands in the state in terms of the natural volcanic air pollution emissions that occur. Volcanic emissions periodically plague the project area. This is especially so since the latest eruption phase of the Kilauea Volcano began in 1983. Air pollution emissions from the Hawaiian volcanoes consist primarily of sulfur dioxide. After entering the atmosphere, these sulfur dioxide emissions are carried away by the wind and either washed out as acid rain or gradually transformed into particulate sulfates or acid aerosols. Although emissions from Kilauea are vented on the other side of a mountain barrier more than 60 miles southeast of the project site, the prevailing wind patterns eventually carry some of the emissions into the Kona and Kohala areas. These emissions can be seen in the form of the volcanic haze (vog) which persistently hangs over the area.

Industrial sources of air pollution in the project vicinity include generating units at Hawaii Electric Light Company's Waimea Generating Station and a rock quarry and cement plant located a few miles south of Waimea. Air pollution emissions from the Hawaii Electric Light Company (HELCO) generating units consist mostly of sulfur dioxide and oxides of nitrogen. The rock quarry and cement plant emit particulate matter and other emissions from fuel combustion.

Traffic within the Waikoloa area is congested at times along the major roadways and at the major intersections. Motor vehicle emissions consist primarily of carbon monoxide and nitrogen oxides.

Agricultural activity consists primarily of pasturing of cattle and horses and the cultivation of truck crops. Any air pollution from these sources is limited mainly to fugitive dust.

The State Department of Health operates a network of air quality monitoring stations at various locations around the state. Unfortunately, very limited data are available for Hawaii Island, and none are available for the Waikoloa area specifically. During the most recent 5-year period for which data have been reported (2011-2015), the Department of Health operated an air quality monitoring site in the Kealakekua area for measuring sulfur dioxide and particulate matter (PM 2.5). Kealakekua is about 25 miles south of the project area. Air quality data collected at this station are probably representative of regional conditions. As indicated in Table 3, measurements of sulfur dioxide concentrations at this location during the 2011-2015 monitoring period were mostly low with annual average concentrations of 0.003 to 0.005 ppm, which represents about 10 to 17 percent of the state standard. During 2011 and 2012, there were a few incidents of higher 1-hour average sulfur dioxide concentrations that exceeded the level of the national standard. The highest annual second-highest 3-hour and 24-hour concentrations (which are most relevant to the state standards) for these five years were 0.079 and 0.030 ppm, respectively; these are about 16 to 21 percent of the applicable standards. No exceedances of the state 3-hour and 24-hour AAQS for sulfur dioxide were recorded.

The annual average PM 2.5 concentrations for the years 2011 through 2015 ranged from 10 to 16 $\mu g/m^3$. These values are near the national primary annual standard which is set at 12 $\mu g/m^3$ for a three-year average. The 98th percentile 24-hour concentration (which is most relevant to the national 24-hour standard) ranged from 18 to 28 μg/m^3 for 2011 through 2015. These values are in compliance with the national standard of 35 μg/m^3 (three-year average). The higher concentrations of fine particulate are primarily due to volcanic emissions.

At this time, there are no reported measurements of lead, ozone, nitrogen dioxide or carbon monoxide in the project vicinity. These are primarily motor vehicle related air pollutants. Lead, ozone and nitrogen dioxide typically are regional scale problems. Concentrations of lead and nitrogen dioxide generally have not been found to exceed AAQS elsewhere in the state. Ozone concentrations measured at Sand Island on Oahu are somewhat elevated but are within state and national standards. Carbon monoxide air pollution typically is a microscale problem caused by congested motor vehicular traffic. In traffic congested areas such as urban Honolulu, carbon monoxide concentrations have been found to occasionally exceed the state AAQS. Present concentrations of carbon monoxide in the project area are estimated later in this study based on computer modeling of motor vehicle emissions.

Given the limited air pollution sources in the area, it is likely that air pollution concentrations are near natural background levels most of the time, except possibly for locations adjacent to agricultural operations or near traffic-congested intersections. Volcanic-related air pollution (vog) may sometimes may sometimes reach concentration levels that approach the national standards for fine particulate matter.

6.0 SHORT-TERM IMPACTS OF PROJECT

Short-term direct and indirect impacts on air quality could potentially occur during project construction. For a project of this nature, there are two potential types of air pollution emissions that could directly result in short-term air quality impacts during construction: (1) fugitive dust from vehicle movement and soil excavation; and (2) exhaust emissions from on-site construction equipment. Indirectly, there also could be short-term impacts from slow-moving construction equipment traveling to and from the project site and from the disruption of traffic due to road construction.

Fugitive dust emissions may arise from the grading and dirt-moving activities associated with land clearing and preparation work. The emission rate for fugitive dust emissions from construction activities is difficult to estimate accurately because of its elusive nature of emission and because the potential for its generation varies greatly depending upon the type of soil at the construction site, the amount and type of dirt-disturbing activity taking place, the moisture content of exposed soil in work areas, and the wind speed. The EPA [2] has provided a rough estimate for uncontrolled fugitive dust emissions from construction activity of 1.2 tons per acre per month under conditions of "medium" activity, moderate soil silt content (30%), and precipitation/evaporation (P/E) index of 50. Uncontrolled fugitive dust emissions in the project area would likely be somewhere near this level or possibly lower due to the wet climate. In any case, State of Hawaii Air Pollution Control Regulations [3] prohibit visible emissions of fugitive dust from construction activities at the project boundary, and thus an effective dust control plan for the project construction phase is essential.

Adequate fugitive dust control can usually be accomplished by the establishment of a frequent watering program to keep bare-dirt surfaces in construction areas from becoming significant sources of dust. In dust-prone or dust-sensitive areas, other control measures such as limiting the area that can be disturbed at any given time, applying chemical soil stabilizers, mulching and/or using wind screens may be necessary. Control regulations further stipulate that open-bodied trucks be covered at all times when in motion if they are transporting materials that could be blown away. Haul trucks tracking dirt onto paved streets from unpaved areas is oftentimes a significant source of dust in construction areas. Some means to alleviate this problem, such as road cleaning or tire washing, may be appropriate. Paving and/or establishment of landscaping as early in the construction schedule as possible can also lower the potential for fugitive dust emissions.

On-site mobile and stationary construction equipment also will emit air pollutants from engine exhausts. The largest of this equipment is usually diesel-powered. Nitrogen oxides emissions from diesel engines can be relatively high compared to gasoline-powered equipment, but the standard for nitrogen dioxide is set on an annual basis and is not likely to be violated by short-term construction equipment emissions. Also, the new short-term (1-hour) standard for nitrogen dioxide is based on a three-year average; thus, it is unlikely that relatively short-term construction emissions would exceed the standard. Carbon monoxide emissions from diesel engines, on the other hand, are low and should be relatively insignificant compared to vehicular emissions on nearby roadways.

Indirectly, slow-moving construction vehicles on roadways leading to and from the project area could obstruct the normal flow of traffic to such an extent that overall vehicular emissions are increased, but this impact can be mitigated by moving heavy construction equipment during periods of low traffic volume. Likewise, road closures during peak traffic periods should be avoided to the extent possible to minimize air pollution impacts from traffic disruption. Thus, with careful planning and attention to dust control, most potential short-term air quality impacts from project construction can be mitigated.

7.0 LONG-TERM IMPACTS OF PROJECT

After construction is completed, the proposed roadway improvements will result in modified traffic flow in the project area. To evaluate the potential long-term, ambient air quality impact of the proposed project, both mesoscale and microscale analyses were performed for each of five scenarios. The five scenarios studied included:

- Existing with present conditions
- 2035 without the project (no build)
- 2035 with project Alternative 4
- 2035 with project Alternative 5
- 2035 with project Alternative 6.

The "no-build" alternative, includes currently programmed actions only through the year 2035. Alternative 4 would extend Saddle Road between Mamalahoa Highway and Queen Kaahumanu Highway as an independent alignment. Alternative 5 is similar to Alternative 4 except it proposes a Saddle Road Extension alignment that approaches closer to the existing Waikoloa Road, and a short roadway segment would connect the two. Alternative 6 proposes an alignment similar to Alternative 5 between Mamalahoa Highway and Waikoloa Road. From there Alternative 6 proposes an alignment that would generally utilize the existing Waikoloa Road alignment to a point about 0.5 mile mauka of Queen Kaahumanu Highway and turn south and intersect it at Waikoloa Beach Drive.

The project alternatives indicated above are described in more detail in the project traffic study [4]. The following subsections of this report discuss the air quality study methodologies and the results of these analyses.

7.1 Mesoscale Analysis

To evaluate the potential mesoscale impact of the proposed project, an analysis of daily and annual emissions from within the roadway corridor in the project area was prepared. The mesoscale analysis was designed to quantify project-related emissions of carbon monoxide, nitrogen oxides and volatile organic compounds occurring within the study area for the existing case and for the future alternatives considered.

The mesoscale emission estimates for each scenario were prepared by first dividing the roadway corridor up into segments and obtaining the estimated daily traffic volume and average travel speed for each segment from the project traffic analysis [4]. Vehicle-miles per day for each segment were then calculated. Next, emission estimates were prepared for each scenario based on the estimated vehicle-miles of travel, average travel speeds, and U.S. EPA emission factors obtained using the Motor Vehicle Emission Simulator (MOVES) computer model [5]. The use of MOVES for a “project-level” analysis requires a number of complex inputs and assumptions. For the mesoscale analysis, an average ambient temperature of 77°F and a relative humidity of 75% were assumed. Default values were used for the required fuel inputs. National average values for vehicle mix and for vehicle age as obtained from EPA's predecessor to the MOVES emissions model (MOBILE6.2) were used [6].

The resulting emission factors generated by MOVES are given in terms of pollutant grams emitted per vehicle mile of travel. For the mesoscale analysis, estimates of volatile organic compounds (VOC), carbon monoxide (CO) and nitrogen oxides (NOx) were generated. Slower vehicle speeds generally result in higher emission factors. It should also be noted that at a given vehicle speed emission factors are lower for future years due to the effects of older, more-polluting vehicles being retired.

