TRANSPORTATION MANAGEMENT PLAN
H-1 AND H-2 UPGRADE / REPLACEMENT OF DESTINATION SIGNS, PHASE 1

Federal-Aid Project No. IM-0300(75)

February 27, 2012

Prepared for:

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TABLE OF CONTENTS

TABLE OF CONTENTS
Cont'd

TABLE OF CONTENTS
Cont'd

Page

TABLES

TABLE OF CONTENTS
Cont'd

FIGURES

TABLE OF CONTENTS
Cont'd

TABLE OF CONTENTS
Cont'd

TABLE OF CONTENTS
Cont'd

TABLE OF CONTENTS
Cont'd

APPENDICES

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TRANSPORTATION MANAGEMENT PLAN
H-1 AND H-2 UPGRADE/REPLACEMENT
OF DESTINATION SIGNS, PHASE 1
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I. INTRODUCTION

The Transportation Management Plan (TMP) for the H-1 and H-2 Upgrade/Replacement of Destination Signs project is prepared by Austin Tsutsumi & Associates, Inc. for KAI Hawaii. According to criteria in the "Determination of a Significant Highway Project" flow chart, this project is determined to be a Level 3 project. The TMP Determination is included in Appendix A.

II. TRANSPORTATION MANAGEMENT PLAN (TMP) ROLES AND RESPONSIBILITIES

TMP Manager:	To be determined
Author:	Austin, Tsutsumi & Associates, Inc.
Stakeholder Review Committee	To be determined
TMP Monitor:	To be determined
Emergency Contact(s):	To be determined

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III. PROJECT DESCRIPTION

A. Project Background

This project involves the upgrade/replacement of destination signs, support structures and foundations at 20 locations along the H-1 Freeway and Moanalua Freeway on the Island of Oahu. The reason for this project is to bring the signs, support structures, and foundations up to current AASHTO standards.

B. Project Type

This project is a Capital Improvement Program (CIP) project using Federal funds.

C. Project Area/Corridor

The project includes construction at 20 non-contiguous sites on the H-1 Freeway and Moanalua Freeway between Waialae and Waipahu. Each site will include the replacement of existing destination sign(s), support structure, and foundation. The project areas are shown in Figure 1.

D. Project Goals and Constraints

Goals and Objectives

The State of Hawaii, Department of Transportation (HDOT) is upgrading the H-1 Freeway and Moanalua Freeway directional signs, support structures, and foundations up to current AASHTO standards to improve the safety of traffic operations on Oahu's Freeway system. Objectives of this study include:

- Provide the most favorable times for lane closures at each sign location.
- Provide alternate routes during roadway closures.
- Provide travelers with information to aid decision-making in effectively using the freeways and alternative routes.
- Maximize the operational safety of the traveling public while using the freeways.

Constraints

Work at the majority of the sign locations would need to occur at night since day closures would lead to heavy congestion and delays. Work at some sign sites

will involve the complete closure of the roadway. This project is constrained by allotted construction funding; therefore, the project will be constructed in several phases. This report addresses only Phase 1 of the replacement project.

E. Proposed Construction Phasing/Staging

The primary focus of the TMP will be on the planned lane closures of the H-1 Freeway and Moanalua Freeway, ramps and roadways in the vicinity of the work areas.

F. General Schedule and Timeline

Work at the 20 sign locations is anticipated to take approximately 430 calendar days.

IV. EXISTING AND FUTURE CONDITIONS

A. Existing Roadway Characteristics

H-1 Freeway is part of the interstate system that connects West Oahu to East Oahu. The H-1 Freeway is approximately 27.1 miles long beginning in the vicinity of Kapolei at Palailai Interchange and ending in the vicinity of Kahala at the Waialae Interchange. Moanalua Freeway is approximately 4 miles long beginning in the vicinity of the Halawa Interchange and ending in the vicinity of the Middle Street Interchange. The general characteristics of the H-1 Freeway or Moanalua Freeway at each sign location are described below.

- H1WB-402 – Exit 26 Waialae Avenue

  This sign is located on the H-1 Freeway in the vicinity of Hunakai Street. In the vicinity of the sign, the H-1 Freeway is a divided roadway providing three (3) through lanes in the eastbound (Hawaii Kai) direction and three (3) through lanes in the westbound (Waipahu) direction. The posted speed limit is generally 50 miles per hour (mph) in this area. West of the sign is the westbound H-1 Freeway single lane off-ramp to Waialae Avenue. See Figure 2 for the sign location.

- H1WBR-452 – Waialae Avenue

  This sign is located on westbound Waialae Road, East of Ekaha Avenue. In the vicinity of the sign, Waialae Avenue is a divided roadway providing two (2) lanes in the eastbound and two (2) lanes in the westbound direction. The left lane westbound direction is a single lane on-ramp to the H-1 Freeway. The right lane is a westbound lane to Waialae Avenue. The posted speed limit along Waialae Avenue is generally 30 mph. See Figure 3 for the sign location.

- H1WB-407 – Exit 24B University Avenue 1/2 Mile

  This sign is located on the H-1 Freeway in the vicinity of the Old Waialae Road overpass. In the vicinity of the sign, the H-1 Freeway is a divided roadway providing three (3) through lanes in the eastbound direction and three (3) through lanes in the westbound direction. To the east of the sign are single-lane on and off ramps which provide access between the H-1 Freeway and King Street. The respective posted speed limits for the eastbound and westbound directions are 50 mph and 45 mph. See Figure 4 for the sign location.

- H1WB-411- Vineyard Boulevard 1/4, Pali Highway 3/4, School Street 1-1/4

  This sign is located on the H-1 Freeway in the vicinity of Ernest Street. In the vicinity of the sign, the H-1 Freeway is a divided roadway providing three (3) through lanes in the eastbound direction and three (3) through lanes in the westbound direction. West of the sign is the eastbound H-1 Freeway on-ramps from Ward Avenue and Vineyard Boulevard. Also west of the sign is a westbound H-1 Freeway single-lane auxiliary lane on-ramp from Lunalilo Street to the Vineyard Boulevard off-ramp. The posted speed limit is generally 50 mph in this area. See Figure 5 for the sign location.

- H1WBR-453 – 61 North Pali Highway

  This sign is located on the westbound H-1 Freeway off-ramp to Pali Highway. The westbound H-1 Freeway off-ramp to Pali Highway is joined by a single lane from Punchbowl Street to provide a total of two (2) lanes in the westbound direction. Vehicles from Punchbowl Street can merge into the right lane to the Pali Highway or continue to the westbound H-1 Freeway. The posted speed limit is generally 25 mph in this area. See Figure 6 for the sign location.

- H1WB-415 – H-1 West Freeway

  This sign is located at the westbound H-1 Freeway on-ramp gore from Punchbowl Street. The westbound H-1 Freeway off-ramp to the Pali Highway is joined by a single lane from Punchbowl Street to provide a total of two (2) lanes in the westbound direction. Vehicles from Punchbowl Street can merge into the right lane to the Pali Highway or continue to the westbound H-1 Freeway. Vehicles from Punchbowl Street access the H-1 Freeway by means of a single acceleration lane. In the vicinity of the sign, the H-1 Freeway provides three (3) through lanes in the eastbound direction and three (3) through lanes in the westbound direction. The posted speed limit is generally 50 mph in this area. See Figure 7 for the sign location.

- H1WB-416 – Palama Street 1/2, Houghtailing Street 1, Likelike Highway 1–1/2

  This sign is located on the H-1 Freeway in the vicinity of the Aala Street overpass. In the vicinity of the sign, the H-1 Freeway is a divided roadway providing three (3) through lanes and an auxiliary lane from Liliha Street to the Pali Highway in the eastbound direction. Three (3) through lanes are provided in the westbound direction. The posted speed limit is generally 50 mph in this area. See Figure 8 for the sign location.

- H1WB-417 – Exit 20B Houghtailing Street 1/2 Mile, 20C Exit, Palama Street Exit 20 C

  This sign is located on the H-1 Freeway at the westbound H-1 Freeway off-ramp gore to Palama Street. In the vicinity of the sign, the H-1 Freeway is a divided roadway providing three (3) through lanes in the eastbound direction and three (3) through lanes in the westbound direction. In the vicinity of the sign, the westbound H-1 Freeway right through lane provides an additional single lane off-ramp to Palama Street. The posted speed limit for the H-1 Freeway is generally 50 mph in this area. The posted speed limit for the Palama Street off ramp is 25 mph. See Figure 9 for the sign location.

- H1WB-418 – Houghtailing Street 1/4, Likelike Highway 3/4, Middle Street 1-1/4

  This sign is located on the H-1 Freeway in the vicinity of the westbound H-1 Freeway on-ramp gore from Halona Street. In the vicinity of the sign, the H-1 Freeway is a divided roadway with three (3) through lanes in the eastbound direction and three (3) through lanes in the westbound direction. The posted speed limit is generally 50 mph in this area. See Figure 10 for the sign location.

- H1WB-420 – Exit 20A 63 North Likelike Highway Exit Only

  This sign is located east of the westbound H-1 Freeway off-ramp to Likelike Highway. In the vicinity of the sign, the H-1 Freeway is a divided roadway providing three (3) through lanes and an auxiliary lane from Kalihi Street to Vineyard Boulevard in the eastbound direction. Three (3) through lanes and an auxiliary lane from Halona Street to Likelike Highway are provided in the westbound direction. The posted speed limit is generally 50 mph in this area. See Figure 11 for the sign location.

- H1EBR-351 – 63 North Likelike Highway

  This sign is located along Kalihi Street, North of Beckley Street. South of the sign, Kalihi Street provides two (2) northbound lanes. The left lane

continues along Kalihi Street to North Likelike Highway and the right lane continues to the eastbound H-1 Freeway. North of the sign, there is a single southbound lane to Kalihi Street. In the vicinity of the sign, vehicles traveling southbound can enter into a storage lane for northbound Kalihi Street or continue onto southbound Kalihi Street. The posted speed limit is generally 25 mph in this area. See Figure 12 for the sign location.

- 78WB-851 – Exit 4, Fort Shafter, Ahua Street 1/4 Mile

  This sign is located on the Moanalua (H-201) Freeway at the Middle Street Interchange. In the vicinity of the sign, the Moanalua Freeway is a divided roadway providing three (3) through lanes in the eastbound direction and three (3) through lanes in the westbound direction. The posted speed limit is generally 50 mph in this area. See Figure 13 for the sign location.

- H1EB-205 – Exit 15, 92, East Nimitz Highway, West Hickam AFB, Naval Base

  This sign is located on the H-1 Freeway east of the Radford Drive Overpass. In the vicinity of the sign, the eastbound H-1 Freeway provides four (4) through lanes, an additional H-1 Freeway off-ramp lane to Nimitz Highway from the right through lane and an auxiliary lane to Hickam AFB, Naval Base. Five (5) through lanes are provided in the westbound direction. The posted speed limit is generally 55 mph in this area. See Figure 14 for the sign location.

- 78EBR-822 - 99 East Stadium/Pearl Harbor and 78 East H–1 Honolulu

  This sign is located on Kamehameha Highway East of Honomanu Street. Just east of Honomanu Street, Kamehameha Highway is a divided highway providing three (3) through lanes in the eastbound direction and three (3) through lanes in the westbound direction. In the vicinity of the sign, Kamehameha Highway provides access to the Stadium/Pearl Harbor and Moanalua Freeway in the eastbound direction. The eastbound left lane continues to the Stadium/Pearl Harbor and the

eastbound right lane continues to the eastbound Moanalua Freeway. Just west of the Stadium, Pearl Harbor and Honolulu sign, the center lane splits into two (2) lanes, the left to Stadium/Pearl Harbor and the right to Moanalua Freeway. The posted speed limit is generally 35 mph in this area. See Figure 15 for the sign location.

- H1WB-601 – Exit 8A Interstate H2 North Mililani/Wahiawa 1 Mile

  This sign is located on the Pearl City Viaduct west of Kamehameha Highway. In the vicinity of the sign, the H-1 Freeway is a divided roadway providing five (5) through lanes in the eastbound direction and five (5) through lanes in the westbound direction. The posted speed limit is generally 55 mph in this area. See Figure 16 for the sign location.

- H1EB-114 – Exit 10 Pearlridge, Waimalu Next Right

  This sign is located on the Pearl City Viaduct west of Kamehameha Highway. In the vicinity of the sign, the H-1 Freeway is a divided roadway providing five (5) through lanes in the eastbound direction and five (5) through lanes in the westbound direction. The posted speed limit is generally 55 mph in this area. See Figure 17 for the sign location.

- H1EB-113 – Exit 10 Pearlridge, Waimalu 1/2 Mile

  This sign is located on the Pearl City Viaduct east of Lehua Avenue. In the vicinity of the sign, the H-1 Freeway is a divided roadway providing five (5) through lanes in the eastbound direction and five (5) through lanes in the westbound direction. The posted speed limit is generally 55 mph in this area. See Figure 18 for the sign location.

- H1WB-602 – Exit 8B Waipahu 1/2 Mile

  This sign is located on the Pearl City Viaduct east of Lehua Avenue. In the vicinity of the sign, the H-1 Freeway is a divided roadway providing five (5) through lanes in the eastbound direction and five (5) through lanes in the westbound direction. The posted speed limit is generally 55 mph in this area. See Figure 19 for the sign location.

- H1EB-112 – Exit 10 Waimalu, Pearlridge 1 Mile

  This sign is located on the Pearl City Viaduct east of the Ala Ike Street overpass. In the vicinity of the sign, the H-1 Freeway is a divided roadway providing five (5) through lanes in the eastbound direction and five (5) through lanes in the westbound direction. The posted speed limit is generally 55 mph in this area. See Figure 20 for the sign location.

- H1EB-103 – Exit 5, 750, 76 Kunia, Waipahu/Ewa 1 Mile Exit Only

  This sign is located approximately 1 Mile to the west of the eastbound Kunia, Waipahu/Ewa off-ramp. In the vicinity of the sign, the H-1 Freeway is a divided roadway with two (2) through lanes and one (1) right exit only lane to Kunia, Waipahu/Ewa in the eastbound direction. Three (3) through lanes are provided in the westbound direction. The posted speed limit is generally 50 mph in this area. See Figure 21 for the sign location.

B. Existing and Historical Traffic Data

Twenty-four hour freeway traffic count data collected in 2006, 2007, 2008 and 2011 was provided by HDOT which at the closest locations to the sign sites at the following project locations and is summarized in Table 1 below. The highlighted values in Table 1 indicate the direction of the roadway that will be affected by the lane closure. The bold values represent the higher of the AM and PM peak hours.

Table 1 - Historic Traffic Volumes

Traffic Count Data	**H1WB-402**	**H1WBR-452**		**H1WB-407**	**H1WB-411**	**H1WBR-453**		
Count Station Location	Kalanianaole Hwy. 750' East of Ainakoa Avenue	Waialae Ave. Between 17th Ave. & Ekaha Ave.	H-1 Freeway Off-ramp to Waialae Ave.	H-1 Freeway Near Ward Ave.	H-1 Freeway Near Ward Ave.	Pali Highway Between Hongwanji Church and Off-ramp to Kuakini Street	Pali Highway Near School Street	Punchbowl Street to WB H-1 Freeway
AM Commuter Peak								
Westbound						Northbound (NB)	NB	
Volume (vph)	**4882**	**1047**	**717**	5057	5057	1279	673	1594
Time	6:30-7:30 a.m.	7:15-8:15 a.m.	7:15-8:15 a.m.	7:00-8:00 a.m.	7:00-8:00 a.m.	7:00-8:00 a.m.	6:45-7:45 a.m.	7:45-8:45 a.m.
Eastbound		N.A.	N.A.			SB	SB	N.A.
Volume (vph)	1949	N.A.	N.A.	4213	**4213**	2452	1225	N.A.
Time	7:15-8:15 a.m.	N.A.	N.A.	6:15-7:15 a.m.	6:15-7:15 a.m.	6:15-7:15 a.m.	6:30-7:30 a.m.	N.A.
PM Commuter Peak								
Westbound						Northbound (NB)	NB	
Volume (vph)	1889	856	416	**5566**	**5566**	**2598**	**1721**	**1886**
Time	5:45-6:45 p.m.	5:15-6:15 p.m.	5:15-6:15 p.m.	3:00-4:00 p.m.	3:00-4:00 p.m.	5:45-6:45 p.m.	5:00-6:00 p.m.	4:45-5:45 p.m.
Eastbound		N.A.	N.A.			SB	SB	N.A.
Volume (vph)	3478	N.A.	N.A.	4150	4150	1876	539	N.A.
Time	4:15-5:15 p.m.	N.A.	N.A.	3:00-4:00 p.m.	3:00-4:00 p.m.	3:00-4:00 p.m.	4:15-5:15 p.m.	N.A.