Tables 4 through 8 provide the details of the mesoscale analysis. A summary of the results is presented below:

Scenario	Emissions (tons/year)		
	CO	NOx	VOC
Existing	420	230	20
2035 Without Project	384	94	6
2035 Alternative 4	336	84	5
2035 Alternative 5	336	83	5
2035 Alternative 6	333	83	5

In comparison to the island-wide emissions given in Table 2 for 1993 (the latest figures available), emissions in the existing year from traffic within the project area were relatively small. Carbon monoxide, nitrogen oxides and VOC emissions from traffic in the project area presently likely account for a few percent of total island-wide emissions.

Without the project in the year 2035, carbon monoxide emissions within the project area were estimated to decrease by about 9 percent compared to existing emissions. Both nitrogen oxides and VOC emissions were estimated to decrease by about 70 percent. Although traffic volumes are projected to be substantially higher in the year 2035 compared to existing volumes, the EPA's emission factor model predicts significantly lower emission factors for periods 20 years into the future. The lower emission factors more than offset the higher traffic volumes, resulting in lower estimated emissions.

As indicated in the summary table above, Alternatives 4, 5 and 6 all were estimated to result in lower emissions of carbon monoxide, nitrogen oxides and VOC compared to the without-project alternative. In Alternative 4, carbon monoxide emissions were estimated to be 12 percent lower, while nitrogen oxides and VOC emissions were projected to be reduced by 11 percent and 17 percent, respectively. The results for Alternatives 5 and 6 are very similar to those for Alternative 4. All three with-project alternatives would provide an air quality benefit in terms of reduced mesoscale emissions.

7.2 Microscale Analyses

In most traffic-related air quality assessments, roadway intersections are one of the primary concerns because of traffic congestion and because of the increase in vehicular emissions associated with traffic queuing. To investigate potential air quality impacts near roadway intersections within the project area, microscale analyses were performed for selected locations using computerized emission and atmospheric dispersion models to estimate worst-case ambient carbon monoxide concentrations. Carbon monoxide was selected for the microscale analyses because it is both the most stable and the most abundant of the pollutants generated by motor vehicles. Furthermore, carbon monoxide air pollution is generally considered to be a microscale problem that can be addressed locally to some extent, whereas other air pollutants most often are regional issues that cannot be addressed by a single highway improvement.

The selected locations for microscale analyses included five representative intersections within the project corridor. These included:

- Saddle Road (DKI Highway) at Mamalahoa Highway
- Mamalahoa Highway at Waikoloa Road
- Waikoloa Road at Paniolo Avenue
- Waikoloa Road at Queen Kaahumanu Highway
- Queen Kaahumanu Highway at Waikoloa Beach Drive.

These are all existing intersections. The two intersections along Queen Kaahumanu Highway are presently signalized while the other intersections are presently stop-controlled. In accordance with the project traffic study [4], for the future analyses, all of the intersections were assumed to be signalized.

The main objective of the microscale analyses was to estimate worst-case 1-hour average carbon monoxide concentrations for each of the scenarios studied. Several scenarios were studied for the microscale analyses. These included the existing-year case, year 2035 without the project, and year 2035 with three different with-project alternatives which were described above.

To evaluate the significance of the estimated microscale concentrations, a comparison of the predicted values for each scenario can be made. A comparison of the estimated values to the national and state AAQS will provide another measure of significance.

Traffic estimates for the project indicate that traffic volumes generally are or will be higher during the afternoon peak hour than during the morning peak period. However, worst-case emission and meteorological dispersion conditions typically occur during the morning hours at most locations. Thus, both morning and afternoon peak-traffic hours were examined to ensure that worst-case concentrations were identified.

Similar to the mesoscale emission burden analysis, the EPA computer model MOVES was used to calculate vehicular carbon monoxide emissions for each year/scenario studied in the microscale analyses. Inputs for fuel, vehicle mix and vehicle age were assumed to be the same as that used for the mesoscale emission estimates. Ambient temperatures of 70 and 90°F were used for morning and afternoon peak-hour emission computations, respectively. These are conservative assumptions since morning/afternoon ambient temperatures will often be cooler than this, and carbon monoxide emission estimates given by MOVES generally increase with increasing temperature in the range of temperatures that occur at the project location.

After computing vehicular carbon monoxide emission factors through the use of MOVES, these data were then input to an atmospheric dispersion model. EPA air quality modeling guidelines [7] currently recommend that the computer model CAL3QHC [8] be used to assess carbon monoxide concentrations at roadway intersections. CAL3QHC was developed for the U.S. EPA to simulate vehicular movement, vehicle queuing and atmospheric dispersion of vehicular emissions near roadway intersections. It is designed to predict 1-hour average pollutant concentrations near roadway intersections based on input traffic and emission data, roadway/receptor geometry and meteorological conditions.

Although CAL3QHC is intended primarily for use in assessing atmospheric dispersion near signalized roadway intersections, it can also be used to evaluate unsignalized intersections. This is accomplished by manually estimating queue lengths and then applying the same techniques used by the model for signalized intersections. All of the study intersections either are or will be signalized in the future.

Input peak-hour traffic data were obtained from the traffic study cited previously. This included vehicle approach volumes, saturation capacity estimates, intersection laneage and signal timings (where applicable). All emission factors that were input to CAL3QHC for free-flow traffic on roadways were obtained from MOVES based on assumed free-flow vehicle speeds corresponding to the posted speed limits.

Model roadways were set up to reflect roadway geometry, physical dimensions and operating characteristics. Concentrations predicted by air quality models generally are not considered valid within the roadway-mixing zone. The roadway-mixing zone is usually taken to include 3 meters on either side of the traveled portion of the roadway and the turbulent area within 10 meters of a cross street. Model receptor sites were thus located at the edges of the mixing zones near all intersections that were studied for all scenarios. All receptor heights were placed at 1.8 meters above ground to simulate levels within the normal human breathing zone.

Input meteorological conditions for this study were defined to provide "worst-case" results. One of the key meteorological inputs is the atmospheric stability category. For these analyses, atmospheric stability category 6 was assumed for morning scenarios and stability category 4 was assumed for afternoon cases. These are the most conservative stability categories that are generally used for estimating pollutant dispersion at rural or suburban locations for these time periods. For all cases, a surface roughness length of 100 cm was assumed and a mixing height of 1,000 meters was used. Worst-case wind conditions were defined as a wind speed of 1 meter per second with a wind direction resulting in the highest predicted concentration. Concentration estimates were calculated at wind directions of every 5 degrees.

Existing background concentrations of carbon monoxide in the project vicinity are believed to be at relatively low levels. Hence, background contributions of carbon monoxide from sources or distant roadways not directly considered in the analysis were accounted for by adding a small background concentration of 0.5 ppm to all predicted 1-hour concentrations for the existing year. Although substantial development and increased traffic are expected to occur within the project area within the next several years, background 1-hour carbon monoxide concentrations may not change significantly since individual emissions from motor vehicles are forecast to decrease with time. Hence, a background value of 0.5 ppm was assumed to persist for the 2035 scenarios that were studied.

Predicted Worst-Case 1-Hour Concentrations

Table 9 summarizes the final results of the microscale modeling study in the form of the estimated worst-case 1-hour morning and afternoon ambient carbon monoxide concentrations for existing conditions and for each of the four 2035 alternatives. The locations of these estimated worst-case 1-hour concentrations all occurred at or very near the indicated intersections.

As indicated in the table, the highest estimated worst-case 1-hour concentration for the present-year scenario was 1.4 ppm, and this occurred during the afternoon at the intersection of Waikoloa Road at Queen Kaahumanu Highway. This concentration is well within the national standard of 35 ppm and the more stringent state standard of 9 ppm. Other worst-case values for this scenario were 1.3 ppm or lower and were well within the state and national standards.

In the year 2035 without the proposed project, the predicted highest worst-case 1-hour concentration continued to occur during the afternoon at the intersection of Waikoloa Road at Queen Kaahumanu Highway with a value of 0.9 ppm, which is about 35 percent lower (better) compared to the existing case and well within the national and state standards. Other concentrations for this scenario ranged between 0.7 and 0.8 ppm. This suggests that even with higher volumes of traffic and more congestion in the future, worst-case concentrations would likely decrease (improve) compared to the existing case. This is because of older, more-polluting vehicles being retired over time.

In the year 2035, the results for Alternatives 4, 5 and 6 were nearly identical and indicated a slight positive impact compared to the without-project scenario. All locations studied for these alternatives would remain well within the state and national standards.

Predicted Worst-Case 8-Hour Concentrations

Worst-case 8-hour carbon monoxide concentrations were estimated by multiplying the worst-case 1-hour values by a persistence factor of 0.5. This accounts for two factors: (1) traffic volumes averaged over eight hours are lower than peak 1-hour values, and (2) meteorological conditions are more variable (and hence more favorable for dispersion) over an 8-hour period than they are for a single hour. Based on monitoring data, 1-hour to 8-hour persistence factors for most locations generally vary from 0.4 to 0.8 with 0.6 being the most typical. One recent study based on modeling [9] concluded that 1-hour to 8-hour persistence factors could typically be expected to range from about 0.4 to 0.5. EPA guidelines [10] recommend using a value of 0.6 to 0.7 unless a locally derived persistence factor is available. Recent monitoring data for Honolulu reported by the Department of Health [11] suggest that this factor may range between about 0.35 and 0.55 depending on location and traffic variability. Considering the location of the project and the traffic pattern for the area, a 1-hour to 8-hour persistence factor of 0.5 will likely yield reasonable estimates of worst-case 8-hour concentrations. However, it should be noted that the 8-hour concentration estimates are generally less reliable than the 1-hour values due to the prediction methodology involved.

The resulting estimated worst-case 8-hour concentrations are indicated in Table 10. In terms of compliance with the state and national standards, the results are similar to the results for the 1-hour analysis. For the current-year scenario, the estimated worst-case 8-hour carbon monoxide concentrations for the five intersections studied ranged from 0.4 ppm to 0.7 ppm. The estimated highest worst-case concentration for the existing case was well within both the national limit of 9 ppm and the state standard of 4.4 ppm.

For the 2035 without project scenario, worst-case concentrations decreased (improved) or remained unchanged at the five locations studied compared to the existing case. Worst-case concentrations were estimated to be 0.4 ppm at all locations evaluated. These values are well within both the national and the state AAQS.

There was no difference predicted amongst Alternatives 4, 5 and 6 and no difference between the with and without-project alternatives. All alternatives would provide results that meet the state and national 8-hour standards.

Conservativeness of Estimates

The results of this study reflect several assumptions that were made concerning both traffic movement and worst-case meteorological conditions. One such assumption concerning worst-case meteorological conditions is that a wind speed of 1 meter per second with a steady direction for 1 hour will occur. A steady wind of 1 meter per second blowing from a single direction for an hour is extremely unlikely and may occur only once a year or less. With wind speeds of 2 meters per second, for example, computed carbon monoxide concentrations would be only about half the values given above. The 8-hour estimates are also conservative in that it is unlikely that anyone would occupy the assumed receptor sites (within 3 m of the roadways) for a period of 8 hours.

7.3 Mobile Source Air Toxics Analysis

In addition to the criteria air pollutants for which there are National Ambient Air Quality Standards (NAAQS), EPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners) and stationary sources (e.g., factories or refineries). Mobile Source Air Toxics (MSATs) are a subset of the 188 air toxics defined by the Clean Air Act. The MSATs are compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline.

A quantitative assessment of the effects of air toxic emissions impacts on human health cannot be made at the project level. While available tools to reasonably predict relative emissions changes between alternatives for larger projects, the amount of MSAT emissions from each of the project alternatives and MSAT concentrations or exposures created by each of the project alternatives cannot be predicted with enough accuracy to be useful in estimating health impacts. The current emissions model is not capable of serving as a meaningful emissions analysis tool for smaller projects. Therefore, the relevance of the unavailable or incomplete information is that it is not possible to make a determination of whether any of the alternatives would have "significant adverse impacts on the human environment."

Even though reliable methods do not exist to accurately estimate the health impacts of MSATs at the project level, it is possible to qualitatively assess the levels of future MSAT emissions under the project. Although a qualitative analysis cannot identify and measure health impacts from MSATs, it can give a basis for identifying and comparing the potential differences among MSAT emissions, if any, from the various alternatives. The qualitative assessment presented below is derived in part from a U.S. Department of Transportation, Federal Highway Administration Memorandum from April Marchese to Division Administrators dated December 6, 2012.

For each project alternative, the amount of MSATs emitted can be expected to be proportional to the vehicle miles traveled, or VMT, assuming that other variables such as fleet mix are the same for each alternative. VMTs are a function of daily traffic volumes and miles of road traveled. For this project, as indicated in Tables 4 through 8, the estimated daily VMT for each scenario were as follows:

Scenario	VMT/day
Existing	251,729
2035 Without Project	929,725
2035 Alternative 4	943,355
2035 Alternative 5	943,613
2035 Alternative 6	931,793

As indicated above, the estimated VMT in 2035 without the project are substantially higher compared to the existing case, and the estimated VMT for the three with-project alternatives are slightly higher (about 1 percent higher or less) compared to without the project.

Any of the three with-project alternatives in 2035 would provide for slightly higher average travel speeds in the project area compared to without the project. The relationship between travel speed and MSAT emission rates has not been well established, but for the criteria air pollutants, lower travel speeds generally result in higher emissions. If it is assumed that the average travel speed is not a factor, then on the basis of VMT alone, the expected slightly higher VMT in 2035 with the project would result in slightly higher MSAT emissions compared to the without project alternative.

Regardless of the alternative chosen, emissions would likely be lower than present levels in the design year as a result of EPA's national control programs that are projected to reduce MSAT emissions by over 80 percent between 2010 and 2050. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in virtually all locations.

In sum, with the project in the design year, it is estimated that MSAT emissions in the immediate area of the project would increase slightly relative to the without-project alternative due to the fact that the project is expected to cause a small increase in the VMT. In comparing the project alternatives, MSAT levels could potentially be higher in some specific locations than others, but current tools and science are not adequate to quantify them. However, on a regional basis, EPA's vehicle and fuel regulations, coupled with fleet turnover, would over time cause substantial reductions that, in almost all cases, would cause region-wide MSAT levels to be significantly lower than today.

8.0 CONCLUSIONS AND RECOMMENDATIONS

Existing Conditions

Relatively little ambient air quality data are available to characterize existing conditions in the project area, but there are only few sources of air pollution emissions. Distant volcanic emissions (vog) likely cause elevated levels of fine particulate matter at times, however, it is likely that all state and federal ambient air quality standards are currently being met in the project area.

Short-Term Impacts and Mitigation

The major potential short-term impact of the project on air quality will occur from the emission of fugitive dust during construction. Uncontrolled fugitive dust emissions from construction activities are estimated to amount to about 1.2 tons per acre per month, depending on rainfall and other factors. To control dust, active work areas and any temporary unpaved work roads should be watered at least twice daily on days without rainfall. Use of wind screens and/or limiting the area that is disturbed at any given time will also help to contain fugitive dust emissions. Wind erosion of inactive areas of the project that have been disturbed could be controlled by mulching or chemical stabilization. Dirt-hauling trucks should be covered when traveling on roadways to prevent windage. A routine road cleaning and/or tire washing program will also help to reduce fugitive dust emissions that may occur as a result of trucks tracking dirt onto paved roadways in the project area. Establishment of landscaping early in the construction schedule will also help to control dust.

During construction phases, emissions from engine exhausts (primarily consisting of carbon monoxide and nitrogen oxides) will also occur both from on-site construction equipment and from the disruption of normal traffic flow. Increased vehicular emissions due to the disruption of traffic can be alleviated by minimizing road closures during peak traffic hours.

Long-Term Mesoscale Impacts

With or without the project by the year 2035, emissions of carbon monoxide, nitrogen oxides and volatile organic compounds within the study area would likely be substantially less than the existing-year emission rates. Without the project by the year 2035, mesoscale analysis indicates that emissions of carbon monoxide from motor vehicles operating within the project study area would decrease slightly compared to existing emissions while nitrogen oxides and volatile organic compounds emissions would decrease would decrease substantially. With Alternatives 4, 5 or 6, additional emission reductions would likely occur due to the improved traffic flow provided by the project. Hence, from a mesoscale perspective, any of the three with-project alternatives studied would likely produce a positive air quality impact. Alternative 6 would likely yield the most benefit but with only a slight advantage.

Long-Term Microscale Impacts

Microscale analysis indicates that worst-case carbon monoxide concentrations in the project area are presently in compliance with the state and national standards. With or without the project in the year 2035, worst-case concentrations would likely improve and continue to meet both state and national standards. Analyses of alternatives with the project suggest that these alternatives would either make a small improvement or no change compared to without the project. There is no significant difference amongst the three with-project alternatives considered.

Long-Term MSAT Impacts

The analysis of potential long-term impacts due to mobile source air toxics (MSATs) is primarily a qualitative assessment based on the estimated vehicle miles of travel for each scenario. It is probable that MSAT emissions for any of the future alternatives studied, with or without the project, will be lower than the existing MSAT emissions. This is due to EPA's vehicle and fuel regulations and to normal fleet turnover with time. Based on vehicle miles of travel estimates for the year 2035 for the various project alternatives evaluated, it is estimated that Alternatives 4, 5 or 6 (with the project) would result in a small increase in MSAT emissions compared to without the project.

Long-Term Mitigation

Options available to mitigate long-term, traffic-related air pollution are generally to further improve roadways, to reduce traffic and/or to reduce individual vehicular emissions. Aside from providing added roadway improvements, air pollution impacts from vehicular emissions could conceivably be additionally mitigated by reducing traffic volumes through the promotion of bus service and car pooling in the project area and/or by adjusting local school and business hours to begin and end during off-peak times. This mitigation measure is generally considered only partially successful. Reduction of emissions from individual vehicles would have to be achieved through the promulgation of local, state or federal air pollution control regulations. For example, Hawaii currently does not require annual inspections of motor vehicle air pollution control equipment. However, at the present time there is no indication that the state is contemplating adopting such rules.

From a mesoscale viewpoint, any of the alternatives which include the project would have a net positive impact. Thus, it does not appear that mitigation for long-term impacts is warranted based on the mesoscale analysis of the project.

Mitigation measures to address microscale impacts are similar to those for mesoscale impacts. An additional mitigation measure for microscale impacts might be to provide added buffer zones between walkways and roadways, although technically, the public would have to somehow be excluded from the buffer zones. The predicted worst-case concentrations in this report are based on a separation distance of 3 m (10 ft) between walkways and roadways. Doubling this distance to about 6 m (20 ft) would reduce maximum concentrations by about 10 to 15 percent.

The analysis of microscale impacts indicates that any of the with-project alternatives would result in either slightly improved air quality or no change compared to the without-project scenario, and worst-case concentrations of carbon monoxide with the project would be well within the state and national standards in the design year. Thus, mitigation of air quality impacts based on the microscale analysis does not appear to be warranted.

The analysis of MSAT impacts suggests that alternatives with the project could result in a small increase in MSAT emissions compared to without the project but that emissions with or without the project in the design year can be expected to be lower than present emissions. Thus, mitigation based on the MSAT impact analysis does not appear to be warranted.

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9. "Persistence Factors for Mobile Source (Roadway) Carbon Monoxide Modeling", C. David Cooper, Journal of the Air & Waste Management Association, Volume 39, Number 5, May 1989.