Traffic Count Data	**H1WB-415**				**H1WB-416**	**H1WB-417**		**H1WB-418**
Count Station Location	Pali Highway Between Hongwanji Church and Off-ramp to Kuakini Street	Pali Highway Near School Street	Punchbowl Street to WB H-1 Freeway	H-1 Freeway Near Ward	H-1 Freeway at Nuuanu Stream Bridge	H-1 Freeway Near Ward Ave.	Palama Off Ramp	H-1 at Nuuanu Stream Bridge
AM Commuter Peak								
Westbound	NB	NB						
Volume (vph)	1279	673	1594	4368	**5255**	5025	143	**5255**
Time	7:00-8:00 a.m.	6:45-7:45 a.m.	7:45-8:45 a.m.	6:15-7:15 a.m.	6:30-7:30 a.m.	6:15-7:15 a.m.	8:00-9:00 a.m.	6:30-7:30 a.m.
Eastbound	SB	SB	N.A.		N.A.		N.A.	N.A.
Volume (vph)	2452	1225	N.A.	4517	N.A.	4668	N.A.	N.A.
Time	6:15-7:15 a.m.	6:30-7:30 a.m.	N.A.	8:00-9:00 a.m.	N.A.	8:00-9:00 a.m.	N.A.	N.A.
PM Commuter Peak								
Westbound	NB	NB						
Volume (vph)	**2598**	**1721**	**1886**	**5017**	4941	**5054**	**167**	4941
Time	5:45-6:45 p.m.	5:00-6:00 p.m.	4:45-5:45 p.m.	3:00-4:00 p.m.	6:00-7:00 p.m.	3:00-4:00 p.m.	6:00-7:00 p.m.	6:00-7:00 p.m.
Eastbound	SB	SB	N.A.		N.A.		N.A.	N.A.
Volume (vph)	1876	539	N.A.	4828	N.A.	4161	N.A.	N.A.
Time	3:00-4:00 p.m.	4:15-5:15 p.m.	N.A.	3:30-4:30 p.m.	N.A.	3:00-4:00 p.m.	N.A.	N.A.

Traffic Count Data	**H1WB-420**	**H1EBR-351**	**78WB-851**	**H1EB-205**	**78EBR-822**			**H1WB-601**
Count Station Location	H-1 at Nuuanu Stream Bridge	Kalihi Street Between Beckley Street & Day Street	Moanalua Freeway at Moanalua Stream Bridge	H-1 Freeway at Halawa Stream Bridge	Kamehameha Highway at Aiea Steam Bridge	Moanalua Freeway Beginning of 5 Lanes	On Ramp Between Aiea Access SB & Moanalua EB	H-1 Freeway 200' West of Kaonohi Street
AM Commuter Peak								
Westbound		NB				N.A.	N.A.	
Volume (vph)	**5255**	940	4473	1792	1264	N.A.	N.A.	5684
Time	6:30-7:30 a.m.	7:30-8:30 a.m.	6:45-7:45 a.m.	7:00-8:00 a.m.	7:45-8:45 a.m.	N.A.	N.A.	7:00-8:00 a.m.
Eastbound	N.A.	SB						
Volume (vph)	N.A.	1047	5316	**8259**	**1394**	**4592**	**1286**	13586
Time	N.A.	7:45-8:45 a.m.	6:00-7:00 a.m.	6:15-7:15 a.m.	6:00-7:00 a.m.	6:15-7:15 a.m.	6:15-7:15 a.m.	6:00-7:00 a.m.
PM Commuter Peak								
Westbound		NB				N.A.	N.A.	
Volume (vph)	4941	**1711**	**5704**	6425	3090	N.A.	N.A.	**10430**
Time	6:00-7:00 p.m.	4:45-5:45 p.m.	3:00-4:00 p.m.	3:00-4:00 p.m.	5:30-6:30 p.m.	N.A.	N.A.	3:00-4:00 p.m.
Eastbound	N.A.	SB						
Volume (vph)	N.A.	629	3818	2907	541	2218	340	6785
Time	N.A.	4:30-5:30 p.m.	3:00-4:00 p.m.	3:30-4:30 p.m.	3:00-4:00 p.m.	3:00-4:00 p.m.	3:00-4:00 p.m.	3:00-4:00 a.m.

Traffic Count Data	**H1EB-113**	**HEB-114**	**H1WB-602**	**H1EB-112**	**H1EB-103**
Count Station Location	H-1 Freeway 200' West of Kaonohi Street	H-1 Freeway 200' West of Kaonohi Street	H-1 Freeway 200' West of Kaonohi Street	H-1 Freeway 200' West of Kaonohi Street	H-1 Freeway 0.45 Miles East of Waikele
AM Commuter Peak					
Westbound					
Volume (vph)	5684	5684	5684	5684	2767
Time	7:00-8:00 a.m.	7:00-8:00 a.m.	7:00-8:00 a.m.	7:00-8:00 a.m.	7:30-8:30 a.m.
Eastbound					
Volume (vph)	**13586**	**13586**	13586	**13586**	**5968**
Time	6:00-7:00 a.m.	6:00-7:00 a.m.	6:00-7:00 a.m.	6:00-7:00 a.m.	5:00-6:00 a.m.
PM Commuter Peak					
Westbound					
Volume (vph)	10430	10430	**10430**	10430	5861
Time	3:00-4:00 p.m.	3:00-4:00 p.m.	3:00-4:00 p.m.	3:00-4:00 p.m.	3:45-4:45 p.m.
Eastbound					
Volume (vph)	6785	6785	6785	6785	4251
Time	3:00-4:00 a.m.	3:00-4:00 a.m.	3:00-4:00 a.m.	3:00-4:00 a.m.	3:00-4:00 p.m.

C. Existing Traffic Operations

Special use lanes including high occupancy vehicle (HOV) lanes and contra-flow lanes are implemented within the project limits as described below.

H-1 Freeway and Moanalua Freeway

- H1WB-402 – Exit 26 Waialae Avenue

  There are no HOV facilities or contra flow lanes on the H-1 Freeway in this area.

- H1WBR-452 – Waialae Avenue

  There are no HOV facilities or contra flow lanes in this area.

- H1WB-407 – Exit 24B University Avenue 1/2 Mile

  There are no HOV facilities or contra flow lanes on the H-1 Freeway in this area.

- H1WB-411- Vineyard Boulevard 1/4, Pali Highway 3/4, School Street 1-1/4

  To the west of the project area, the a.m. westbound H-1 Freeway on-ramp from Lunalilo Street is closed. This closure takes place from 6:00-9:30 a.m. Construction work and traffic control will need to be cleared before the setup of this operation. There are no HOV facilities or contra flow lanes on the H-1 Freeway in this area.

- H1WBR-453 – 61 North Pali Highway

  There are no HOV facilities or contra flow lanes in this area.

- H1WB-415 – H-1 West Freeway

  There are no HOV facilities or contra flow lanes on the H-1 Freeway in this area.

- H1WB-416 – Palama Street 1/2, Houghtailing Street 1, Likelike Highway 1-1/2

  There are no HOV facilities or contra flow lanes on the H-1 Freeway in this area.

- H1WB-417 – Exit 20B Houghtailing Street 1/2 Mile, 20C Exit, Palama Street Exit 20C

  There are no HOV facilities or contra flow lanes on the H-1 Freeway in this area.

- H1WB-418 – Houghtailing Street 1/4, Likelike Highway 3/4, Middle Street 1-1/4

  There are no HOV facilities or contra flow lanes on the H-1 Freeway in this area.

- H1WB-420 – Exit 20A 63 North Likelike Highway Exit Only

  There are no HOV facilities or contra flow lanes on the H-1 Freeway in this area.

- H1EBR-351 – 63 North Likelike Highway

  There are no HOV facilities or contra flow lanes in this area.

- 78WB-851 – Exit 4, Fort Shafter, Ahua Street 1/4 Mile

  There are no HOV facilities or contra flow lanes on the Moanalua Freeway in this area.

- H1EB-205 – Exit 15, 92, East Nimitz Highway, West Hickam AFB, Naval Base

  The zipper lane, a HOV contra-flow lane from the Waiawa Interchange to Radford Drive, which uses a moveable barrier to reduce the westbound H-1 Freeway from five (5) through lanes to three (3) through lanes during the eastbound a.m. peak hour. Eastbound vehicles use the two (2) westbound lanes during the a.m. peak period to ease delays and congestion. The zip mobile is deployed at 1 a.m. near the Radford Drive

overpass. The zip lane will not conflict will the eastbound lane closures. The median lane in each direction is designated as an HOV lane starting at the Waiawa Interchange and ending at the Keehi Interchange. The eastbound median lane operates as HOV during the a.m. and p.m. peak periods and the westbound HOV lane operates as HOV in the p.m. peak period.

- 78EBR-822 - 99 East Stadium/Pearl Harbor and 78 East H1 Honolulu

  There are no HOV facilities or contra flow lanes in this area.

- H1WB-601 – Exit 8A Interstate H2 North Mililani/Wahiawa 1 Mile
  H1WB-602 – Exit 8B Waipahu 1/2 Mile

  The zipper lane, a HOV contra-flow lane from the Waiawa Interchange to Radford Drive, which uses a moveable barrier to reduce the westbound H-1 Freeway from five (5) through lanes to three (3) through lanes during the eastbound a.m. peak hour. Eastbound vehicles use the two (2) westbound lanes during the a.m. peak period to ease delays and congestion. The zip mobile is deployed at 1 a.m. near the Radford Drive overpass and reaches the Pearl City Viaduct around 3:00 or 3:30 a.m. in the morning. All westbound lane closures needed for sign work must be opened prior to the arrival of the zip mobile to avoid the cumulative impacts of the zip mobile lane closures. The median lane in each direction is designated as an HOV lane starting at the Waiawa Interchange and ending at the Keehi Interchange. The eastbound median lane operates as HOV during the a.m. and p.m. peak periods and the westbound HOV lane operates as HOV in the p.m. peak period.

- H1EB-114 – Exit 10 Pearlridge, Waimalu Next Right
  H1EB-113 – Exit 10 Pearlridge, Waimalu 1/2 Mile
  H1EB-112 – Exit 10 Waimalu, Pearlridge 1 Mile

  The zipper lane, a HOV contra-flow lane from the Waiawa Interchange to Radford Drive, which uses a moveable barrier to reduce the westbound H-1 Freeway from five (5) through lanes to three (3) through lanes during the eastbound a.m. peak hour. Eastbound vehicles use the two (2)

westbound lanes during the a.m. peak period to ease delays and congestion. The zip mobile is deployed at 1 a.m. near the Radford Drive overpass and reaches the Pearl City Viaduct around 3:00 or 3:30 a.m. in the morning. The zip lane will not affect eastbound lane closures needed for sign work. The median lane in each direction is designated as an HOV lane starting at the Waiawa Interchange and ending at the Keehi Interchange. The eastbound median lane operates as HOV during the a.m. and p.m. peak periods and the westbound HOV lane operates as HOV in the p.m. peak period.

- H1EB-103 – Exit 5, 750, 76 Kunia, Waipahu/Ewa 1 Mile Exit Only

  There are no HOV facilities or contra flow lanes on the H-1 Freeway in this area.

D. Traffic Predictions During Construction

The planned lane closures and complete roadway closures of the H-1 Freeway and Moanalua Freeway will take place during the night to minimize impacts to the driving public to avoid higher volumes during the daylight hours.

Diversion Routes During Roadway Closures

The planned closures include the (H1WBR-452) westbound Waialae Avenue ramp to Kaimuki, the (H1WBR-453) westbound H-1 Freeway off-ramp to northbound Pali Highway along with the westbound H-1 Freeway on-ramp from Punchbowl Street and the Pali Highway on-ramp from Punchbowl Street, (H1WB-415) the westbound H-1 Freeway on-ramp from Punchbowl Street, (H1WB-417) the westbound H-1 Freeway off-ramp to Palama Street, the (H1EBR-351) northbound Kalihi Street H-1 Freeway overpass, and the (78EBR-822) eastbound Moanalua Freeway on-ramp to Honolulu and the Stadium, Pearl Harbor. Closures will occur during the night to minimize impacts to the driving public. A description of the detour routes are listed below.

- H1WBR-452 – Waialae Avenue

  Traffic will be diverted along two (2) routes during the Waialae Avenue ramp closure. The first route will begin westbound on Waialae Avenue.

Vehicles will continue southbound on Hunakai Street, then westbound on Pahoa Avenue and then northbound on 16th Avenue until Waialae Avenue. The second route will also begin westbound on Waialae Avenue. Vehicles will continue southbound on 21st Avenue, continue westbound on Harding Avenue and then northbound on 16th Avenue until Waialae Avenue.

- H1WBR-453 – 61 North Pali Highway

  Traffic from Punchbowl Street will be diverted along the following route during the closure of Punchbowl Street to the westbound H-1 Freeway on-ramp and to the Pali Highway. Vehicles on Punchbowl Street will be diverted southbound to Vineyard Boulevard in the westbound direction. From Vineyard Boulevard, vehicles can continue northbound to the Pali Highway or continue westbound along Vineyard Boulevard to the Halona Street westbound H-1 Freeway on-ramp.

- H1WB-415 – H-1 West Freeway

  Traffic will be diverted along the following route during the closure of the westbound H-1 Freeway on-ramp from Punchbowl Street. Vehicles heading toward the closed westbound H-1 Freeway on-ramp will be diverted onto the Pali Highway in the northbound direction, continue northbound on Pacific Heights Road, then westbound on Pauoa Road, then southbound on Nuuanu Avenue, and then westbound on School Street. Vehicles may then access the westbound H-1 Freeway on-ramp from School Street.

- H1WB-417 – Houghtailing Street 1/2 Mile, 20C Exit, Palama Street Exit 20C

  Traffic will be diverted along two (2) routes during the westbound H-1 Freeway off-ramp closure to Palama Street.

  The first route is for vehicles traveling westbound on North School Street headed to Palama Street. Vehicles traveling westbound on North School

Street will be diverted onto southbound Aala Street, then westbound on Vineyard Boulevard until Palama Street.

The second route is for vehicles traveling on the westbound H-1 Freeway to Palama Street. Vehicles will be diverted from the westbound H-1 Freeway onto westbound Halona Street. From Halona Street, vehicles will continue southbound on Houghtailing Street then eastbound on North King Street until Palama Street.

- H1EBR-351 – Likelike Highway Exit 20A Exit Only

  During the closure of northbound Kalihi Street, vehicles will be diverted on the following route. Vehicles heading northbound on Kalihi Street will be diverted onto the eastbound H-1 Freeway and continue onto eastbound Vineyard Boulevard. From Vineyard Boulevard, vehicles will continue northbound on Palama Street, then westbound on North School Street, then southbound on Kapalama Avenue, then westbound on Bernice Street until Kalihi Street.

- 78EBR-822 - 99 East Stadium/Pearl Harbor and 78 East H1 Honolulu

  Removal and erection of the signs will be completed in two (2) phases. During Phase 1A, the two (2) eastbound Moanalua Freeway on-ramp lanes will be closed and two (2) eastbound Stadium, Pearl Harbor lanes will be open. During Phase 1B, the two (2) eastbound Stadium, Pearl Harbor lanes will be closed and one (1) eastbound Moanalua Freeway on-ramp lane will be open.

Phase 1A

During the closure of the eastbound Moanalua Freeway on-ramp, vehicles will be diverted along the following route. Vehicles will continue eastbound then southbound along Kamehameha Highway toward the Stadium, Pearl Harbor, then onto Salt Lake Boulevard to northbound Kamehameha Highway. Vehicles will continue northbound on Kamehameha Highway until the eastbound Moanalua Freeway on-ramp.

Phase 1B

During the closure of the eastbound Stadium, Pearl Harbor lanes, vehicles will be diverted along the following route. Vehicles on Kamehameha Highway will continue onto the eastbound Moanalua Freeway on-ramp, continue onto the eastbound Moanalua Freeway off-ramp to Halawa Heights, Halawa Valley, Stadium to south-westbound Kahuapaani Street. From Kahuapaani Street, vehicles will continue north-westbound along Salt Lake Boulevard to Kamehameha Highway.

Traffic Analysis

Traffic volumes collected by HDOT in 2006 for the Vineyard Boulevard and in 2007 for North King Street and Vineyard Boulevard are presented in Table 2. Table 2 shows the peak hour volumes for the count stations on the detour routes. The highlighted values indicate the direction of the freeway that will be affected by the roadway closure. The bold values represent the higher of the AM and PM peak hours.

Twenty-four hour traffic count data from the freeways or roadways nearest the sign location was plotted by 15-minute increments to determine when traffic volumes would be favorable to perform lane closures, roadway closures and diversion routes.

Diversion Routes

Two (2) methods were used. The first method is for diversion routes which utilize roadways that are heavily used during the peak hour of traffic. The second method is for those which do not utilize heavily used roadways or had limited count data.

Method 1: Threshold flow rates were determined using the peak hour volume for a roadway on the diversion route. Using the highest hourly volume, divided by four and reduced by 30 percent, provided the threshold value. Twenty-four hour traffic count data from the closed ramp combined with the twenty-four hour traffic count data of a roadway on the diversion route and plotted by 15-minute increments. Using the threshold volume of the roadway on the diversion route, the most favorable time to use diversion routes was determined.

Method 2: The twenty-four hour traffic count data for the closed roadway or ramp was plotted by 15-minute increments. Through observation of the graph, the most favorable work hours were determined to be when the traffic volume was lowest.

Table 2 – Estimated Traffic Volumes on Diversion Routes

Traffic Count Data	H1WBR-453	H1WB-417	
Count Station Location	Vineyard Boulevard between Queen Emma Street and Pali Highway	North King Street between Desha Lane and Akepo Lane	Vineyard Boulevard at Nuuanu Stream Bridge
AM Commuter Peak			
Direction	Westbound	Westbound	Westbound
Volume (vph)	**1,051**	634	604
Time	8:00-9:00 a.m.	8:00-9:00 a.m.	7:30-8:30 a.m.
Direction	Eastbound	Eastbound	Eastbound
Volume (vph)	1,147	**1,592**	948
Time	7:15-8:15 a.m.	7:15-8:15 a.m.	6:45-7:45 a.m.
PM Commuter Peak			
Direction	Westbound	Westbound	Westbound
Volume (vph)	860	1,612	**842**
Time	4:15-5:15 p.m.	4:30-5:30 p.m.	4:30-5:30 p.m.
Direction	Eastbound	Eastbound	Eastbound
Volume (vph)	1,321	1,225	878
Time	5:15-6:15 p.m.	4:00-5:00 p.m.	3:45-4:45 p.m.

Lane Closures

LOS threshold rates for lane closures were estimated based on the Highway Capacity Manual 2010. The LOS D through F thresholds has been graphed on all of the 15-minute demand graphs at all sign sites which do not require complete roadway or complete ramp closures. The best LOS threshold line was used which would allow for eight (8) hours of work time. Table 3 summarizes the LOS thresholds used for the different types of closures.

Table 3 – Threshold for Lane Closures of the H-1 and Moanalua Freeway

	Speed (mph)	LOS D or Better	LOS E or Better	LOS F or Better
Ramp	25	160 pc/ln/15 min.	220 pc/ln/15 min.	280 pc/ln/15 min.
Ramp	35	225 pc/ln/15 min.	300 pc/ln/15 min.	390 pc/ln/15 min.
Freeway	45	290 pc/ln/15 min.	395 pc/ln/15 min.	505 pc/ln/15 min.

- H-1 Freeway and Moanalua Freeway Lane Closures

  Construction at each sign site includes demolition, foundation/miscellaneous work, installation, removal and erection for the sign. Lane closures will vary based on construction requirements.

- H1WB-402 – Exit 26 Waialae Ave

  Construction of this sign will require the following lane closures. Foundation/miscellaneous work will not require any lane closures. Demolition, installation, removal, and erection of the sign will require a single lane closure of the westbound H-1 Freeway right through lane reducing the capacity of the H-1 freeway from three (3) through lanes to two (2) through lanes. (See Figure 22) The lane closure will occur at night to minimize impacts to the driving public during the daylight hours. Demolition is anticipated to take three (3) days, foundation/miscellaneous work will take 50 days, installation will take three (3) days, and removal and erection of the sign will take one (1) hour each.

- H1WBR-452 – Waialae Avenue

  Construction of this sign will require the following lane closures. Demolition, foundation/miscellaneous work, installation, removal and erection of the sign will require a single lane closure of the westbound lane to Waialae Avenue. (See Figure 23) During the Waialae Avenue Ramp night closure, drivers heading westbound beneath the H-1 Freeway to the Waialae Avenue ramp will be provided with two (2) diversion routes to Waialae Avenue. (See Detour Section.) Demolition is anticipated to take four (4) days, foundation/miscellaneous work will take 34 days,

installation will take three (3) days and removal and erection of the sign will take one (1) hour each.

- H1WB-407 – Exit 24B University Avenue ½ Mile

  Construction of this sign will require the following lane closures. Demolition, foundation/miscellaneous work, and installation of the sign will require a single lane closure of the westbound H-1 Freeway right lane, reducing the capacity of the H-1 Freeway in the vicinity of the project area from three (3) through lanes to two (2) through lanes. (See Figure 24) Removal and erection the sign will require a two-lane closure of the westbound H-1 Freeway right and center lanes, reducing the capacity of the H-1 Freeway from three (3) through lanes to one (1) through lane. (See Figure 25) Lane closure(s) will occur at night to minimize impacts to the driving public. Demolition is anticipated to take four (4) days, foundation/miscellaneous work will take 34 days, installation will take three (3) days and removal and erection of the sign will take one (1) hour each.

- H1WB-411- Vineyard Boulevard 1/4, Pali Highway 3/4, School Street 1-1/4

  Construction of this sign will require the following lane closures. Demolition, foundation/miscellaneous work and installation of the sign, will require a two-lane closure of the eastbound and westbound H-1 Freeway median lanes. These closures will reduce the capacity of the H-1 Freeway in the vicinity of the project area from three (3) through lanes to two (2) through lanes in the eastbound and westbound directions. (See Figure 26) Removal and erection of the sign will require the closure of the westbound H-1 Freeway median and center lanes, along with the eastbound median lane. These closures will reduce the capacity of the H-1 Freeway in the vicinity of the project area from three (3) through lanes to one (1) through lane in the westbound direction. (See Figure 27) In the eastbound direction, the capacity of the H-1 Freeway will be reduced from three (3) through lanes to two (2) through

lanes. (See Figure 28) Lane closures will occur at night to minimize the impacts to the driving public. Demolition is anticipated to take a total of nine (9) days, foundation/miscellaneous work will take 40 days, installation will take three (3) days and removal and erection of the sign will take one (1) hour each.

- H1WBR-453 – 61 North Pali Highway

  Construction of this sign will require the following lane closures. Demolition, foundation/miscellaneous work and installation of the sign will require a single lane closure on the westbound H-1 Freeway off-ramp to the northbound Pali Highway in the vicinity of the project area. Vehicles taking the westbound H-1 Freeway off-ramp to Pali Highway will merge left into the adjacent lane carrying vehicles from Punchbowl Street to the westbound H-1 Freeway on-ramp. At the end of the project area, vehicles can merge back into the right lane and continue northbound onto the Pali Highway. (See Figure 29) During the removal and erection of the sign, the westbound H-1 Freeway off-ramp to the Pali Highway will be closed in addition to the westbound H-1 Freeway on-ramp from Punchbowl Street. (See Figure 30) Vehicles approaching from Punchbowl Street will be provided with a diversion route. (See Detour Section) Lane closure(s) will occur at night to minimize the impacts to the driving public. Demolition is anticipated to take a total of four (4) days, foundation/miscellaneous work will take 34 days, installation will take three (3) days and removal and erection of the sign will take one (1) hour each.

- H1WB-415 – H-1 West Freeway

  Construction of this sign will require the following lane closures. Demolition, foundation/miscellaneous work and installation of the sign, will require the closure of the right lane on the westbound H-1 Freeway. This will reduce the capacity of the H-1 Freeway in the vicinity of the project area, from three (3) through lanes to two (2) through lanes. Vehicles from Punchbowl Street approaching the westbound H-1

Freeway on-ramp will merge over the gore into the right westbound H-1 Freeway lane, which is closed to vehicles already on the H-1 Freeway. (See Figure 31) During the removal and erection of the sign, the westbound H-1 Freeway right through lane will be closed in addition to the westbound H-1 Freeway on-ramp from Punchbowl Street. This will reduce the capacity of the westbound H-1 Freeway to two (2) through lanes. (See Figures 32 and 33) Vehicles approaching from Punchbowl Street will continue onto Pali Highway. The vehicles heading toward the westbound H-1 Freeway from Punchbowl Street will be provided with a diversion route which begins at the Pali Highway ramp and ends at the westbound H-1 Freeway on-ramp from School Street. (See Detour Section) Lane closure(s) will occur at night to minimize the impacts to the driving public. Demolition is anticipated to take four (4) days, foundation/miscellaneous work will take 34 days, installation take three (3) days and removal and erection of the sign will take one (1) hour each.

- <u>H1WB-416 – Palama Street 1/2, Houghtailing Street 1, Likelike Highway 1-1/2</u>

  Construction of this sign will require the following lane closures. Demolition, foundation/miscellaneous work and installation of the sign, will require a single lane closure of the westbound H-1 Freeway right through lane. This will reduce the capacity of the H-1 Freeway from three (3) through lanes to two (2) through lanes. (See Figure 34) Removal and erection of the sign will require a two-lane closure of the westbound H-1 Freeway right and center through lanes. This will reduce the capacity of the H-1 Freeway from three (3) through lanes to one (1) through lane. (See Figure 35) Lane closure(s) of the westbound H-1 Freeway will occur at night to minimize the impacts to the driving public. Demolition is anticipated to take four (4) days, foundation/miscellaneous work will take 34 days, installation work will take three (3) days and removal and erection of the sign will take one (1) hour each.

- H1WB-417 – Exit 20B Houghtailing Street 1/2 Mile, 20C Exit, Palama Street Exit 20C

  Construction of this sign will require the following lane closures. Demolition, foundation/miscellaneous work and installation of the sign, will require a single lane closure of the westbound H-1 Freeway right through lane, reducing the capacity of the H-1 Freeway in the vicinity of the project area from three (3) through lanes to two (2) through lanes. The westbound Palama Street off-ramp will also be closed. (See Figures 36 and 37) Removal and erection of the sign will require a two-lane closure of the westbound H-1 Freeway right and center through lanes. This will reduce the capacity of the H-1 Freeway from three (3) through lanes to one (1) through lane. The westbound Palama Street off-ramp will also be closed. (See Figures 38 and 39) Lane and off-ramp closure(s) will occur at night to minimize the impacts to the driving public. Two (2) diversion routes will be provided for drivers heading to Palama Street. (See Detour Section) Demolition work is anticipated to take a total of a total of nine (9) days, foundation/miscellaneous work will take 40 days, installation work will take three (3) days and removal and erection of the sign will take one (1) hour each.

- H1WB-418 – Houghtailing Street 1/4, Likelike Highway 3/4, Middle Street 1-1/4

  Construction of this sign will require the following lane closures. Demolition, foundation/miscellaneous work and installation of the sign, will require a single lane closure of the westbound H-1 Freeway right through lane. This will reduce the capacity of the H-1 Freeway from three (3) through lanes to two (2) through lanes. (See Figure 40) Removal and erection of the sign will require a two-lane closure of the westbound H-1 Freeway. This will include the closure of the right and center through lanes. This will reduce the capacity of the H-1 Freeway from three (3) through lanes to one (1) through lane. (See Figure 41) Lane closure(s) of the westbound H-1 Freeway will occur at night to minimize the impacts to the driving public. Demolition work is anticipated

to take four (4) days, foundation/miscellaneous work will take 34 days, installation work will take three (3) days and removal and erection of the sign will take one (1) hour each.

- H1WB-420 – Exit 20A 63 North Likelike Highway Exit Only

  Construction of this sign will require the following lane closures. Demolition, foundation/miscellaneous work and installation of the sign, will require a single lane closure of the westbound H-1 Freeway auxiliary lane to the Likelike Highway. This will reduce the capacity of the H-1 Freeway from three (3) through lanes and one (1) auxiliary lane to three (3) through lanes. (See Figure 42) Removal and erection of the sign will require a two-lane closure including the westbound H-1 Freeway right through lane and auxiliary lane. The capacity of the H-1 Freeway will be reduced from three (3) through lanes and one (1) auxiliary lane to two (2) through lanes. (See Figure 43) Lane closure(s) will occur at night to minimize the impacts to the driving public. Demolition is anticipated to take four (4) days, foundation/miscellaneous work will take 34 days, installation will take three (3) days and removal and erection of the sign will take one (1) hour each.

- H1EBR-351 – 63 North Likelike Highway

  Construction of this sign will require the following lane closures. Demolition and foundation/miscellaneous work will not require any lanes closures. Installation, removal and erection of the sign will require a single lane closure on Kalihi Street. (See Figure 44) A diversion route will be provided for vehicles heading northbound on Kalihi Street. (See Detour Section) The lane closure will occur at night to minimize impacts to the driving public. Demolition work is anticipated to take four (4) days, foundation/miscellaneous work will take 34 days, installation work will take three (3) days and removal and erection of the sign will take one (1) hour each.

- 78WB-851 – Exit 4, Fort Shafter, Ahua Street 1/4 Mile

  Construction of this sign will require the following lane closures. Demolition, foundation/miscellaneous work and installation of the sign, will require a single lane closure of the westbound Moanalua Freeway right through lane. This will reduce the capacity of the Moanalua Freeway in the vicinity of the project area from three (3) through lane to two (2) through lanes. (See Figure 45) Removal and erection of the sign will require a two-lane closure of the westbound Moanalua Freeway right and center through lanes. This will reduce the capacity of the Moanalua Freeway from three (3) through lanes to one (1) through lane. (See Figure 46) Lane closure(s) will occur at night to minimize the impacts to the driving public. Demolition is anticipated to take nine (9) days, foundation/miscellaneous work will take 40 days, installation will take three (3) days and removal and erection of the sign will take one (1) hour each.

- H1EB-205 – Exit 15, 92, East Nimitz Highway, West Hickam AFB, Naval Base

  Construction of this sign will require the following lane closures. Foundation/miscellaneous work will require a single lane closure of the eastbound H-1 Freeway auxiliary lane to Hickam AFB, Naval Base. (See Figure 47) Demolition and installation of the sign will require a two-lane closure of the H-1 Freeway, which will include the H-1 Freeway off-ramp lane to Nimitz Highway from the right through lane with the auxiliary lane to Hickam AFB, Naval Base. (See Figure 47) Removal and erection of the sign will require the closure of the three (3) right lanes. The three (3) closed lanes include the right through lane, the exit lane to Nimitz Highway from the right through lane along with the auxiliary lane to Hickam AFB, Naval Base. (See Figure 48) During demolition, installation, removal and erection of the sign, vehicles taking the H-1 Freeway off-ramp to East Nimitz Highway or West Hickam AFB, Naval Base will merge over the gore. Lane closure(s) will occur at night to minimize the impacts to the driving public. Demolition work is anticipated

to take four (4) days, foundation/miscellaneous work will take 34 days, installation will take three (3) days and removal and erection of the sign will take one (1) hour each.

- 78EBR-822 - 99 East Stadium/Pearl Harbor and 78 East H1 Honolulu

  Construction of this sign will require the following lane closures. During demolition, foundation/miscellaneous work, and installation of the signs, one (1) eastbound lane to the Stadium/Pearl Harbor and one (1) eastbound Moanalua Freeway Honolulu on-ramp lane will be open. (See Figure 49) Removal and erection of the signs will be done in two (2) Phases. During Phase 1A, two (2) eastbound Moanalua Freeway on-ramp lanes to Honolulu will be closed and two (2) Stadium, Pearl Harbor lanes will be open. (See Figure 50) A diversion route will be provided for the eastbound Moanalua Freeway on-ramp closure. (See Detour Route) During Phase 1B, two (2) eastbound Stadium, Pearl Harbor lanes will be closed and one (1) eastbound Moanalua Freeway on-ramp lane to Honolulu will be open. (See Figure 51) A diversion route will be provided Stadium, Pearl Harbor lane closures. (See Detour Route) Lane closures will occur at night to minimize the impacts to the driving public. Demolition is anticipated to take a total of ten (10) days, foundation/miscellaneous work will take 41 days, installation will take three (3) days and removal and erection will take one (1) hour each.