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Figure 1

PROJECT LOCATION

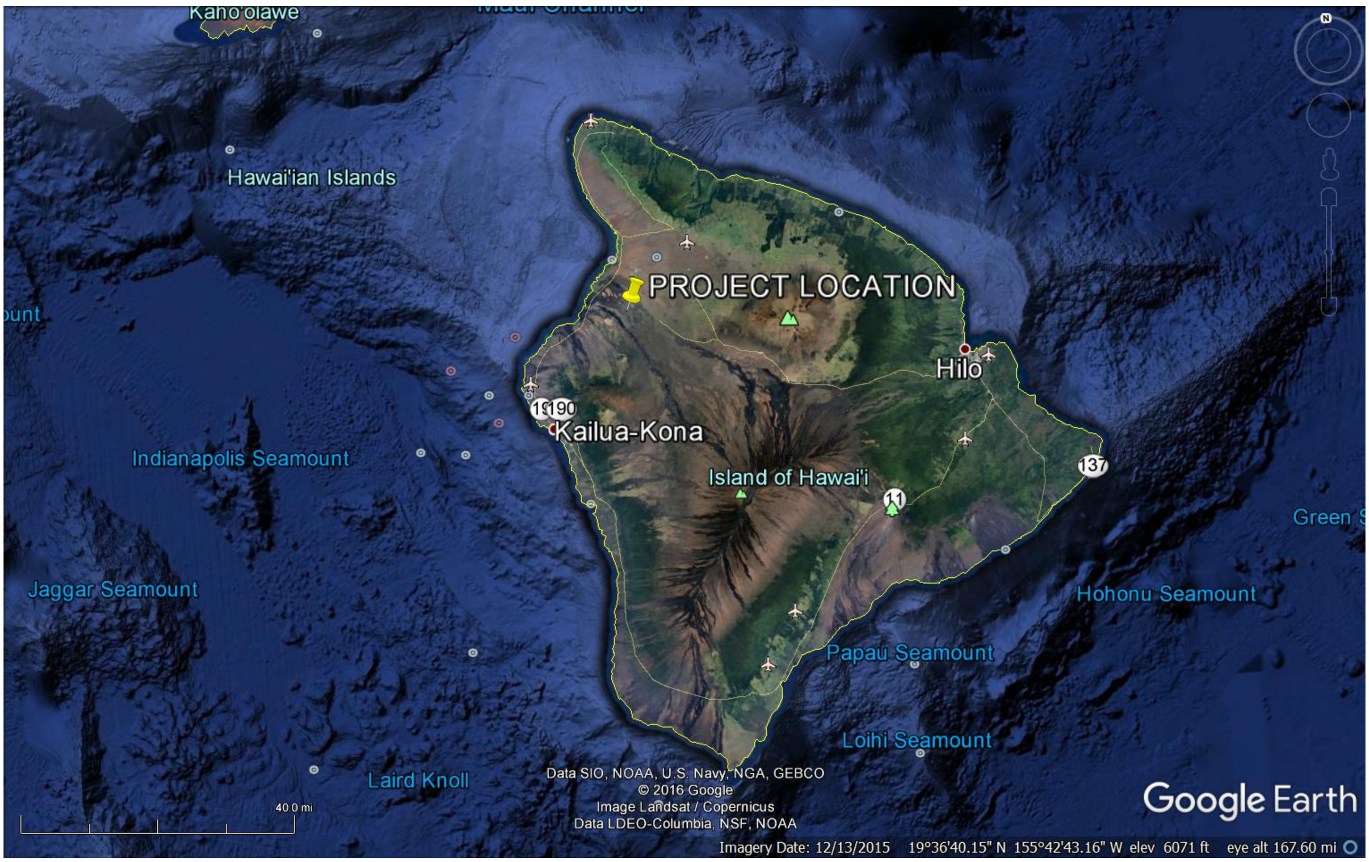

Table 1

SUMMARY OF STATE OF HAWAII AND NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Units	Averaging Time	Maximum Allowable Concentration		
			National Primary	National Secondary	State of Hawaii
Particulate Matter (<10 microns)	μg/m³	Annual	–	–	50
		24 Hours	150[a]	150[a]	150[b]
Particulate Matter (<2.5 microns)	μg/m³	Annual	12[c]	15[c]	–
		24 Hours	35[d]	35[d]	–
Sulfur Dioxide	ppm	Annual	–	–	0.03
		24 Hours	–	–	0.14[b]
		3 Hours	–	0.5[b]	0.5[b]
		1 Hour	0.075[e]	–	–
Nitrogen Dioxide	ppm	Annual	0.053	0.053	0.04
		1 Hour	0.100[f]	–	–
Carbon Monoxide	ppm	8 Hours	9[b]	–	4.4[b]
		1 Hour	35[b]	–	9[b]
Ozone	ppm	8 Hours	0.070[g]	0.070[g]	0.08[g]
Lead	μg/m³	3 Months	0.15[h]	0.15[h]	–
		Quarter	1.5[i]	1.5[i]	1.5[i]
Hydrogen Sulfide	ppm	1 Hour	–	–	0.025[b]

[a] Not to be exceeded more than once per year on average over three years.
[b] Not to be exceeded more than once per year.
[c] Three-year average of the weighted annual arithmetic mean.
[d] 98th percentile value of the 24-hour concentrations averaged over three years.
[e] Three-year average of annual fourth-highest daily 1-hour maximum.
[f] 98th percentile value of the daily 1-hour maximum averaged over three years.
[g] Three-year average of annual fourth-highest daily 8-hour maximum.
[h] Rolling 3-month average.
[i] Quarterly average.

Table 2

AIR POLLUTION EMISSIONS INVENTORY FOR ISLAND OF HAWAII, 1993

Air Pollutant	Point Sources (tons/year)	Area Sources (tons/year)	Total (tons/year)
Particulate	30,311	9,157	39,468
Sulfur Oxides	9,345	nil	9,345
Nitrogen Oxides	4,054	8,858	12,912
Carbon Monoxide	3,357	23,934	27,291
Hydrocarbons	1,477	203	1,680

Source: Final Report, "Review, Revise and Update of the Hawaii Emissions Inventory Systems for the State of Hawaii", prepared for Hawaii Department of Health by J.L. Shoemaker & Associates, Inc., 1996

Table 3

ANNUAL SUMMARIES OF AIR QUALITY MEASUREMENTS FOR MONITORING STATIONS NEAREST SADDLE ROAD EXTENSION PROJECT

Parameter / Location	2011	2012	2013	2014	2015
Sulfur Dioxide / Kealakekua, Kona					
1-Hour Averaging Period:					
No. of Samples	8367	8273	8618	7390	8394
Highest Concentration (ppm)	0.089	0.106	0.059	0.051	0.053
99TH Percentile Concentration (ppm)	-	-	-	0.035	0.031
2nd Highest Concentration (ppm)	0.055	0.098	0.058	-	-
No. Occurrences Greater than 0.075 ppm	1	2	0	0	0
3-Hour Averaging Period:					
No. of Samples	2709	2672	2787	2538	2681
Highest Concentration (ppm)	0.065	0.089	0.048	0.036	0.049
2nd Highest Concentration (ppm)	0.053	0.079	0.036	0.036	0.028
No. of State AAQS Exceedances	0	0	0	0	0
24-Hour Averaging Period:					
No. of Samples	349	346	365	333	354
Highest Concentration (ppm)	0.019	0.030	0.017	0.015	0.017
2nd Highest Concentration (ppm)	0.018	0.030	0.016	0.011	0.010
No. of State AAQS Exceedances	0	0	0	0	0
Annual Average Concentration (ppm)	0.003	0.005	0.005	0.003	0.003
Particulate (PM-2.5) / Kealakekua, Kona					
24-Hour Averaging Period:					
No. of Samples	355	350	356	335	351
Highest Concentration ($\mu g/m^3$)	28	32	29	27	26
98TH Percentile Concentration ($\mu g/m^3$)	21	28	26	18	23
No. Occurrences Greater than 35 $\mu g/m^3$	0	0	0	0	0
Annual Average Concentration ($\mu g/m^3$)	12	16	13	10	12

Source: State of Hawaii Department of Health, "Annual Summaries, Hawaii Air Quality Data, 2011 - 2015"

Table 4

ESTIMATED MESOSCALE EMISSIONS FOR SADDLE ROAD EXTENSION PROJECT - EXISTING CASE

Road Segment	Length (miles)	Average Daily Traffic Volume	Vehicle Miles Per Day	Average Travel Speed (mph)	Emission Factors (grams/veh-mile)			Emissions (lb/day)		
					CO	NOx	VOC	CO	NOx	VOC
(1) Queen Kaahumanu Hwy North of Waikoloa Rd	5.0	10,840	54,200	52	4.10	2.26	0.196	489	270	23
(2) Queen Kaahumanu Hwy Between Waikoloa Rd and Waikoloa Beach Dr	1.1	13,420	14,762	52	4.10	2.26	0.196	133	73	6
(3) Queen Kaahumanu Hwy South of Waikoloa Beach Dr	5.0	12,150	60,750	52	4.10	2.26	0.196	549	302	26
(4) Waikoloa Rd East of Queen Kaahumanu Hwy	2.5	6,700	16,750	42	4.35	2.32	0.218	160	86	8
(5) Waikoloa Rd West of Paniolo Ave	2.5	6,630	16,575	42	4.35	2.32	0.218	159	85	8
(6) Waikoloa Rd East of Paniolo Ave to Mamalahoa Hwy	5.5	3,400	18,700	42	4.35	2.32	0.218	179	96	9
(7) Mamalahoa Hwy North of Waikoloa Rd	5.0	5,060	25,300	52	4.10	2.26	0.196	228	126	11
(8) Mamalahoa Hwy from Waikoloa Rd to DKI Hwy	2.8	3,640	10,192	52	4.10	2.26	0.196	92	51	4
(9) Mamalahoa Hwy South of DKI Hwy	5.0	4,250	21,250	52	4.10	2.26	0.196	192	106	9
(10) DKI Highway East of Mamalahoa Highway	5.0	2,650	13,250	52	4.10	2.26	0.196	120	66	6
Total	39.4	68,740	251,729		Totals (lb/day)			2301	1261	110
					Totals (tons/year)			420	230	20