- H1WB-601 – Exit 8A Interstate H2 North Mililani/Wahiawa 1 Mile

  Construction of this sign will require the following lane closures. Foundation/miscellaneous work will not require any lane closures. Demolition, installation, removal and erection of the sign will require a single lane closure of the westbound H-1 Freeway right lane. This will reduce the capacity of the H-1 Freeway in the vicinity of the project area from five (5) through lanes to four (4) through lanes. (See Figure 52) The lane closure will occur at night to minimize impacts to the driving public. Demolition is anticipated to take three (3) days, foundation/miscellaneous

work will take 50 days, installation will take three (3) days and the removal and erection will take one (1) hour each.

- H1EB-114 – Exit 10 Pearlridge, Waimalu Next Right

  Construction of this sign will require the following lane closures. Foundation/miscellaneous work will not require any lane closures. Demolition, installation, removal and erection of the sign will require a single lane closure of the eastbound H-1 Freeway right lane. This will reduce the capacity of the H-1 Freeway in the vicinity of the project area from five (5) through lanes to four (4) through lanes. (See Figure 53) The lane closure will occur at night to minimize impacts to the driving public. Demolition is anticipated to take three (3) days, foundation/miscellaneous work will take 50 days, installation will take three (3) days and the removal and erection will take one (1) hour each.

- H1EB-113 – Exit 10 Pearlridge, Waimalu 1/2 Mile

  Construction of this sign will require the following lane closures. Foundation/miscellaneous work will not require any lane closures. Demolition, installation, removal and erection of the sign will require a single lane closure of the eastbound H-1 Freeway right lane. This will reduce the capacity of the H-1 Freeway in the vicinity of the project area from five (5) through lanes to four (4) through lanes. (See Figure 54) The lane closure will occur at night to minimize impacts to the driving public. Demolition is anticipated to take three (3) days, foundation/miscellaneous work will take 50 days, installation will take three (3) days and the removal and erection will take one (1) hour each.

- H1WB-602 – Exit 8B Waipahu 1/2 Mile

  Construction of this sign will require the following lane closures. Foundation/miscellaneous work will not require any lane closures. Demolition, installation, removal and erection of the sign will require a single lane closure of the westbound H-1 Freeway right lane. This will reduce the capacity of the H-1 Freeway in the vicinity of the project area from five (5) through lanes to four (4) through lanes. (See Figure 55) The

lane closure will occur at night to minimize impacts to the driving public. Demolition is anticipated to take three (3) days, foundation/miscellaneous work will take 50 days, installation will take three (3) days and the removal and erection will take one (1) hour each.

- H1EB-112 – Exit 10 Waimalu, Pearlridge 1 Mile

  Construction of this sign will require the following lane closures. Foundation/miscellaneous work will not require any lane closures. Demolition, installation, removal and erection of the sign will require a single lane closure of the eastbound H-1 Freeway right lane. This will reduce the capacity of the H-1 Freeway in the vicinity of the project area from five (5) through lanes to four (4) through lanes. (See Figure 56) The lane closure will occur at night to minimize impacts to the driving public. Demolition is anticipated to take three (3) days, foundation/miscellaneous work will take 50 days, installation will take three (3) days and the removal and erection will take one (1) hour each.

- H1EB-103 – Exit 5, 750, 76 Kunia, Waipahu/Ewa 1 Mile Exit Only

  Construction of this sign will require the following lane closures. Foundation/miscellaneous work will not require any lane closures. Demolition and installation of the sign will require a single lane closure of the eastbound H-1 Freeway right Kunia, Waipahu/Ewa exit only lane. This will reduce the capacity of the eastbound H-1 Freeway in the vicinity of the project area from two (2) through lanes and an eastbound exit lane to Kunia, Waipahu/Ewa to two (2) through lanes. (See Figure 57) Removal and erection of the sign will require a two-lane closure of the eastbound H-1 Freeway right Kunia, Waipahu/Ewa exit only lane and the right through lane. This will reduce the capacity of the H-1 Freeway in the vicinity of the project area to one (1) through lane. (See Figure 58) The planned closure of the two rightmost eastbound H-1 Freeway lanes will occur at night to minimize impacts to the driving public. Demolition is anticipated to take four (4) days, foundation/miscellaneous work will take

34 days, installation will take three (3) days and removal and erection will take one (1) hour each.

E. Graph Explanations

To determine the most favorable times to perform lane, roadway or ramp closures for construction work. Figures 22 through 58 show the twenty-four hour traffic count data at 15-minute increments for relevant roadways within the project limits. The construction hours were determined from the observation of the graphs and the 645 Work Zone Traffic Control when relevant.

- H1WB-402 – Exit 26 Waialae Ave

  Figure 22 shows the twenty-four hour traffic count data for westbound Kalanianaole Highway near Ainakoa Avenue. LOS threshold lines were plotted on the graph for two (2) open H-1 Freeway lanes. The most favorable construction hours were determined to be 8:00 p.m. to 4:00 a.m.

- H1WBR-452 – Waialae Avenue

  Figure 23 shows the twenty-four hour traffic count data for the westbound Waialae Ramp. Vehicles will be diverted on two (2) routes during the Waialae Ramp closure. To create minimal impact on the detour routes, the construction time was determined by observing when the volumes were lowest on the Waialae Ramp, while still providing an eight-hour work period. The most favorable work hours were determined to be 9:00 p.m. to 5:00 a.m.

- H1WB-407 – Exit 24B University Avenue ½ Mile

  Figure 24 shows the twenty-four hour traffic count data for the westbound H-1 Freeway near Ward Avenue. LOS threshold lines were plotted on the graph for two (2) open H-1 Freeway lanes. The most favorable work hours were determined to be 9:00 p.m. to 4:00 a.m. based on Section 645-Work Zone Traffic Control.

  Figure 25 shows the twenty-four hour traffic count data for the westbound H-1 Freeway near Ward Avenue. LOS threshold lines were plotted on the

graph for one (1) open H-1 Freeway lane. The most favorable work hours were determined to be 10:30 p.m. to 4:00 a.m. based on the Section 645 – Work Zone Traffic Control.

- H1WB-411 – Vineyard Boulevard ¼, Pali Highway ¾, School Street 1-1/4

  Figure 26 shows the twenty-four hour traffic count data for the eastbound and westbound H-1 Freeway near Ward Avenue. LOS threshold lines were plotted on the graph for two (2) open H-1 Freeway lanes. The most favorable work hours were determined to be 9:00 p.m. to 4:00 a.m. based on the Section 645 – Work Zone Traffic Control.

  During removal and erection of the sign, a single westbound lane (Figure 27) will be open and two (2) eastbound lanes will be open (Figure 28). Figure 27 shows the twenty-four hour traffic count data for the westbound H-1 Freeway near Ward Avenue. LOS threshold lines were plotted on the graph for a single westbound lane on the H-1 Freeway. The most favorable work hours were determined to be 10:30 p.m. to 4:00 a.m. based on the Section 645-Work Zone Traffic Control. Figure 28 shows the twenty-four hour traffic count data for the eastbound H-1 Freeway near Ward Avenue. LOS threshold lines were plotted on the graph for two (2) eastbound lanes on the H-1 Freeway. The most favorable work hours were determined to be 9:00 p.m. to 4:00 a.m. based on the Section 645-Work Zone Traffic Control.

- H1WBR-453 – 61 North Pali Highway

  Figure 29 shows the twenty-four hour traffic count data for the vehicles heading to the westbound H-1 Freeway on-ramp from Punchbowl Street, the Pali Highway on-ramp from Punchbowl Street, along with the vehicles on the Pali Highway on-ramp. LOS threshold lines were plotted on the graph for one (1) open lane. The most favorable work hours were determined while providing a minimum of six hours to be 10:30 p.m. to 4:30 a.m.

  During the removal and erection of the sign, the westbound H-1 Freeway off-ramp to the northbound Pali Highway along with the westbound H-1

Freeway on-ramp from Punchbowl Street and the Pali Highway on-ramp from Punchbowl Street will be closed. Figure 30 shows the twenty-four hour traffic count data for the westbound H-1 Freeway on-ramp from Punchbowl Street and the Pali Highway on-ramp from Punchbowl Street and Vineyard Boulevard. The threshold for Vineyard Boulevard was determined by using the peak hour volume, dividing it by four to get the peak volume per 15-minute period and then reducing it by 30 percent. The most favorable work hours were determined to be 11:00 p.m. to 4:00 a.m.

- H1WB-415 – H-1 West Freeway

  Figure 31 shows the twenty-four hour traffic count data for the westbound H-1 Freeway near Ward Avenue. LOS threshold lines were plotted on the graph for two (2) open lanes in the westbound direction on the H-1 Freeway. The most favorable work hours were determined to be 9:00 p.m. to 4:00 a.m. based on the Section 645-Work Zone Traffic Control.

  During the removal and erection of the sign, the westbound H-1 Freeway right lane will be closed along with the westbound H-1 Freeway on-ramp from Punchbowl Street. These closures will reduce the capacity of the H-1 Freeway from three (3) through lanes to two (2) through lanes. Figure 32 shows the twenty-four hour traffic count data for the westbound H-1 Freeway near Ward Avenue. LOS threshold lines were plotted on the graph for two (2) open westbound H-1 Freeway lanes. The most favorable work hours were determined to be 9:00 p.m. to 4:00 a.m. based on the Section 645-Work Zone Traffic Control. Figure 33 shows the twenty-four hour traffic count data for the westbound H-1 Freeway on-ramp from Punchbowl Street, the Pali Highway on-ramp from Punchbowl Street. The most favorable work hours were determined to be 11:00 p.m. to 4:00 a.m. based on the Section 645-Work Zone Traffic Control.

- H1WB-416 – Palama Street ½, Houghtailiing Street 1, Likelike Highway 1-1/2

  Figure 34 shows the twenty-four hour traffic count data for the westbound H-1 Freeway at the Nuuanu Stream Bridge. LOS threshold lines were plotted on the graph for two (2) open westbound H-1 Freeway lanes. The most favorable work hours were determined to be 9:00 p.m. to 4:00 a.m. based on the Section 645-Work Zone Traffic Control.

  Figure 35 shows the twenty-four hour traffic count data for the westbound H-1 Freeway at the Nuuanu Stream Bridge. LOS threshold lines were plotted on the graph for one (1) open westbound H-1 Freeway lane. The most favorable work hours were determined to be 11:00 p.m. to 4:00 a.m. based on the Section 645-Work Zone Traffic Control.

- H1WB-417 – Exit 20B Houghtailing Street 1/2 Mile, 20C Exit, Palama Street Exit 20C

  Figure 36 shows the twenty-four hour traffic count data for the westbound H-1 Freeway west of Ward Avenue with the twenty-four hour traffic count data from the westbound H-1 Freeway off-ramp to Palama Street. LOS threshold lines were plotted on the graph for two (2) open westbound H-1 Freeway lanes. The most favorable work hours were determined to be 9:00 p.m. to 4:00 a.m. based on the Section 645-Work Zone Traffic Control.

  Figure 37 is comprised of two (2) graphs, one for each of the two (2) detour routes. The red graph shows twenty-four hour traffic count data for North King Street with the Palama Ramp volume. The green graph shows the twenty-four hour traffic count data for Vineyard Boulevard with the Palama Ramp volume. The two (2) graphs represent the worst case scenario, for each alternative route during the closure of the Palama Ramp. The thresholds for King Street and Vineyard Boulevard were determined by taking the respective peak hour volumes, dividing it by four to get the peak volume per 15 minutes and then reducing by 30 percent.

The most favorable work hours were determined to be 8:00 p.m. to 4:30 a.m.

Figure 38 shows the twenty-four hour traffic count data for the westbound H-1 Freeway 0.5 miles west of Ward Avenue with the twenty-four hour traffic count data from the westbound H-1 Freeway off-ramp to Palama Street. LOS threshold lines were plotted on the graph for one (1) open westbound H-1 Freeway lane. The most favorable work hours were determined to be 11:00 p.m. to 4:00 a.m. based on the Section 645-Work Zone Traffic Control.

Figure 39 is comprised of two (2) graphs, one for each of the two (2) detour routes. The red graph shows twenty-four hour traffic count data plotted by 15-minute increments for North King Street with the Palama Ramp volume. The green graph shows the twenty-four hour traffic count data plotted by 15-minute increments for Vineyard Boulevard with the Palama Ramp volume. The two (2) graphs represent the worst case scenario, for each alternative route during the closure of the Palama Ramp. The thresholds for King Street and Vineyard Boulevard were determined by taking the respective peak hour volumes, dividing it by four to get the peak volume per 15 minutes and then reducing by 30 percent. The most favorable work hours were determined to be 8:00 p.m. to 4:30 a.m.

- <u>H1WB-418 – Houghtailing Street 1/4, Likelike Highway 3/4, Middle Street 1-1/4</u>

  Figure 40 shows the twenty-four hour traffic count data for the westbound H-1 Freeway at the Nuuanu Stream Bridge. LOS threshold lines were plotted on the graph for two (2) open westbound H-1 Freeway lanes. The most favorable work hours were determined to be 9:00 p.m. to 4:00 a.m. based on the Section 645-Work Zone Traffic Control.

  Figure 41 shows the twenty-four hour traffic count data for the westbound H-1 Freeway at the Nuuanu Stream Bridge. LOS threshold lines were plotted on the graph for one (1) open westbound H-1 Freeway lane. The

most favorable work hours were determined to be 11:00 p.m. to 4:00 a.m. based on the Section 645-Work Zone Traffic Control.

- H1WB-420 – Exit 20A 63 North Likelike Highway Exit Only

  Figure 42 shows the twenty-four hour traffic count data for the westbound H-1 Freeway at the Nuuanu Stream Bridge. LOS threshold lines were plotted on the graph for three (3) open westbound H-1 Freeway lanes. The most favorable work hours were determined to be 9:00 p.m. to 4:00 a.m. based on the Section 645-Work Zone Traffic Control.

  Figure 43 shows the twenty-four hour traffic count data for the westbound H-1 Freeway at the Nuuanu Stream Bridge. LOS threshold lines were plotted on the graph for two (2) open westbound H-1 Freeway lanes. The most favorable work hours were determined to be 9:00 p.m. to 4:00 a.m. based on the Section 645-Work Zone Traffic Control.

- H1EBR-351 – 63 North Likelike Highway

  Figure 44 is comprised of the twenty-four hour traffic count data for northbound Kalihi Street. The most favorable work hours were determined to be 10:00 p.m. to 4:30 a.m.

- 78WB-851 – Exit 4, Ft. Shafter, Ahua Street 1/4 Mile

  Figure 45 shows the twenty-four hour traffic count data for the westbound Moanalua Freeway at the Moanalua Stream Bridge. LOS threshold lines were plotted on the graph for two (2) open westbound Moanalua Freeway lanes. The most favorable work hours were determined to be 9:00 p.m. to 4:00 a.m. based on the Section 645-Work Zone Traffic Control.

  Figure 46 shows the twenty-four hour traffic count data for the westbound Moanalua Freeway at the Moanalua Stream Bridge. LOS threshold lines were plotted on the graph for one (1) open Moanalua Freeway lane. The most favorable work hours were determined to be 11:00 p.m. to 4:00 a.m. based on the Section 645-Work Zone Traffic Control.

- H1EB-205 – Exit 15, 92 East Nimitz Highway West Hickam AFB, Naval Base

  Figure 47 shows the twenty-four hour traffic count data for the eastbound H-1 Freeway at the Halawa Stream Bridge. LOS threshold lines were plotted on the graph for four (4) open eastbound H-1 Freeway lanes. The most favorable work hours were determined to be 8:00 p.m. to 4:00 a.m. based on the Section 645-Work Zone Traffic Control.

  Figure 48 shows the twenty-four hour traffic count data for the eastbound H-1 Freeway at the Halawa Stream Bridge. LOS threshold lines were plotted on the graph for three (3) open eastbound H-1 Freeway lanes. The most favorable work hours were determined to be 8:00 p.m. to 4:00 a.m. based on the Section 645-Work Zone Traffic Control.

- 78EBR-822 – 99 East Stadium/Pearl Harbor and 78 East H–1 Honolulu

  The twenty-four hour traffic count data for the eastbound Moanalua Freeway on-ramp to Honolulu and the twenty-four hour traffic count data for the eastbound Stadium, Pearl Harbor demand are reflected in Figure 49. LOS threshold lines were plotted on the graph for one (1) open lane. The most favorable work hours were determined to be 10:00 p.m. to 4:00 a.m.

  Figure 50 shows the twenty-four hour traffic count data for the eastbound Moanalua Freeway on-ramp to Honolulu combined with the eastbound lanes to the Stadium, Pearl Harbor. The most favorable work hours were determined to be 11:00 p.m. to 4:00 a.m.