Table 5

ESTIMATED MESOSCALE EMISSIONS FOR SADDLE ROAD EXTENSION PROJECT – 2035 WITHOUT PROJECT

Road Segment	Length (miles)	Average Daily Traffic Volume	Vehicle Miles Per Day	Average Travel Speed (mph)	Emission Factors (grams/veh-mile)			Emissions (lb/day)		
					CO	NOx	VOC	CO	NOx	VOC
(1) Queen Kaahumanu Hwy North of Waikoloa Rd	5.0	34,150	170,750	48	0.85	0.213	0.013	320	80	5
(2) Queen Kaahumanu Hwy Between Waikoloa Rd and Waikoloa Beach Dr	1.1	28,150	30,965	50	0.85	0.210	0.013	58	14	1
(3) Queen Kaahumanu Hwy South of Waikoloa Beach Dr	5.0	27,150	135,750	50	0.85	0.210	0.013	254	63	4
(4) Waikoloa Rd East of Queen Kaahumanu Hwy	2.5	21,600	54,000	17	1.36	0.323	0.024	162	38	3
(5) Waikoloa Rd West of Paniolo Ave	2.5	18,850	47,125	17	1.36	0.323	0.024	141	34	2
(6) Waikoloa Rd East of Paniolo Ave to Mamalahoa Hwy	5.5	18,950	104,225	17	1.36	0.323	0.024	312	74	6
(7) Mamalahoa Hwy North of Waikoloa Rd	5.0	19,200	96,000	36	0.93	0.226	0.015	197	48	3
(8) Mamalahoa Hwy from Waikoloa Rd to DKI Hwy	2.8	30,950	86,660	21	1.20	0.290	0.021	229	55	4
(9) Mamalahoa Hwy South of DKI Hwy	5.0	21,450	107,250	32	0.98	0.254	0.016	232	60	4
(10) DKI Highway East of Mamalahoa Hwy	5.0	19,400	97,000	36	0.93	0.226	0.015	199	48	3
Total	39.4	239,850	929,725		Totals (lb/day)			2104	514	35
					Totals (tons/year)			384	94	6

Table 6

ESTIMATED MESOSCALE EMISSIONS FOR SADDLE ROAD EXTENSION PROJECT – 2035 ALTERNATIVE 4

Road Segment	Length (miles)	Average Daily Traffic Volume	Vehicle Miles Per Day	Average Travel Speed (mph)	Emission Factors (grams/veh-mile)			Emissions (lb/day)		
					CO	NOx	VOC	CO	NOx	VOC
(1) Queen Kaahumanu Hwy North of Waikoloa Rd	5.0	34,150	170,750	48	0.85	0.213	0.013	320	80	5
(2) Queen Kaahumanu Hwy Between Waikoloa Rd and Waikoloa Beach Dr	1.1	27,950	30,745	50	0.85	0.210	0.013	58	14	1
(3) Queen Kaahumanu Hwy South of Waikoloa Beach Dr	5.0	30,950	154,750	49	0.85	0.211	0.013	290	72	4
(4) Waikoloa Rd East of Queen Kaahumanu Hwy	2.5	11,100	27,750	49	0.85	0.211	0.013	52	13	1
(5) Waikoloa Rd West of Paniolo Ave	2.5	9,750	24,375	40	0.88	0.221	0.014	47	12	1
(6) Waikoloa Rd East of Paniolo Ave to Mamalahoa Hwy	5.5	8,450	46,475	42	0.87	0.219	0.014	89	22	1
(7) Mamalahoa Hwy North of Waikoloa Rd	5.0	19,200	96,000	36	0.93	0.226	0.015	197	48	3
(8) Mamalahoa Hwy from Waikoloa Rd to DKI Hwy	2.8	22,950	64,260	24	1.07	0.273	0.019	151	39	3
(9) Mamalahoa Hwy South of DKI Hwy	5.0	17,650	88,250	40	0.88	0.221	0.014	171	43	3
(10) DKI Highway East of Mamalahoa Hwy	5.0	19,400	97,000	36	0.93	0.226	0.015	199	48	3
(11) Saddle Rd Extension, Mamalahoa Hwy to Queen Kaahumanu	10.0	14,300	143,000	48	0.85	0.213	0.013	268	67	4
Total	49.4	215,850	943,355		Totals (lb/day)			1842	458	29
					Totals (tons/year)			336	84	5

Table 7

ESTIMATED MESOSCALE EMISSIONS FOR SADDLE ROAD EXTENSION PROJECT – 2035 ALTERNATIVE 5

Road Segment	Length (miles)	Average Daily Traffic Volume	Vehicle Miles Per Day	Average Travel Speed (mph)	Emission Factors (grams/veh-mile)			Emissions (lb/day)		
					CO	NOx	VOC	CO	NOx	VOC
(1) Queen Kaahumanu Hwy North of Waikoloa Rd	5.0	34,150	170,750	48	0.85	0.213	0.013	320	80	5
(2) Queen Kaahumanu Hwy Between Waikoloa Rd and Waikoloa Beach Dr	1.1	27,950	30,745	50	0.85	0.210	0.013	58	14	1
(3) Queen Kaahumanu Hwy South of Waikoloa Beach Dr	5.0	30,950	154,750	49	0.85	0.211	0.013	290	72	4
(4) Waikoloa Rd East of Queen Kaahumanu Hwy	2.5	11,000	27,500	39	0.90	0.222	0.014	55	13	1
(5) Waikoloa Rd West of Paniolo Ave	2.5	12,290	30,725	36	0.93	0.226	0.014	63	15	1
(6) Waikoloa Rd East of Paniolo Ave to Mamalahoa Hwy	5.5	5,910	32,505	42	0.87	0.219	0.014	62	16	1
(7) Mamalahoa Hwy North of Waikoloa Rd	5.0	19,200	96,000	36	0.93	0.226	0.015	197	48	3
(8) Mamalahoa Hwy from Waikoloa Rd to DKI Hwy	2.8	20,410	57,148	32	0.98	0.254	0.015	123	32	2
(9) Mamalahoa Hwy South of DKI Hwy	5.0	17,650	88,250	40	0.88	0.221	0.014	171	43	3
(10) DKI Highway East of Mamalahoa Hwy	5.0	19,400	97,000	36	0.93	0.226	0.015	199	48	3
(11) Saddle Rd Extension, Mamalahoa Hwy to Waikoloa Rd	6.0	16,840	101,040	41	0.88	0.220	0.013	196	49	3
(12) Saddle Rd Extension, Waikoloa Rd to Queen Kaahumanu	4.0	14,300	57,200	48	0.85	0.213	0.013	107	27	2
Total	49.4	230,050	943,613		Totals (lb/day)			1841	457	29
					Totals (tons/year)			336	83	5

Table 8

ESTIMATED MESOSCALE EMISSIONS FOR SADDLE ROAD EXTENSION PROJECT - 2035 ALTERNATIVE 6

Road Segment	Length (miles)	Average Daily Traffic Volume	Vehicle Miles Per Day	Average Travel Speed (mph)	Emission Factors (grams/veh-mile)			Emissions (lb/day)		
					CO	NOx	VOC	CO	NOx	VOC
(1) Queen Kaahumanu Hwy North of Waikoloa Rd	5.0	34,150	170,750	48	0.85	0.213	0.013	320	80	5
(2) Queen Kaahumanu Hwy Between Waikoloa Rd and Waikoloa Beach Dr	1.1	21,000	23,100	52	0.84	0.207	0.013	43	11	1
(3) Queen Kaahumanu Hwy South of Waikoloa Beach Dr	5.0	30,950	154,750	49	0.85	0.211	0.013	290	72	4
(4) Waikoloa Rd East of Queen Kaahumanu Hwy	2.5	14,050	35,125	32	0.98	0.254	0.015	76	20	1
(5) Waikoloa Rd West of Paniolo Ave	2.5	12,290	30,725	36	0.93	0.226	0.014	63	15	1
(6) Waikoloa Rd East of Paniolo Ave to Mamalahoa Hwy	5.5	5,910	32,505	42	0.87	0.219	0.014	62	16	1
(7) Mamalahoa Hwy North of Waikoloa Rd	5.0	19,200	96,000	36	0.93	0.226	0.015	197	48	3
(8) Mamalahoa Hwy from Waikoloa Rd to DKI Hwy	2.8	20,410	57,148	32	0.98	0.254	0.015	123	32	2
(9) Mamalahoa Hwy South of DKI Hwy	5.0	17,650	88,250	40	0.88	0.221	0.014	171	43	3
(10) DKI Highway East of Mamalahoa Hwy	5.0	19,400	97,000	36	0.93	0.226	0.015	199	48	3
(11) Saddle Rd Extension, Mamalahoa Hwy to Waikoloa Rd	6.0	16,840	101,040	41	0.88	0.220	0.013	196	49	3
(12) Saddle Rd Extension, Waikoloa Rd to Queen Kaahumanu	4.0	11,350	45,400	50	0.85	0.210	0.013	85	21	1
Total	49.4	223,200	931,793		Totals (lb/day)			1825	455	28
					Totals (tons/year)			333	83	5

Table 9

ESTIMATED WORST-CASE 1-HOUR CARBON MONOXIDE CONCENTRATIONS NEAR INTERSECTIONS INCLUDED WITHIN SADDLE ROAD EXTENSION PROJECT (parts per million)

Roadway Intersection	Year/Scenario									
	Present		2035 Without Project		2035 Alternative 4		2035 Alternative 5		2035 Alternative 6	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
DKI Highway at Mamalahoa Highway	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7
Mamalahoa Highway at Waikoloa Road	0.8	0.8	0.8	0.8	0.7	0.8	0.7	0.7	0.7	0.7
Waikoloa Road at Paniolo Avenue	1.3	1.1	0.7	0.7	0.7	0.6	0.7	0.6	0.7	0.6
Waikoloa Road at Queen Kaahumanu Hwy	1.2	1.4	0.8	0.9	0.8	0.8	0.8	0.8	0.8	0.8
Queen Kaahumanu Hwy at Waikoloa Beach Drive	1.2	1.3	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8

Hawaii State AAQS: 9 National AAQS: 35

Table 10

ESTIMATED WORST-CASE 8-HOUR CARBON MONOXIDE CONCENTRATIONS NEAR INTERSECTIONS INCLUDED WITHIN SADDLE ROAD EXTENSION PROJECT (parts per million)

Roadway Intersection	Year/Scenario				
	Present	2035 Without Project	2035 Alternative 4	2035 Alternative 5	2035 Alternative 6
DKI Highway at Mamalahoa Highway	0.4	0.4	0.4	0.4	0.4
Mamalahoa Highway at Waikoloa Road	0.4	0.4	0.4	0.4	0.4
Waikoloa Road at Paniolo Avenue	0.6	0.4	0.4	0.4	0.4
Waikoloa Road at Queen Kaahumanu Hwy	0.7	0.4	0.4	0.4	0.4
Queen Kaahumanu Hwy at Waikoloa Beach Drive	0.6	0.4	0.4	0.4	0.4

Hawaii State AAQS: 4.4 National AAQS: 9

SADDLE ROAD EXTENSION
SOUTH KOHALA, HAWAI‘I

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Appendix J
Summary of Avoidance, Minimization and/or Mitigation Measures

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ACCESS TO EXISTING LAND USES

1. Construction contract conditions will require access to properties and public use and recreation areas to be available at all times during construction, although temporary interruptions will be allowed.
2. If Alternative 4 is selected, FHWA and HDOT will coordinate with the DLNR to determine access points that could be used to promote hunting access in the Puʻuanahulu Game Management Area.