  Figure 51 shows the twenty-four hour traffic count data for the eastbound lanes to the Stadium, Pearl Harbor combined with the eastbound H-1 Freeway on-ramp to Honolulu. The most favorable work hours were determined to be 11:00 p.m. to 4:00 a.m.

- H1WB-601 – Exit 8A Interstate H–2 North Mililani/Wahiawa 1 Mile

  Figure 52 shows the twenty-four hour traffic count data for the westbound H-1 Freeway west of Kaonohi Street. LOS threshold lines were plotted

on the graph for four (4) open westbound H-1 Freeway lanes. The most favorable work hours were determined to be 11:00 p.m. to 3:30 a.m. based on the Section 645-Work Zone Traffic Control.

- H1EB-114 – Exit 10 Pearlridge, Waimalu Next Right

  Figure 53 shows the twenty-four hour traffic count data for the eastbound H-1 Freeway west of Kaonohi Street. LOS threshold lines were plotted on the graph for four (4) open eastbound H-1 Freeway lanes. The most favorable work hours were determined to be 8:00 p.m. to 3:30 a.m. based on the Section 645-Work Zone Traffic Control.

- H1EB-113 – Exit 10 Pearlridge, Waimalu 1/2 Mile

  Figure 54 shows the twenty-four hour traffic count data for the eastbound H-1 Freeway west of Kaonohi Street. LOS threshold lines were plotted on the graph for four (4) open eastbound H-1 Freeway lanes. The most favorable work hours were determined to be 8:00 p.m. to 3:30 a.m. based on the Section 645-Work Zone Traffic Control.

- H1WB-602 – Exit 8B Waipahu 1/2 Mile

  Figure 55 shows the twenty-four hour traffic count data for the westbound H-1 Freeway west of Kaonohi Street. LOS threshold lines were plotted on the graph for four (4) open westbound H-1 Freeway lanes. The most favorable work hours were determined to be 11:00 p.m. to 3:30 a.m. based on the Section 645-Work Zone Traffic Control.

- H1EB-112 – Exit 10 Waimalu, Pearlridge 1 Mile

  Figure 56 shows the twenty-four hour traffic count data for the eastbound H-1 Freeway west of Kaonohi Street. LOS threshold lines were plotted on the graph for four (4) open eastbound H-1 Freeway lanes. The most favorable work hours were determined to be 8:00 p.m. to 3:30 a.m. based on the Section 645-Work Zone Traffic Control.

- H1EB-103 – Exit 5, 750, 76 Kunia, Waipahu / Ewa 1 Mile Exit Only

  Figure 57 shows the twenty-four hour traffic count data for the eastbound H-1 Freeway near Waikele. LOS threshold lines were plotted on the graph for two (2) open eastbound H-1 Freeway lanes. The most favorable work hours were determined to be 8:00 p.m. to 3:30 a.m.

  Figure 58 shows the twenty-four hour traffic count data for the eastbound H-1 Freeway near Waikele. LOS threshold lines were plotted on the graph for one (1) open eastbound H-1 Freeway lane. The most favorable work hours were determined to be 10:00 p.m. to 3:00 a.m.

V. ROADWAY CLOSURE TIMES

Location	**Hours**
H1WB-402 – Exit 26 Waialae Avenue	
Demolition, Installation, Removal, Erection	
(Westbound - H-1 Freeway)	
2 lanes open:	8:00 p.m. to Midnight, Monday through Thursday Midnight to 4:00 a.m., Tuesday through Friday
H1WBR-452 – Waialae Avenue	
Demolition, Foundation/Miscellaneous Work, Installation, Removal, Erection	
(Westbound - Waialae Avenue Ramp)	
Ramp Closure:	9:00 p.m. to Midnight, Monday through Thursday Midnight to 5:00 a.m., Tuesday through Friday
H1WB-407 – Exit 24B University Avenue 1/2 Mile	
Demolition, Foundation/Miscellaneous Work, Installation	
(Westbound – H-1 Freeway)	
2 lanes open:	9:00 p.m. to Midnight, Monday through Thursday Midnight to 4:00 a.m., Tuesday through Friday

Location	**Hours**
Removal, Erection	
(Westbound – H-1 Freeway)	
1 lane open:	10:30 p.m. to Midnight, Monday through Thursday Midnight to 4:00 a.m., Tuesday through Friday

H1WB -411 – Vineyard Boulevard 1/4, Pali Highway 3/4, School Street 1-1/4

Demolition, Foundation/Miscellaneous Work, Installation	
(Westbound – H-1 Freeway)	
2 lanes open:	9:00 p.m. to Midnight, Monday through Thursday Midnight to 4:00 a.m., Tuesday through Friday
(Eastbound – H-1 Freeway)	
2 lanes open:	9:00 p.m. to Midnight, Monday through Thursday Midnight to 4:00 a.m., Tuesday through Friday
Removal, Erection	
(Westbound – H-1 Freeway)	
1 lanes open:	10:30 p.m. to Midnight, Monday through Thursday Midnight to 4:00 a.m., Tuesday through Friday
(Eastbound – H-1 Freeway)	
2 lanes open:	9:00 p.m. to Midnight, Monday through Thursday Midnight to 4:00 a.m., Tuesday through Friday

H1WBR-453 – 61 North Pali Highway

Demolition, Foundation/Miscellaneous Work, Installation	
(Westbound – Punchbowl Street to H-1 Freeway and Punchbowl Street to the Pali Highway)	
1 lane open:	10:30 p.m. to Midnight, Monday through Thursday Midnight to 4:30 a.m., Tuesday through Friday

Location	**Hours**
Removal, Erection	
(Westbound – Punchbowl Street to H-1 Freeway and Pali Highway, and H-1 Freeway Off-ramp to Pali Highway)	
No Lanes open:	11:00 p.m. to Midnight, Mondaythrough Thursday Midnight to 4:00 a.m., Tuesday through Friday
H1WB-415 – H-1 West Freeway	
Demolition, Foundation/Miscellaneous Work, Installation	
(Westbound – H-1 Freeway)	
2 lanes open:	9:00 p.m. to Midnight, Monday through Thursday Midnight to 4:00 a.m., Tuesday through Friday
Removal, Erection	
(Westbound – Pali Highway On-ramp from Punchbowl Street)	
1 lane open:	11:00 p.m. to Midnight, Monday through Thursday Midnight to 4:00 a.m., Tuesday through Friday
(Westbound – H-1 Freeway)	
2 lanes open:	9:00 p.m. to Midnight, Monday through Thursday Midnight to 4:00 a.m., Tuesday through Friday
H1WB-416 – Palama Street 1/2, Houghtailing Street 1, Likelike Highway 1-1/2	
Demolition, Foundation/Miscellaneous Work, Installation	
(Westbound – H-1 Freeway)	
2 lanes open:	9:00 p.m. to Midnight, Monday through Thursday Midnight to 4:00 a.m., Tuesday through Friday
Removal, Erection	
(Westbound – H-1 Freeway)	
1 lanes open:	11:00 p.m. to Midnight, Monday through Thursday Midnight to 4:00 a.m., Tuesday through Friday

Location	**Hours**
H1WB-417 – Exit 20B Houghtailing Street 1/2 Mile, 20C Exit, Palama Street Exit 20C	
Demolition, Foundation/Miscellaneous Work, Installation	
(Westbound – H-1 Freeway)	
2 lanes open:	9:00 p.m. to Midnight, Monday through Thursday Midnight to 4:00 a.m., Tuesday through Friday
(Westbound – Palama Ramp Closed)	
Ramp closed:	8:00 p.m. to Midnight, Monday through Thursday Midnight to 4:30 a.m., Tuesday through Friday
Removal, Erection	
(Westbound – H-1 Freeway)	
1 lane open:	11:00 p.m. to Midnight, Monday through Thursday Midnight to 4:00 a.m., Tuesday through Friday
(Westbound – Palama Ramp Closed)	
Ramp closed:	8:00 p.m. to Midnight, Monday through Thursday Midnight to 4:30 a.m., Tuesday through Friday
H1WB-418 – Houghtailing Street 1/4, Likelike Highway ¾, Middle Street 1-1/4	
Demolition, Foundation/Miscellaneous Work, Installation	
(Westbound – H-1 Freeway)	
2 lanes open:	9:00 p.m. to Midnight, Monday through Thursday Midnight to 4:00 a.m., Tuesday through Friday
Removal, Erection	
(Westbound – H-1 Freeway)	
1 lane open:	11:00 p.m. to Midnight, Monday through Thursday Midnight to 4:00 a.m., Tuesday through Friday

Location	**Hours**
H1WB-420 – Exit 20A 63 North Likelike Highway Exit Only	
Demolition, Foundation/Miscellaneous Work, Installation	
(Westbound – H-1 Freeway)	
3 lanes open:	9:00 p.m. to Midnight, Monday through Thursday Midnight to 4:00 a.m., Tuesday through Friday
Removal, Erection	
(Westbound – H-1 Freeway)	
2 lanes open:	9:00 p.m. to Midnight, Monday through Thursday Midnight to 4:00 a.m., Tuesday through Friday
H1EBR-351 – 63 North Likelike Highway	
Installation, Removal, Erection	
(Eastbound - Kalihi Street Closure)	
No lanes open:	10:00 p.m. to Midnight, Monday through Thursday Midnight to 4:30 a.m., Tuesday through Friday
78WB-851 – Exit 4 Fort Shafter, Ahua Street 1/4 Mile	
Demolition, Foundation/Miscellaneous Work, Installation	
(Westbound – Moanalua Freeway)	
2 lanes open:	9:00 p.m. to Midnight, Monday through Thursday Midnight to 4:00 a.m., Tuesday through Friday
Removal, Erection	
(Westbound – Moanalua Freeway)	
1 lane open:	11:00 p.m. to Midnight, Monday through Thursday Midnight to 4:00 a.m., Tuesday through Friday

Location	**Hours**
H1EB-205 – Exit 15, 92, East Nimitz Highway West Hickam AFB, Naval Base	
Foundation/Miscellaneous Work, Demolition, Installation	
(Eastbound – H-1 Freeway)	
4 lanes open:	8:00 p.m. to Midnight, Monday through Thursday Midnight to 4:00 a.m., Tuesday through Friday
Removal, Erection	
(Eastbound – H-1 Freeway)	
3 lanes open:	8:00 p.m. to Midnight, Monday through Thursday Midnight to 4:00 a.m., Tuesday through Friday
78EBR-822 – 99 East Stadium/Pearl Harbor and 78 East H-1 Honolulu	
Demolition, Foundation/Miscellaneous Work, Installation	
(Eastbound – 1 lane to the Stadium/Pearl Harbor, 1 Lane to Moanalua Freeway)	
Total of 2 lanes open:	10:00 p.m. to Midnight, Monday through Thursday Midnight to 4:00 a.m., Tuesday through Friday
Removal, Erection	
Phase 1A	
(Eastbound – 2 lanes to the Stadium/Pearl Harbor)	
2 lanes open:	11:00 p.m. to Midnight, Monday through Thursday Midnight to 4:00 a.m., Tuesday through Friday
Phase 1B	
(Eastbound – 1 lane to Moanalua Freeway)	
1 lane open:	11:00 p.m. to Midnight, Monday through Thursday Midnight to 4:00 a.m., Tuesday through Friday

Location	**Hours**
H1WB-601 – Exit 8A Interstate H2 North Mililani/Wahiawa 1 Mile	
Demolition, Installation, Removal, Erection	
(Westbound – H-1 Freeway)	
4 lanes open:	11:00 p.m. to Midnight, Monday through Thursday Midnight to 3:30 a.m., Tuesday through Friday
H1EB-114 – Exit 10 Pearlridge, Waimalu Next Right	
Demolition, Installation, Removal, Erection	
(Eastbound – H-1 Freeway)	
4 lanes open:	8:00 p.m. to Midnight, Monday through Thursday Midnight to 3:30 a.m., Tuesday through Friday
H1EB-113 – Exit 10 Pearlridge, Waimalu 1/2 Mile	
Demolition, Installation, Removal, Erection	
(Eastbound – H-1 Freeway)	
4 lanes open:	8:00 p.m. to Midnight, Monday through Thursday Midnight to 3:30 a.m., Tuesday through Friday
H1WB-602 – Exit 8B Waipahu 1/2 Mile	
Demolition, Installation, Removal, Erection	
(Westbound – H-1 Freeway)	
4 lanes open:	11:00 p.m. to Midnight, Monday through Thursday Midnight to 3:30 a.m., Tuesday through Friday
H1EB-112 – Exit 10 Waimalu, Pearlridge 1 Mile	
Demolition, Installation, Removal, Erection	
(Eastbound – H-1 Freeway)	
4 lanes open:	8:00 p.m. to Midnight, Monday through Thursday Midnight to 3:30 a.m., Tuesday through Friday

Location	Hours
H1EB-103 – Exit 5, 750, 76 Kunia, Waipahu/Ewa 1 Mile Exit Only	
Demolition, Installation (Eastbound – H-1 Freeway)	
2 lanes open:	8:00 p.m. to Midnight, Monday through Thursday Midnight to 3:30 a.m., Tuesday through Friday
Removal, Erection (Eastbound – H-1 Freeway)	
1 lane open:	10:00 p.m. Midnight, Monday through Thursday Midnight to 3:00 a.m., Tuesday through Friday

Penalties to the Contractor for non-compliance are outlined in Section 108 of the Special Provisions.

VI. WORK ZONE IMPACTS ASSESSMENT REPORT

A. Qualitative Summary of Anticipated Work Zone Impacts

Freeway and roadway lane closures will be implemented at night when traffic volumes are lower as described in the "Traffic Predictions During Construction" Section above. Diversion routes will be implemented during complete roadway closures for the following signs: H1WBR-452, H1WBR-453, H1WB-415, H1WB-417, H1EBR-351 and 78EBR-822.

B. Impacts Assessment of Alternative Project Design and Management Strategies

Closure of the freeways or roadway lane(s) to perform the demolition, foundation/miscellaneous work, installation, removal and installation for the signs on the H-1 Freeway and Moanalua Freeway will occur during the night to avoid significant impacts to motorist during daylight hours.

C. Traffic Analysis Results

The analysis is based on past experience and analysis of daily traffic patterns in the "Traffic Predictions During Construction" Section. Freeway closures and freeway lane closures will occur at night when traffic volumes are lower.

VII. SELECTED WORK ZONE IMPACTS MANAGEMENT STRATEGIES

A. Temporary Traffic Control (TTC) Strategies

The freeway closure schedule in the Traffic Predictions During Construction Section are meant for recurring travel patterns as it is recognized that fluctuations in traffic pattern will occur due to various non-recurring causes. The schedule is provided to identify overnight periods when traffic volumes are considered favorable to implement roadway lane closures or diversion routes. Additional recommendations regarding the implementation of freeway closures are mentioned below.

- Coordinate with the City and County to provide monitoring of traffic operations on the diversion routes during the (H1WBR-452) westbound Waialae Ramp closure, the (H1WBR-453) westbound H-1 Freeway off-ramp to northbound Pali Highway along with Punchbowl Street to the westbound H-1 Freeway and to the Pali Highway closures, the (H1WB-415) westbound H-1 Freeway on-ramp from Punchbowl Street and Pali Highway on-ramp from Punchbowl Street closure, the (H1WB-417) westbound H-1 Freeway off-ramp to Palama Street closure, the (H1EBR-351) closure of Northbound Kalihi Street, and the (78EBR-822) closures of the Moanalua Freeway on-ramp to Honolulu and the Stadium, Pearl Harbor from Kamehameha Highway and to adjust the traffic signal timing to accommodate the higher traffic volumes on these routes during night hours.

- Coordinate sign construction with the Zip Lane and provide a minimum 30-minute buffer period between the two (2) operations.

- Notify the public in advance of lane closure dates and times using message boards, advertisements and other means.
- Modify the schedule if congestion occurs. Construction times may be adjusted in 1/2 hour increments at the beginning or at the end of the time period.
- Prohibit lane closures on holidays where traffic volumes may be higher.
- Inform TheBus and emergency responders (police, fire and ambulance services) dates and times of planned freeway closures.

B. Public Information

All public information will be handled by the HDOT Public Information Office. Section 645 of the Special Provisions outlines public information practices required for the project.

C. Transportation Operations

Applicable Work Zone Safety Management Strategies will be implemented during construction, including use of advisory speed limits and traffic control devices as outlined in the MUTCD.

VIII. TMP MONITORING DURING CONSTRUCTION

A. Evaluation Report of Failures of TMP

A request will be made of HWY-OC to document and evaluate any failures of the TMP, for future use by other projects.

FIGURES

NORTH

NOT TO SCALE

H–1 AND H–2
UPGRADE / REPLACEMENT
OF DESTINATION SIGNS

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

FIGURE 1

PROJECT LOCATION MAP

FROM GOOGLE EARTH

H-1 AND H-2
UPGRADE / REPLACEMENT
OF DESTINATION SIGNS

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

FIGURE
2

H1WB-402 - EXIT 26 WAIALAE AVENUE

FROM GOOGLE EARTH

H-1 AND H-2
UPGRADE / REPLACEMENT
OF DESTINATION SIGNS

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

FIGURE
3

H1WBR-452 - WAIALAE AVENUE

FROM GOOGLE EARTH

H-1 AND H-2
UPGRADE / REPLACEMENT
OF DESTINATION SIGNS

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

FIGURE
4

H1WB-407 - EXIT 24B UNIVERSITY AVENUE ½ MILE

FROM GOOGLE EARTH

H-1 AND H-2
UPGRADE / REPLACEMENT
OF DESTINATION SIGNS

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

H1WB-411 – VINEYARD BLVD. ¼ , PALI HWY. ¾ , SCHOOL ST. 1-¼

FIGURE
5

FROM GOOGLE EARTH

H-1 AND H-2
UPGRADE / REPLACEMENT
OF DESTINATION SIGNS

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
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FIGURE
6

H1WBR-453 – 61 NORTH PALI HIGHWAY

FROM GOOGLE EARTH

H-1 AND H-2
UPGRADE / REPLACEMENT
OF DESTINATION SIGNS

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

FIGURE
7

H1WB-415 – H-1 WEST FREEWAY

FROM GOOGLE EARTH

H-1 AND H-2
UPGRADE / REPLACEMENT
OF DESTINATION SIGNS

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

FIGURE
8

H1WB-416 – PALAMA ST. ½, HOUGHTAILING ST. 1, LIKELIKE HWY. 1-½

FROM GOOGLE EARTH

H-1 AND H-2
UPGRADE / REPLACEMENT
OF DESTINATION SIGNS

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

FIGURE
9

H1WB-417 – EXIT 20B HOUGHTAILING ST. ½ MILE, 20C EXIT, PALAMA ST. EXIT 20C

FROM GOOGLE EARTH

H-1 AND H-2
UPGRADE / REPLACEMENT
OF DESTINATION SIGNS

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

FIGURE
10

H1WB-418 – HOUGHTAILING ST. ¼ , LIKELIKE HWY. ¾ , MIDDLE ST. 1-¼

FROM GOOGLE EARTH

H-1 AND H-2
UPGRADE / REPLACEMENT
OF DESTINATION SIGNS

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
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FIGURE
11

H1WB-420 – EXIT 20A, 63 NORTH LIKELIKE HWY. EXIT ONLY

FROM GOOGLE EARTH

H-1 AND H-2
UPGRADE / REPLACEMENT
OF DESTINATION SIGNS

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

FIGURE
12

H1EBR-351 – 63 NORTH LIKELIKE HIGHWAY

FROM GOOGLE EARTH

H-1 AND H-2
UPGRADE / REPLACEMENT
OF DESTINATION SIGNS

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

78WB-851 – EXIT 4, FT. SHAFTER, AHUA ST. ¼ MILE

FIGURE
13

FROM GOOGLE EARTH

H-1 AND H-2
UPGRADE / REPLACEMENT
OF DESTINATION SIGNS

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
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FIGURE
14

H1EB-205 – EXIT 15, 92, EAST NIMITZ HWY., WEST HICKAM AFB, NAVAL BASE

FROM GOOGLE EARTH

H-1 AND H-2
UPGRADE / REPLACEMENT
OF DESTINATION SIGNS

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

78EBR-822 – 99 EAST STADIUM/PEARL HARBOR AND 78 EAST MOANALUA FWY. ON-RAMP

FIGURE
15

FROM GOOGLE EARTH

H-1 AND H-2
UPGRADE / REPLACEMENT
OF DESTINATION SIGNS

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
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FIGURE
16

H1WB-601 – EXIT 8A INTERSTATE H2 NORTH
MILILANI/WAHIAWA 1 MILE

FROM GOOGLE EARTH

H-1 AND H-2
UPGRADE / REPLACEMENT
OF DESTINATION SIGNS

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
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H1EB-114 – EXIT 10 PEARLRIDGE, WAIMALU NEXT RIGHT

FIGURE
17

FROM GOOGLE EARTH

H-1 AND H-2
UPGRADE / REPLACEMENT
OF DESTINATION SIGNS

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
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FIGURE
18

H1EB-113 – EXIT 10 PEARLRIDGE, WAIMALU ½ MILE

FROM GOOGLE EARTH

H-1 AND H-2
UPGRADE / REPLACEMENT
OF DESTINATION SIGNS

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
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FIGURE
19

H1WB-602 – EXIT 8B WAIPAHU ½ MILE

FROM GOOGLE EARTH

H-1 AND H-2
UPGRADE / REPLACEMENT
OF DESTINATION SIGNS

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
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FIGURE
20

H1EB-112 – EXIT 10 WAIMALU, PEARLRIDGE 1 MILE

FROM GOOGLE EARTH

H-1 AND H-2
UPGRADE / REPLACEMENT
OF DESTINATION SIGNS

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
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FIGURE
21

H1EB-103 – EXIT 5, 750, 76 KUNIA, WAIPAHU/EWA
1 MILE EXIT ONLY

FROM GOOGLE EARTH

Figure 22 - H1WB-402 (2 WB Lanes Open)
15-Minute Plot - Kalanianaole Highway Near Ainakoa Avenue

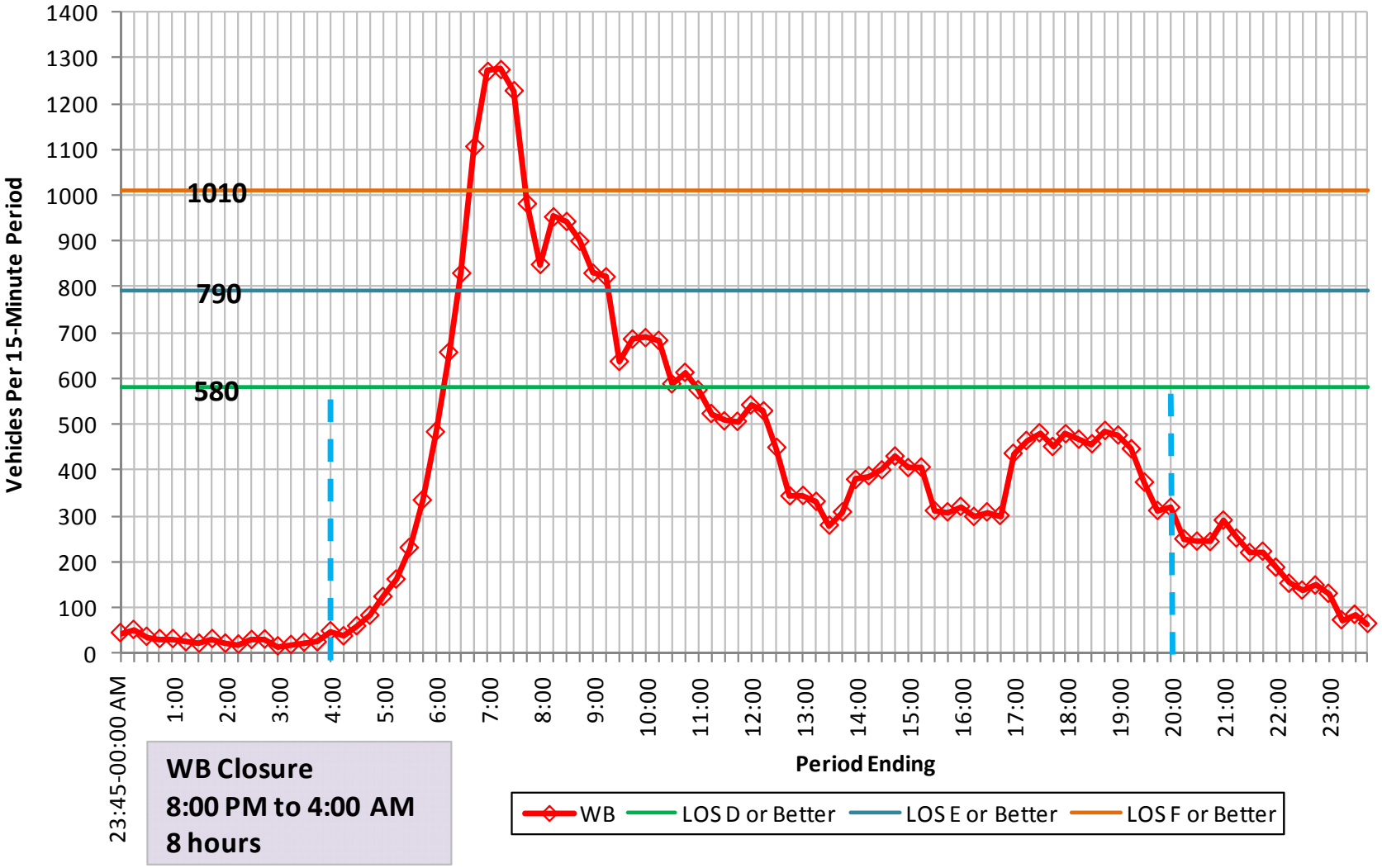


Figure 23 - H1WBR-452 (WB Waialae Ramp Closed)
15-Minute Plot - Waialae Avenue Ramp