FARMLAND AND RANCHING

HDOT will be responsible for the following actions for all affected grazing land:

1. Provide funding for temporary relocation of cattle during construction, if determined to be necessary during coordination with land managers and ranchers.
2. Construct (non-barbed wire) fencing along the right-of-way of the highway for access control and cattle control, and be responsible to maintain the fence.
3. Provide for access on both sides of the highway to properties used for grazing that are divided by the highway.
4. Re-fence existing paddocks and corrals.
5. Right-of-way will be acquired in conformance with the Uniform Relocation and Real Property Acquisition Policies Act of 1970. (Cross-reference Section 3.4.2)

EFFECTS TO LOCAL BUSINESSES

1. FHWA and HDOT will work with the County of Hawaiʻi and Waikoloa Village merchants to install standard signage on the Saddle Road Extension indicating the availability of goods and services in Waikoloa.

PUBLIC FACILITIES AND UTILITIES

1. HDOT will work with Hawaiʻi Electric Light, Hawaiian Telcom, Sandwich Isles Communications and Oceanic Time Warner Cable to perform utility relocations, including excavation and pole relocation, to ensure appropriate clearances and a minimum of disruption to electrical transmission and other utility services. Special Contract Requirements would specify that the contractor shall schedule construction so as to minimize the length of time utility customers are inconvenienced.
2. During construction, emergency spill treatment, storage, and disposal of all hazardous materials, both within construction limits and at staging areas will be handled in accordance with the most recent version of FHWA's *Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects*.

TRAFFIC, CONSTRUCTION-PHASE

1. Temporary traffic control plans will be developed and implemented to keep all project area highways and roads open to road users. Two-way travel will be accommodated on the existing road or temporary roadways during construction to the greatest degree practical. Construction activities may periodically necessitate restricting the road to one lane of travel. In such cases, road use will be maintained by implementing an alternate one-way movement of travel through the construction area. Provisions will be made for this alternate one-way movement using such methods as flagger control, a flag transfer, a pilot car, or traffic control signals. Provisions will be made to restrict these alternate one-lane closures to a period of no more than several hours; no full, 24-hour alternate one-way movement would be implemented.
2. Full closure of Māmalahoa Highway may be needed for a very limited number of construction activities if a grade-separated design option is selected. Provisions will be made to restrict these full closures to when road use is minimal. Provisions will also be made to restrict these full closures to a period of several hours, and no full, 24-hour closures are proposed. The public will be notified well in advance of all closures. Emergency and incident responders will be allowed access through the construction area at all times.
3. The project is located in a rural setting and there are limited bicycle and pedestrian facilities through the project area. The existing bicyclist usage is minimal, consisting of occasional touring and recreational cyclists, and pedestrian use is almost non-existent. Standard traffic control practices described in the Manual of Uniform Traffic Control Devices (MUTCD) would be proposed to accommodate bicyclists. Bicyclists will share the road and ride through the construction zone without impeding traffic, similar to the current conditions. Provisions to aid in lowering vehicular speeds through the construction zone would be implemented. The existing posted speed limit of 55 MPH is proposed to be lowered in 10 MPH increments through the construction zone (to a posted 25 MPH speed limit in areas of active construction). Bicyclists' needs will be met by maintaining a paved surface where feasible and removing temporary signs, debris, and other obstructions from the edge of the road after each day's work.

TRAFFIC, OPERATIONAL (POST-CONSTRUCTION)

If a Build Alternative is selected, the following intersection improvements have been incorporated into the design to assist in reducing congestion:

1. Channelize turn movements at the Māmalahoa Highway/SRX/DKI Highway intersection through striping;
2. Implement double left-turn lanes both northbound and southbound Queen Ka‘ahumanu Highway at both the Waikoloa Road and Waikoloa Beach Road/SRX intersections;
3. Implement double left-turn lanes on the Waikoloa Road, SRX, and Waikoloa Beach Drive approaches to Queen Ka‘ahumanu Highway;
4. Build a grade-separated intersection or signalize an at-grade intersection on Māmalahoa Highway at DKI Highway/SRX

5. If Design Option 1 is selected (at-grade intersection), and either Alternative 5 or 6 is selected, provide two lanes in each direction for through traffic movements on the DKI Highway/SRX movement. After the intersection, the SRX and DKI Highways will be transitioned back to one lane in each direction away from this intersection.
6. If Alternative 5 or 6 is selected, signalize the connector intersections of Waikoloa Road/SRX at the time when traffic signal warrants are satisfied.

RIGHT-OF-WAY AND RELOCATION

1. The acquisition of property necessitated by the Project would be conducted in accordance with Federal Uniform Relocation and Real Property Acquisition Policies Act of 1970 (P.L. 91-646), as amended, and applicable State regulations.

BICYCLE USE, OPERATIONAL (POST-CONSTRUCTION)

After construction, the Project design itself provides for a highway with a widened shoulder and rumble strips to connect Queen Kaʻahumanu Highway and the Daniel K. Inouye Highway, which substantially improves existing conditions. The following mitigation will be implemented:

1. Signage will be emplaced indicating a signed, shared bicycle route.
2. Project construction will include provisions for safe pedestrian and bicycle crossings of affected roadways during construction periods.

CLIMATE AND AIR QUALITY

1. Standard dust control and construction equipment emission control measures will be implemented as necessary to reduce temporary impacts to air quality during construction activities. Water or a dust palliative will be applied as necessary to minimize particulate pollution. Areas to receive such treatment will include unpaved access roads, staging sites, and construction areas where the movement and operation of construction equipment produces airborne dust. Up to 40,000 MGals of water may be used for dust control, earthwork compaction, and irrigation. This could require up to 5,000 truck trips, or 10 trucks per work day each way, depending on the hauling capacity of the equipment used. Water would be obtained from a contractor-selected source, most likely in Waimea due to its close proximity to the Project. Water will be hauled via a temporary construction access road pioneered along the new alignment and connecting to SR 190 at the Daniel K. Inouye Highway junction.
2. Construction activities will incorporate fugitive dust emission control measures in compliance with provisions of HAR Chapter 11-60.1, "Air Pollution Control," Section 11-60.1-33 on Fugitive Dust. Measures that are expected to be used to control airborne emissions include the following:
    - Use water, disturbance area limitations, and re-vegetation to minimize dust emissions.
    - Stabilize all disturbed areas with erosion control measures.
    - Cover open-bodied trucks and trailers whenever hauling material that can be blown away.

- Revegetate disturbed area as soon as practical after construction.
- Stabilize construction entrances to avoid offsite tracking of sediment.
- Maintain equipment in working order.
- Construction equipment will be required to meet all applicable emission standards.

3. Construction equipment will be required to meet all applicable emission standards. Emission impacts will be minimized by requiring the Contractor to use vehicles that are properly maintained.

NOISE

1. A Community Noise Permit will be obtained from HDOH under HAR Chapter 11-46, Community Noise Control. For HDOH to issue a noise permit, the application would describe construction activities for the Project and the specific permit restrictions required for construction projects, including the following:
   A. No permit shall allow construction activities creating excessive noise (as defined by the applicable noise district) before 7 am and after 6 pm of the same day.
   B. No permit shall allow construction activities that emit noise in excess of 95 dBA except between 9 am and 5:30 pm of the same day.
   C. No permit shall allow construction activities that exceed the allowable noise levels on Sundays and on certain holidays. Pile driving and other activities exceeding 95 dBA would be prohibited on Saturdays.
2. The HDOH noise permit generally does not limit the noise level generated at the construction site, but rather the times at which high-volume construction can take place. Before issuing the permit, HDOH may require noise mitigation to be incorporated into construction plans; for example, maintenance and proper muffling of construction equipment and onsite vehicles that exhaust gas or air. HDOH may also require the Contractor to conduct noise monitoring. In addition to the noise permit, a noise variance may be requested from HDOH for specific occasions when work hours need to be extended into the evenings and/or on weekends to implement the overall construction schedule.
3. In addition, the following construction noise mitigation measures will be implemented:
   A. In the event that a contractor applies for and is allowed a noise variance to work during the normal curfew periods, the use of heavy excavation or rock breaking equipment will not be allowed.
   B. Heavy truck and equipment staging areas will also be located in areas that are as far from noise sensitive properties as feasible, on or as close as possible to the actual construction area.
   C. The contractor will be required to identify and select truck routes that avoid residential communities to the extent feasible.