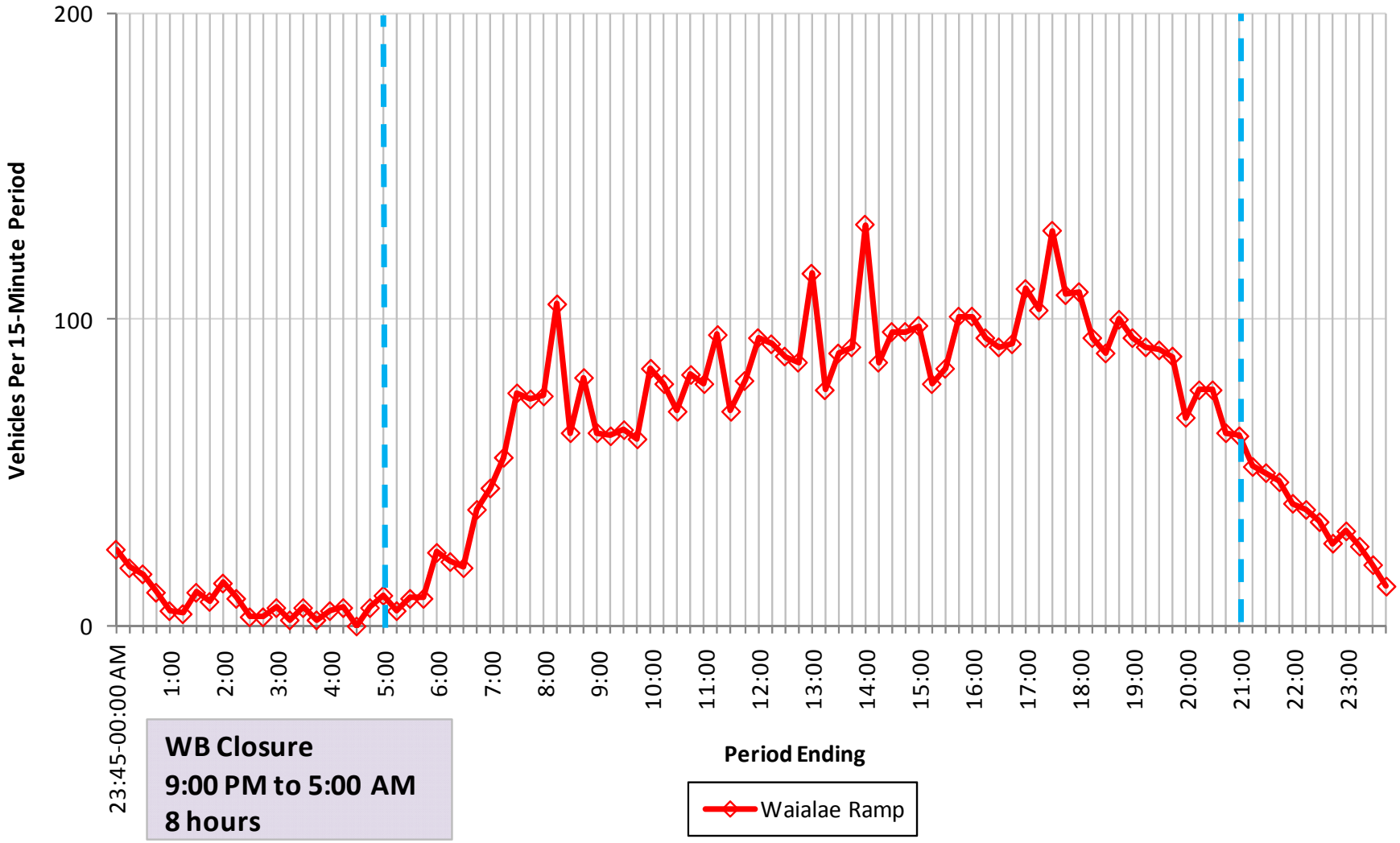


Figure 24 - H1WB-407 (2 WB Lanes Open)
15-Minute Plot - H-1 Freeway at Ward

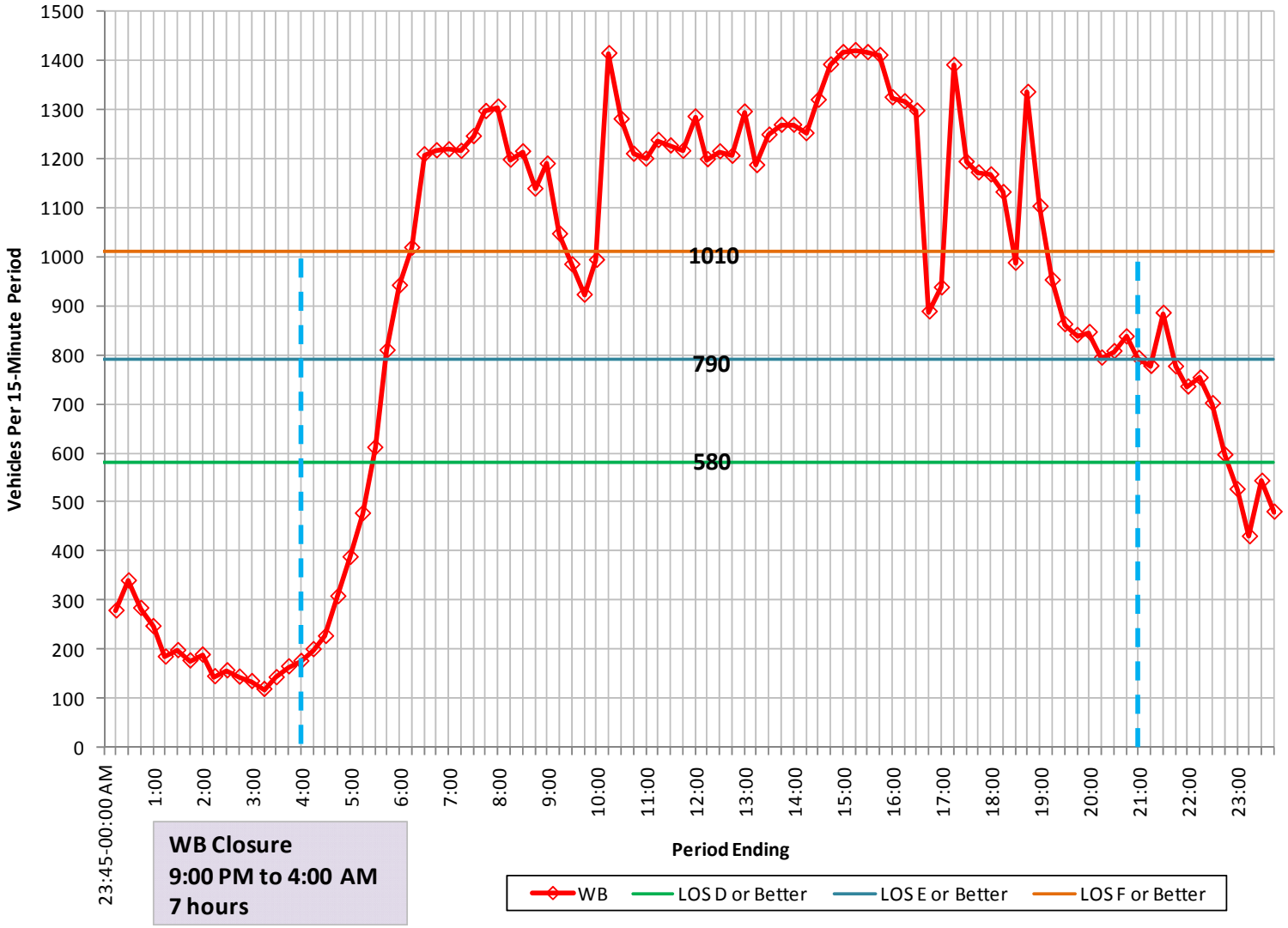


Figure 25 - H1WB-407 (1 WB Lane Open)
15-Minute Plot - H-1 Freeway at Ward

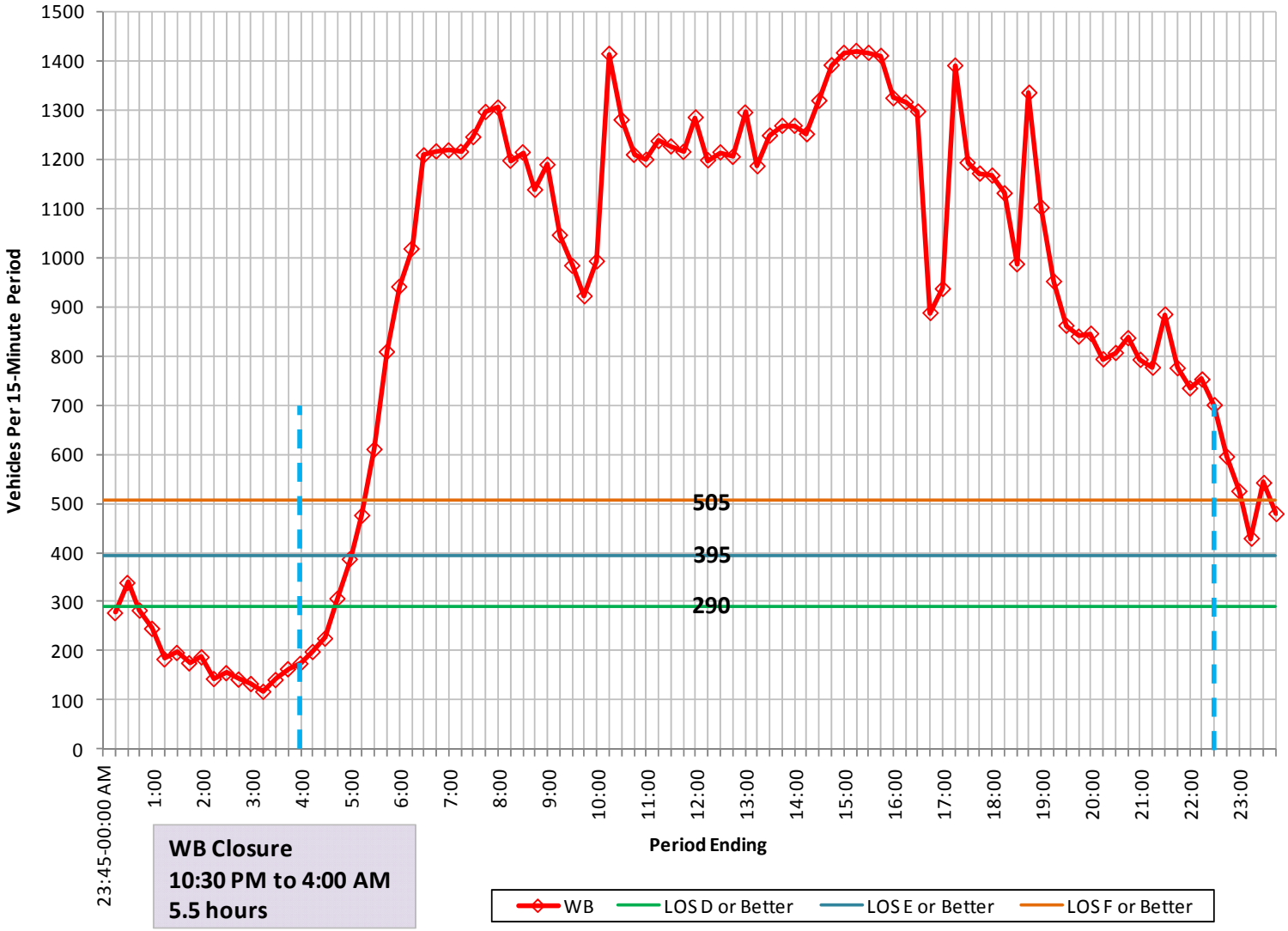


Figure 26 - H1WB-411 (2 EB Lanes Open & 2 WB Lanes Open)
15-Minute Plot - H-1 Freeway at Ward

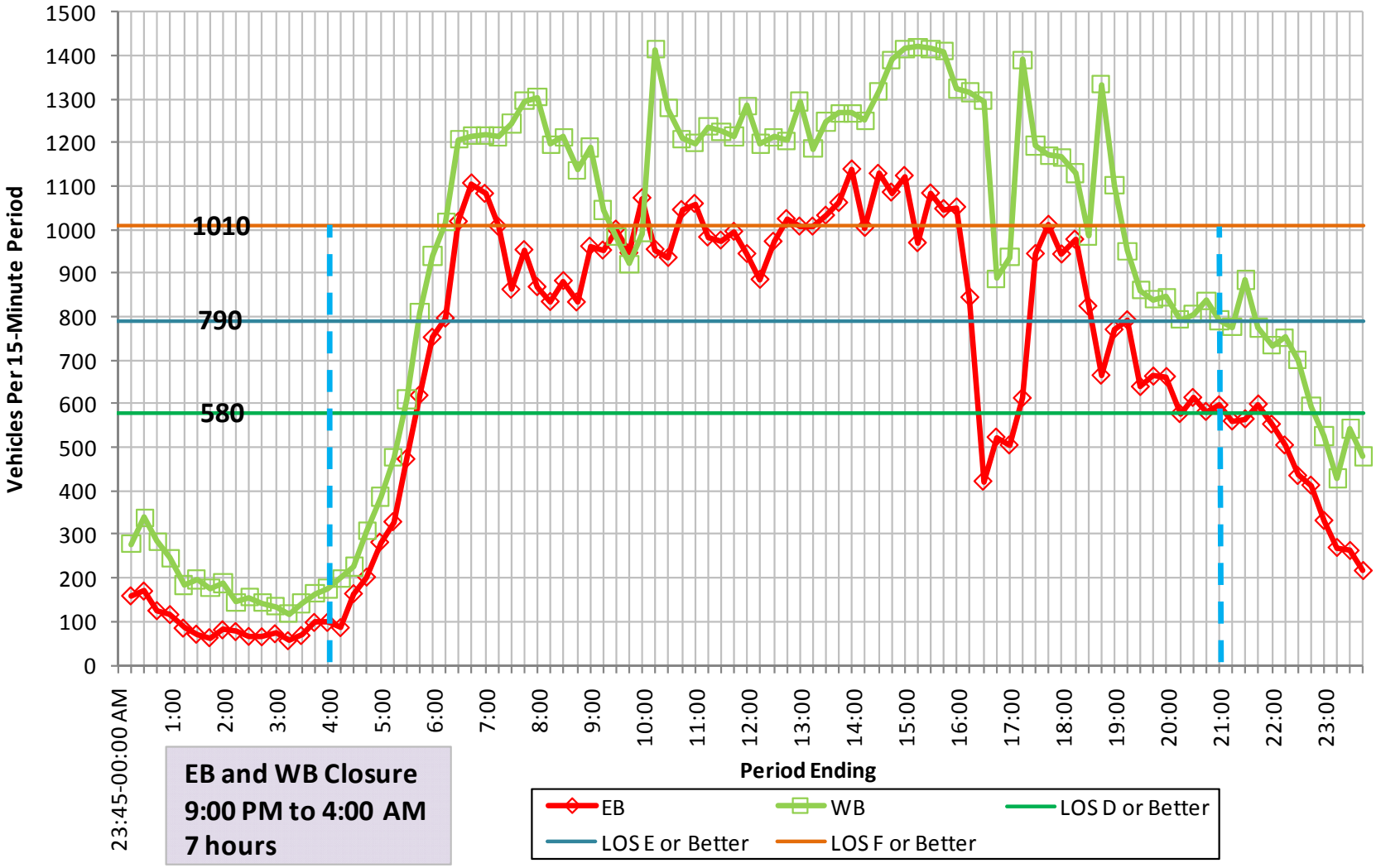


Figure 27 - H1WB-411 (1 WB Lane Open)
15-Minute Plot - H-1 Freeway at Ward

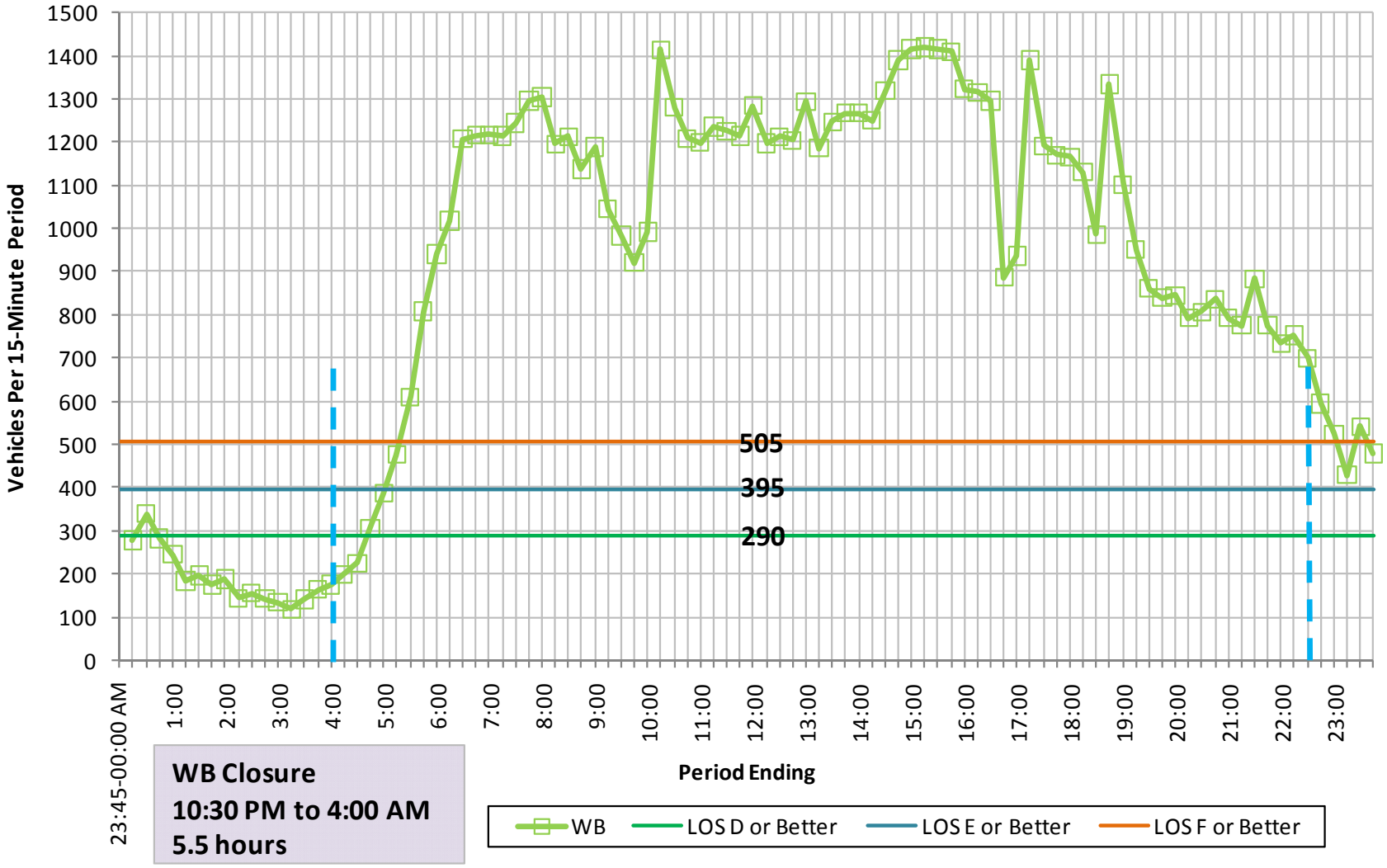


Figure 28 - H1WB-411 (2 EB Lanes Open)
15-Minute Plot - H-1 Freeway at Ward

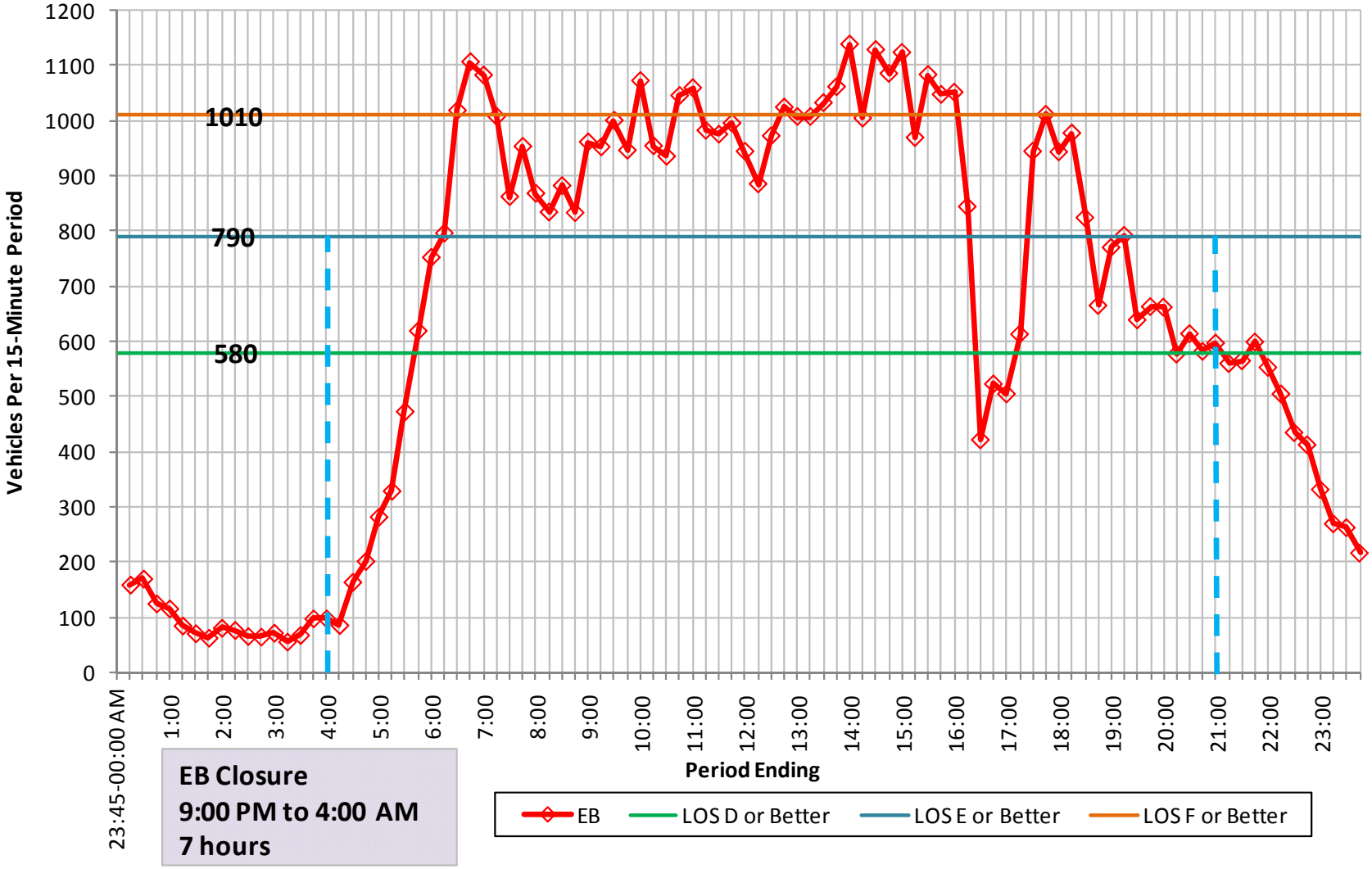


Figure 29 - H1WBR-453 (1 WB Lane Open)
15-Minute Plot - Pali Highway Ramp & WB H-1 Freeway On-Ramp from Punchbowl Street and Pali Highway On-Ramp from Punchbowl Street