GEOLOGY

1. Contractors will be supplied with maps identifying general areas where lava tube caves are known to exist;
2. In case a previously undetected lava tube is breached during construction, the Hawai‘i State Department of Transportation (HDOT) will implement a contingency plan in coordination with the State Historic Preservation Division (SHPD):
   A. If a previously undetected lava tube cave is encountered, all construction with the potential to impact the lava tube will immediately cease;
   B. The appropriate personnel at the State Department of Transportation, Highways Division, will be contacted;
   C. These personnel will contact SHPD, the U.S. Geological Survey and the U.S. Fish and Wildlife Service to determine whether historic sites or burials are present, and whether the lava tube cave has special geological, biological or other value that merits investigation and data collection; and
   D. Organizations with an interest in lava tube caves will also be consulted.
3. Depending on the context and resources associated with the cave, several alternative courses of action may be pursued:
   A. If burials or historic sites are present, the mitigation directed by the SHPD and Hawai‘i Island Burial Council will be followed, in accordance with Chapter 6E, HRS, Section 106 of the National Historic Preservation Act, P.L. 101-85, and P.L. 101-601. In addition, if the historic sites are determined to be important for preservation in place, Section 4(f) will be triggered (see Section 5 for explanation). All work on that portion of the Project will cease while the State evaluates measures to avoid the significant site.
   B. If no historic sites are present, the disposition of the cave will be as follows:
      I. If appropriate and feasible, the cave will be disturbed as little as possible and left as-is.
      II. If the cave poses a structural hazard to the road or related features, appropriate actions will be taken to produce a structurally sound surface for construction, such as collapse, bridging, structural modification, or some combination of these.
4. Construction specifications will be incorporated to minimize potential hazards of caves to construction workers.

WATER RESOURCES

1. The FHWA and HDOT will require the contractor to obtain NPDES and County grading permits that will involve preparation of a Stormwater Pollution Prevention Plan (SWPPP). As the permit application and accompanying site-specific SWPPP has not yet been developed, the following is a list of potential BMPs that may be included:
   A. Practices that prevent erosion, including the stabilization of cut and fill slopes by vegetative as well as non-vegetative means.
   B. Practices that trap pollutants before they can be discharged, such as silt fences and sedimentation basins.
   C. Practices that prevent the mixing of pollutants from construction materials and stormwater, such as providing protected storage for chemicals, paints solvents, and other toxic materials.

D. During construction, erosion will be minimized by applying temporary measures that will reduce the velocity of the runoff and retain sediment on-site. Examples of these measures include but are not limited to: silt fences, check dams, mulching, culvert outlet protection, and sedimentation basins. Construction materials will be stored in a protected area with measures in place to contain and clean-up spills.

E. Permanent pollution control measures will be applied to minimize degradation of stormwater quality after construction of the road has been completed. These measures include but are not limited to the following: velocity reducers and/or settlement basins at culvert outlets; vegetating slopes; minimizing the steepness of slopes where possible; providing drainage gully bank stabilization where required; and managing the use of chemicals for roadway maintenance.

F. Cut slopes will be revegetated to reduce highway runoff pollution.

G. If a major hazardous spill occurs, cleanup efforts will be coordinated through both the County of Hawaiʻi Civil Defense Agency and the State of Hawaiʻi DOH.

DRAINAGE

1. The 50-year design storm will serve as the basis of culvert design for the Saddle Road Extension. Based on preliminary engineering, a total of 37 drainage structures will be required. The main drainage structures that would be used to pass these flows are single or multiple circular or box culverts of reinforced concrete. Most culverts would be several feet in diameter, with an expected maximum size of 12 by 8 feet at one drainage. Although bridges are currently not anticipated to be needed, if required, the 100-year design storm would be used for bridge design, in accordance with the HDOT's Design Criteria for Highway Drainage. Drainage structures will be provided at all drainage crossings to prevent water from flowing over the roadway during major storm events. The structures will be designed to accommodate the drainage without increasing existing flood elevations or altering existing drainage patterns. The design improvements proposed will serve to better protect the road base and surface from flood drainage and associated damage, and will decrease the likelihood that flood waters would overtop and inundate the roadway in the future.

BOTANICAL RESOURCES AND WILDFIRE

Native Plant Species

1. If t Alternative 5 or 6 is selected for construction, and the one *wiliwili* tree located within Segment 5/6 is still alive prior to construction, FHWA and HDOT will work with a local conservation group to relocate the tree, if practical and reasonable.

Invasive Plant Species

2. Temporarily disturbed areas would be revegetated as part of the Project, and the spread of noxious weeds would be managed through the implementation of BMPs as part of the project.

3. To minimize the risk of construction equipment bringing invasive weed seeds or viable vegetative matter onto the construction site the contractor shall be required to:
   A. Thoroughly wash or steam clean all construction equipment before it is brought onto the construction site. If construction equipment is moved away from the site, it shall be re-cleaned prior to being allowed back on the construction site.
   B. Restrict all construction equipment to within the clearly defined ROW, and/or within previously identified and biologically cleared equipment and materials staging areas. No equipment will be stored, parked or take short cuts through any other area within the general construction area.
   C. Certified weed free permanent and temporary erosion control measures to minimize erosion and sedimentation during and after construction according to the contract erosion control plan, contract permits, FP Section 107, FP Section 157 and SCR Section 157 will be provided.
   D. Have qualified biologists conduct quarterly surveys during the duration of the construction of the roadway of the disturbance corridor, the storage and lay down areas and any stockpiled aggregate for invasive alien weed species, any such species found shall be physically removed and/or poisoned with a suitable herbicide. Any such green waste shall be disposed of appropriately.
4. Following build-out of the highway, HDOT shall make arrangements to have qualified personnel from the Department of Land and Natural Resources or Department of Agriculture, or other qualified personnel, monitor the roadway annually. Individuals and populations of introduced plants new to the region will be eradicated, if practical. This annual survey could be done in conjunction with the periodic surveys of fuel conditions recommended for wildfire control.

Wildfire

5. Engineering design measures being incorporated into the Project's Typical Roadway Section (see Figure 2.5) will minimize the unintended fire ignition risk posed by vehicular traffic and improve the highway's function as a firebreak and fuel break. These design elements will provide between a 40 and 52-foot wide paved wildfire fuel break and firebreak. Specific design and construction features that will accomplish these goals are:
   A. Two paved 12-foot travel lanes
   B. A third paved climbing lane in the uphill direction
   C. Two paved 8-foot paved shoulders
   D. Graded clear zones of varying width outside the shoulders
   E. Installation of high fire risk signs along the highway
6. Where existing fenced cattle pastures are present, the Project will include constructing fences along the right-of-way of the highway for access control and cattle control, with HDOT being responsible to maintain the fence. This will also prevent vehicles from accessing grassy or brushy areas and causing fires.
7. In addition, to minimize the risk of wildfire during construction, the Special Contract Requirements will include but not be limited to the following specific requirements and prohibitions:

A. The contractor will develop a wildfire prevention and response plan that will be approved by FHWA and HDOT prior to the initiation of any construction.
B. All construction activity shall be restricted to within the clearly delineated ROW and that entry and exit into the ROW by all construction personnel and equipment shall be at previously identified and marked non-sensitive areas. The area beyond the construction limits will not be disturbed. Trees, shrubs or vegetated areas temporarily damaged by construction operations will be re-vegetated.
C. All construction equipment will be restricted to within the clearly defined ROW, and/or within previously identified and biologically cleared equipment and materials staging areas. Clearing and grubbing will be held to a minimum.
D. All construction vehicles will be required to carry fire extinguishers at all times.
E. No smoking will only be allowed by any personnel on the construction site.
F. No cooking with open fires, barbecues, hibachis, etc., will be permitted with the construction site.
G. During the course of construction of the road, the contractor will be required to ensure that quarterly weed surveys are conducted within all areas that have been disturbed. Weed clusters that pose a fire risk within the project limits, especially fountain and buffel grass, will be treated with herbicide and/or physically removed to reduce the risk that construction activity could ignite a wildfire.

8. Following build-out of the highway, annual field surveys will be conducted to ensure that fuel loads are not building up to a dangerous level. If fuel loads are found to be large, the potential threat will be controlled by mowing, herbicide and/or physical removal to reduce the threat of unintentional ignition of a wildfire.

Other Special Provisions to Protect Botanical Resources

9. The servicing and maintenance of heavy construction equipment will generate quantities of used oils, lubricants and hydraulic fluids. If improperly disposed of on site, these pose significant threats to the biological environment. All equipment, material and support structures shall be stored and maintained either within the clearly defined ROW, and/or within previously identified and biologically cleared equipment and materials staging areas. No equipment will be stored, parked or take short cuts through any other area within the general construction area.
10. Emergency spills treatment, storage and disposal of all petroleum, oils and lubricants both within the construction limits and at staging areas will be handled in strict accordance with FHWA 2014 (FP-14) “Specifications for Construction of Roads and Bridges on Federal Highways Projects” as well as Federal Acquisition Regulations and the appropriate Environmental Protection Agency (EPA) regulations. FHWA will require the contractor to prepare a Spill Prevention, Control, and Countermeasure (SPCC) Plan at least 2 days before beginning work.
11. Any spill of petroleum products, hazardous materials, or other chemical or biological products released from stationary sources or construction, fleet, or other support vehicles shall be properly cleaned, mitigated, and remedied, if necessary. Any spill of petroleum products or a hazardous material shall be reported to the appropriate federal, state, and local authorities, if the spill is a reportable quantity. Response shall occur in accordance with federal, state, and local regulations.

12. In general, when gasoline, diesel fuel, antifreeze, hydraulic fluid or any other chemical contained within the vehicle is released to the pavement or the ground, proper, corrective, clean-up and safety actions specified in the SPCC and SWPPP will be immediately implemented. All vehicles with load rating of two tons or greater will carry, at minimum, enough absorbent materials to effectively immobilize the total volume of fluids contained within the vehicle.
13. Leaks will be repaired immediately on discovery. Equipment that leaks will not be used. Oil pans and absorbent material will be in place prior to beginning repair work. The contractor will be required to provide the "on-scene" capability of catching and absorbing leaks or spillage of petroleum products including antifreeze from breakdowns or repair actions with approved absorbent materials. A supply of acceptable absorbent materials at the job site in the event of spills, as defined in the SWPPP will be available. Sand and soil are not approved absorbent materials. Soils contaminated with fluids will be removed, placed in appropriate safety containers, and disposed of according to state and/or federal regulations.

FAUNA

General

1. Construction will be preceded by implementation of an Endangered Species Awareness Training program. This training will be given to all construction workers and managers working on highway construction. In the training module construction crews will become familiar with the appearance, general habits and behavior of the listed species they may encounter. Training will also cover specific restrictions that workers must follow when encountering any of these species to ensure that their activities do not result in harmful impacts to the listed species. It will detail emergency response protocols and reporting procedures that will be followed in the event of an injury or death of a listed species.

Hawaiian Hoary Bat

2. Any fences that may be erected or replaced as part of the Project will have barbless wire to prevent entanglements of the Hawaiian hoary bat on barbed wire.
3. Very few tall trees or shrubs are present in the project corridors. However, no trees or shrubs taller than 15 feet will be trimmed or removed as a part of the Project between June 1 and September 15, when juvenile bats that are not yet capable of flying may be roosting in the trees.

Nēnē

4. The listed species that construction workers are most likely to encounter during highway construction is the *nēnē*, which may be drawn to the activity, water, and possibly human food and garbage. The Endangered Species Awareness training module will focus especially on this species. Specific restrictions that will be followed during the construction phase of the Project include:
   A. No pets on the construction site;

B. Police all human food scraps, soda cans and any other food stuffs into covered garbage containers to reduce predators being attracted to the area and *nēnē* eating human food;
C. Do not feed or pet *nēnē* or any other wild animals; and
D. Report all *nēnē* seen immediately to a supervisor.

1. If a nesting pair of *nēnē* are encountered, work shall stop within 100 feet of the birds or nest and will not resume until consultation with the USFWS and/or DOFAW has been concluded and all conditions imposed by the regulatory agencies have been fulfilled.
2. If temporary irrigation is utilized, irrigation must be removed 90 days prior to the opening of the highway to deter foraging in revegetated areas.
3. After the highway is in operation, HDOT personnel will monitor the route. It is conceivable that *nēnē* may be attracted to the roadside somewhere along the route. *Nēnē* may be seen browsing, or crossing the road in a specific area repeatedly. If this activity persists, additional roadside fencing will be erected to discourage birds from occupying the highway margins and being at risk from vehicles.

Threatened and Endangered Seabirds

8. Construction activity will be restricted to daylight hours during the peak fallout period for Hawaiian Petrels, Newell's Shearwaters and Band-rumped Storm-Petrels (September 15–December 15) to avoid the use of nighttime lighting that could attract seabirds. Dark sky procedures will be used outside the peak fallout period in the unlikely event that night work is required.
9. All streetlights installed as part of this project will be full cut-off, down-pointed fixtures adhering to the "Dark Skies Initiative". This minimization measure is credited with reducing the potential for collisions of nocturnally flying Hawaiian Petrels and Newell's Shearwaters with external lights and man-made structures (Reed et al. 1985, Telfer et al. 1987). This minimization measure would minimize the threat of disorientation and downing of seabirds and also fully comply with the Hawaiʻi County Code § 14-50 et seq., which requires the shielding of exterior lights in order to lower the ambient glare for the astronomical observatories located on Mauna Kea.

Blackburn's Sphinx Moth (BSM)

10. The FHWA shall minimize the potential for harassment, harm, or mortality of BSM within the action area. This minimization will be achieved by taking all reasonable measures to constrain disturbance of BSM to the minimum needed to accomplish the proposed action.
11. To ensure that clearing and grubbing activities do not result in harm to Blackburn's sphinx moth, the project corridor for the Selected Alternative will be inspected for tree tobacco by a qualified biologist prior to the onset of construction, at a time approved by the USFWS. The current general guidelines are that searches should be conducted between 30 and 45 days after the start of heavy spring rains. Any tree tobacco plants found will be searched for eggs, larvae and adult moths. If found, trees will be flagged and a 33-foot radius buffer will be established around the tree.

12. Mitigation will follow the USFWS-approved protocols that are in place at that time. Currently, these protocols call for larvae and eggs to be translocated to an area designated by the USFWS and DOFAW. After the moth is translocated, the plant is cut to a few inches above ground and herbicide is applied to the stump, in order to ensure that it will not be utilized again prior to highway construction (a very large number of alternate tree tobacco host plants are present in surrounding areas). Areas cleared of BSM eggs and larvae will be managed by cutting and/or herbicide treatments to ensure that no tree tobacco plants taller than three feet are on the site for the duration of construction activities.
13. Construct and revegetate disturbed areas as soon as possible to avoid re-infestation of tree tobacco to ensure adverse effects to BSM eggs and larvae are avoided.
14. After construction, the right-of-way will be regularly inspected and infestations of weeds removed through mechanical or suitable herbicide methods. Tree tobacco will be removed before it reaches three feet in height to avoid use by the BSM.

ARCHAEOLOGICAL AND HISTORIC RESOURCES

1. Of the 28 total sites within the APE, no further work is recommended for four, because the significant data contained within these sites has been collected in the form of measurements, photographs, descriptions, figures, documentary research, oral interview, and historical research. The appropriate research has been conducted for these sites, and further study would not contribute any new information. Avoidance measures have and will continue to be incorporated into the design of the Project. Consultation with the Hawaiʻi SHPO will continue and any adverse effects to archaeological resources will be mitigated in accordance with an approved data recovery treatment plan and Memorandum of Agreement (MOA) if warranted. FHWA will implement the measures as outlined in a final signed MOA for the Project.

2. In addition, the FHWA will provide a full-time archaeological monitor during clearing, grubbing, and excavation operations on the proposed project.

CULTURAL RESOURCES AND PRACTICES

1. As has occurred previously as part of newly-constructed segments of the Daniel K. Inouye Highway are opened for public use, proper cultural protocol will be completed by a native Hawaiian who follows the ways of the old culture to release and sanctify or bless the construction project.
2. Cultural monitors will be employed during ground disturbing activities as part of construction of the highway. These monitors will complement the efforts of archaeological monitors in assuring that significant cultural resources that may have not been documented during the EIS are recognized and dealt with appropriately. Native Hawaiian Organizations (NHOs) and others in the Hawaiian community will be consulted in the selection and hiring of cultural monitors.
3. As the *moku* boundary is culturally important, it will be marked with signage for entering and exiting travelers. In addition, some of the trails will be marked where the proposed highway crosses them. During final design, FHWA will consider utilizing a distinct road

surface color that will show the pathway. These measures will honor these cultural divisions of space and will educate the public.

4. Despite such mitigation, the disturbance of the cultural landscape is seen by many as almost unmitigable. As suggested by the Hawaiʻi Island Burial Council, FHWA will work with the University of Hawaiʻi at Hilo to provide funding for students to assist in an effort to collect information from the archaeological sites and the cultural landscape prior to construction.

HAZARDOUS MATERIALS AND TOXIC SUBSTANCES

1. If previously unidentified hazardous substances or toxic materials are found during or before Project construction that indicate an existing release, a past release, or a material threat of a release of any hazardous substance or petroleum products into the project corridor of the selected alternative, work will cease at that location and appropriate regulatory or resource personnel will be contacted.
2. In areas where right-of-way is needed outside of that already surveyed, the project area will be further investigated prior to land acquisition and construction to confirm the absence of hazardous substances or toxic materials, if appropriate.

ORDNANCE AND EXPLOSIVES

1. The FHWA and HDOT will consult with the USACE Honolulu District to determine the appropriate actions to reduce potential for the hazard from OE during and after construction of the selected highway route. Ordnance survey and disposal will precede construction activities in areas to be determined as part of the consultation.

SCENIC CHARACTER

1. Final cut and fill slope faces will be made to blend with the surrounding landscape. The natural appearance of the slopes will be improved by rounding the toe and top of slopes, warping, blending the ends of slopes, varying the slope ratios, utilizing staggered ledges, and roughening the face of cut slopes, either by ripping or blasting, where appropriate. (Warping results in a slope face that is not parallel to the roadway. Slope rounding refers to blending the slope into the natural terrain by excavating additional area at the top of the cut slope. Laying back the ends of slopes or blending provides a smooth transition to adjacent cut, fill, or drainage area by flattening the slope ratio at the ends of slopes. Varying slope ratios leaves an irregular, undulating or roughened appearance with staggered ledges rather than a uniform grade. Staggered ledges are benches with varying dimensions and heights on the cut face which do not cross the entire face.) The slope ratios will vary from the top to the bottom of the slope face as well as horizontally along the face, if practicable and feasible.
2. Rock slope surface treatment will be applied to cut slopes in competent rock areas as identified in the geotechnical testing results. These treatments include roughening of the cut face to incorporate short, staggered ledges, minor warping, and other irregularities in the rock that take on a natural appearance.
3. In areas not recommended for revegetation, the top three feet of lava material in disturbed

areas will be stockpiled prior to construction. After construction, the stockpiled material will be used as plating material. The plating material will be placed over slope faces to resemble the adjacent, undisturbed ground surface conditions or used as rip rap material along ledges and outside of ditch backslopes.

4. Intercepted drainages on cut slopes will be cut at the angle to existing joints, planes or rock features, and drainage patterns. These features will be incorporated into the NPDES SWPPP.
5. Where guardrails are needed, natural-appearing guardrail material, such as naturally weathered steel or a material approved by HDOT, will be used to blend more effectively with the surrounding landscape.
6. To reduce contrast and blend more effectively with the surrounding landscape, aesthetic fencing materials will be used, such as naturally weathered metal or steel, or painted or wooded posts, as approved by HDOT.
7. Clearing of trees and large shrubs along an irregular edge adjacent to the recovery zone will be done to create a gradual transition or feathered edge.
8. As determined appropriate during final design, the Project may include informal scenic pullouts, which may include interpretive signage. This will be determined during final design.

ENERGY AND CLIMATE CHANGE

1. Construction contractors will be required to limit idling of diesel on-road vehicles and non-road equipment during construction to no more than five minutes when not in use.
2. Contract specifications will require use of use recycled and/or locally available construction materials to the extent feasible.
3. The project traffic plan would include detours and strategic construction timing (including weekend work) during construction phases to allow the continued movement of traffic through the area and reduce backups to the traveling public to the greatest extent possible.
4. FHWA will ensure that the active construction areas, staging areas, and material transfer sites are established in a way that reduces standing wait times for construction equipment.

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