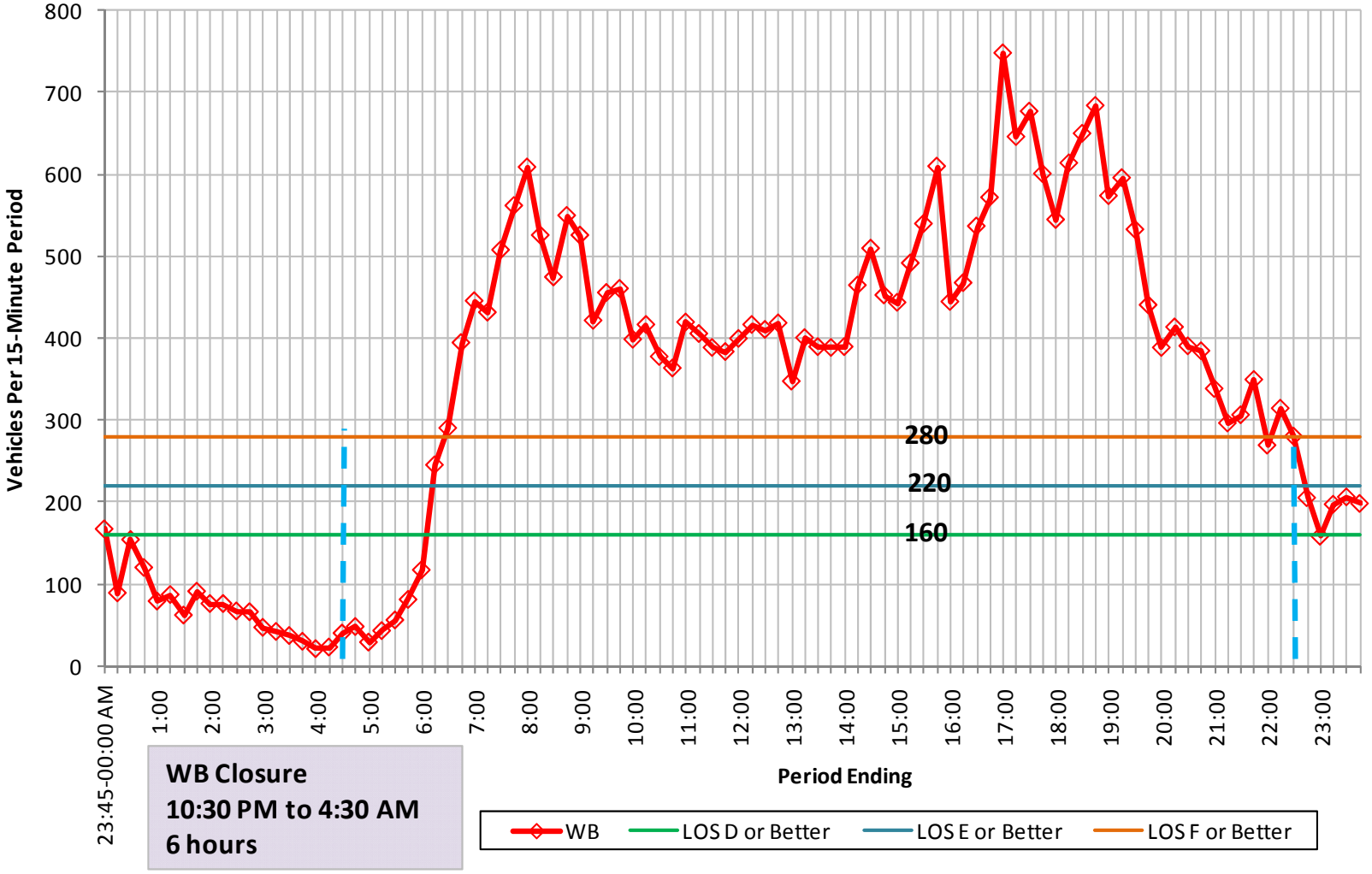


Figure 30 - H1WBR-453 (No Lanes Open , WB H-1 On-Ramp & Pali Highway On-ramp from Punchbowl Street Closed)
15-Minute Plot - Vineyard Blvd, WB H-1 Freeway On-Ramp from Punchbowl Street and Pali Highway On-Ramp from Punchbowl Street

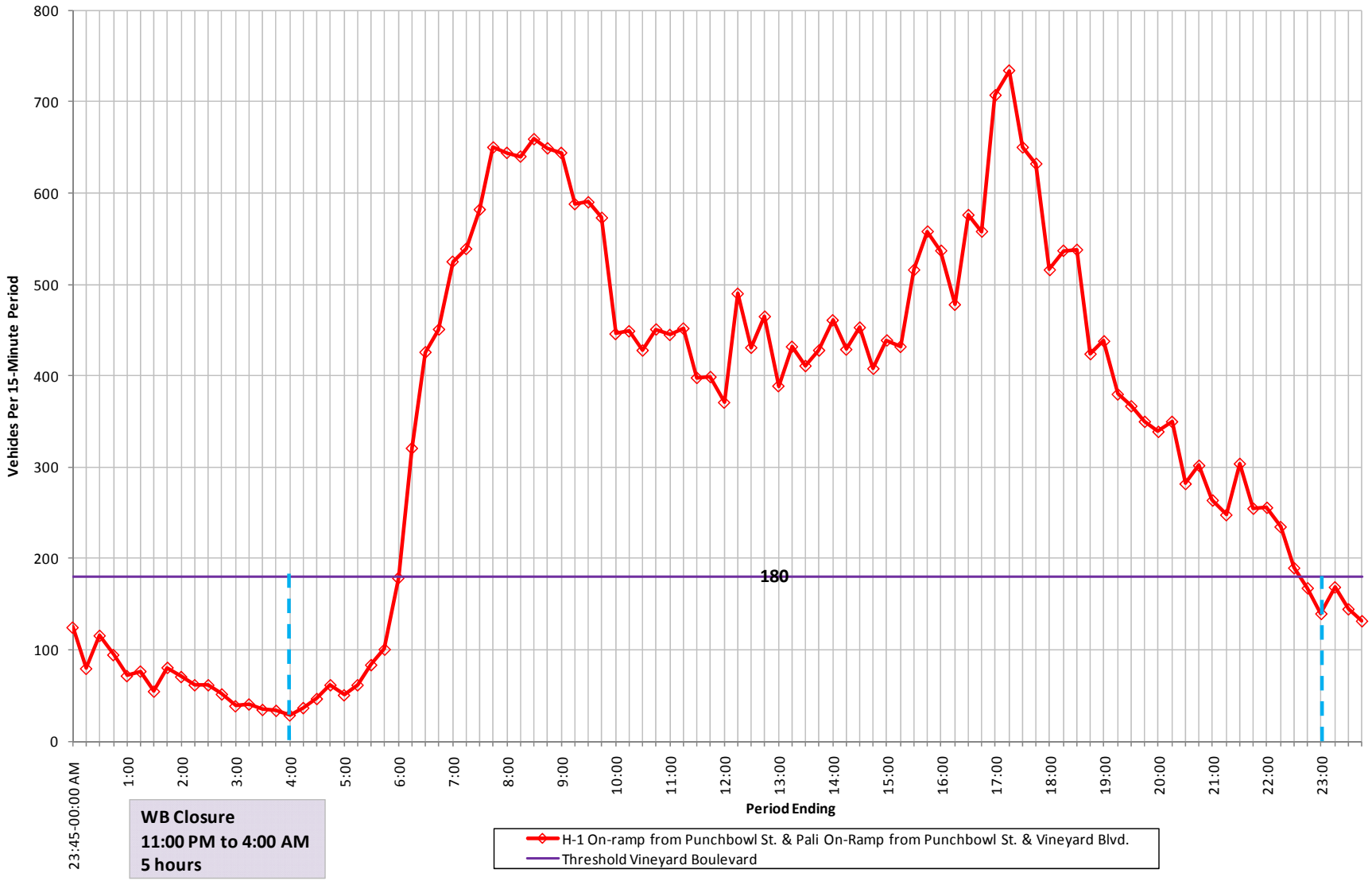


Figure 31 - H1WB-415 (2 WB Lanes Open)
15-Minute Plot - H-1 Freeway Near Ward

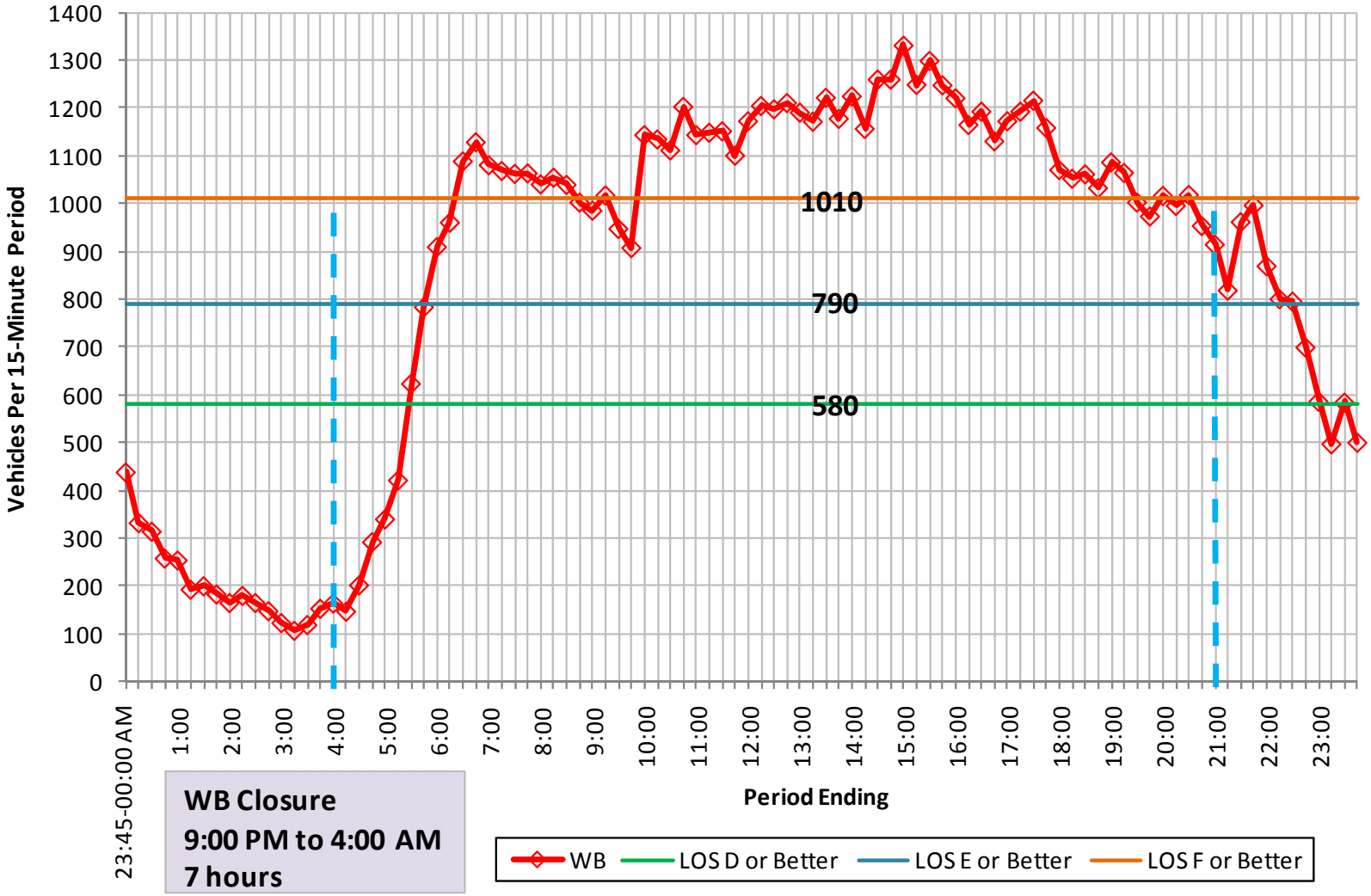


Figure 32 - H1WB-415 (2 WB Lanes Open)
15-Minute Plot - H-1 Freeway Near Ward

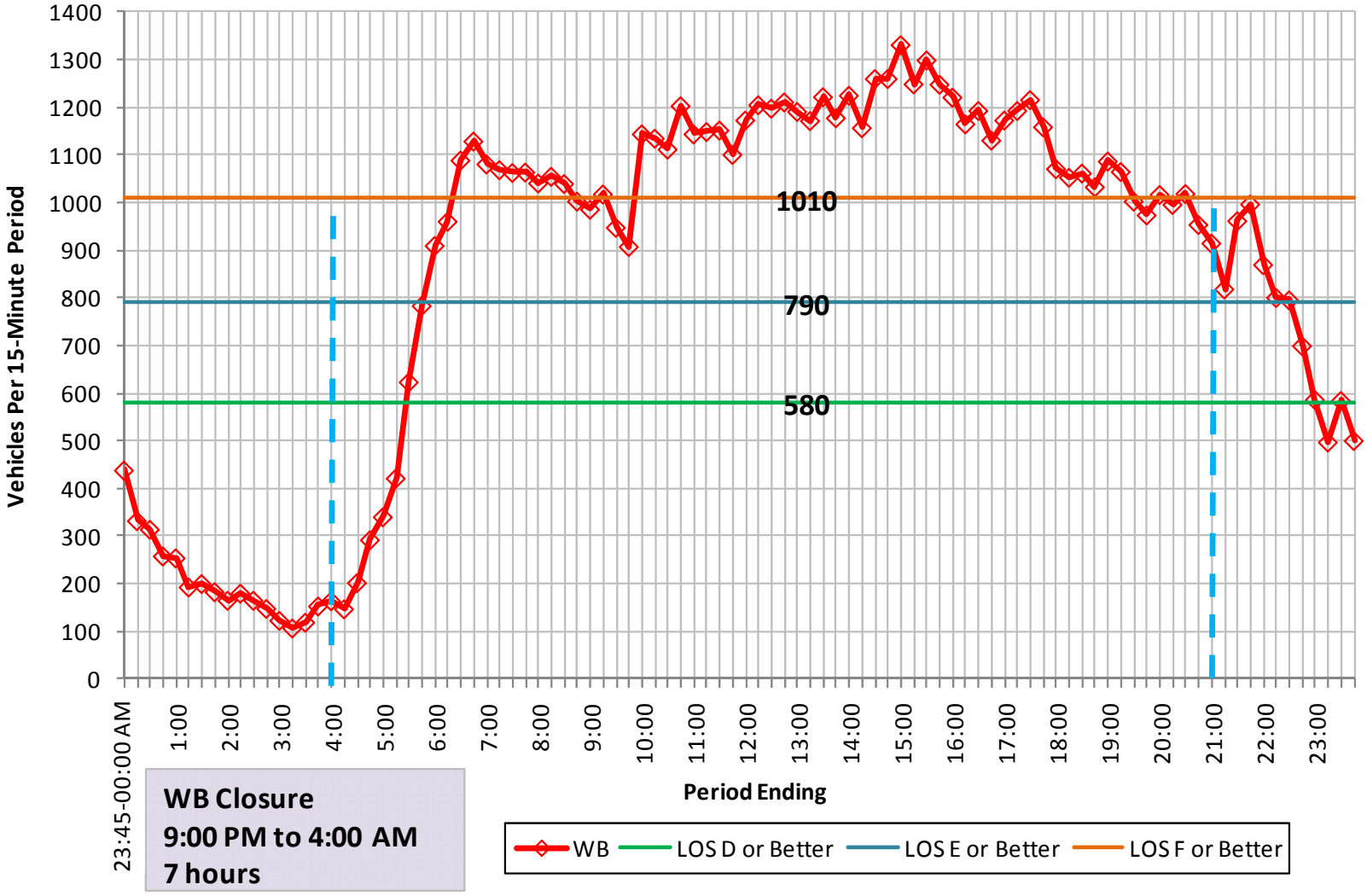


Figure 33 - H1WB-415 (WB H-1 Freeway On-Ramp from Punchbowl Street Closed)
15-Minute Plot - Punchbowl St. to WB H-1 On-ramp and Pali Highway, Pali Highway Ramp

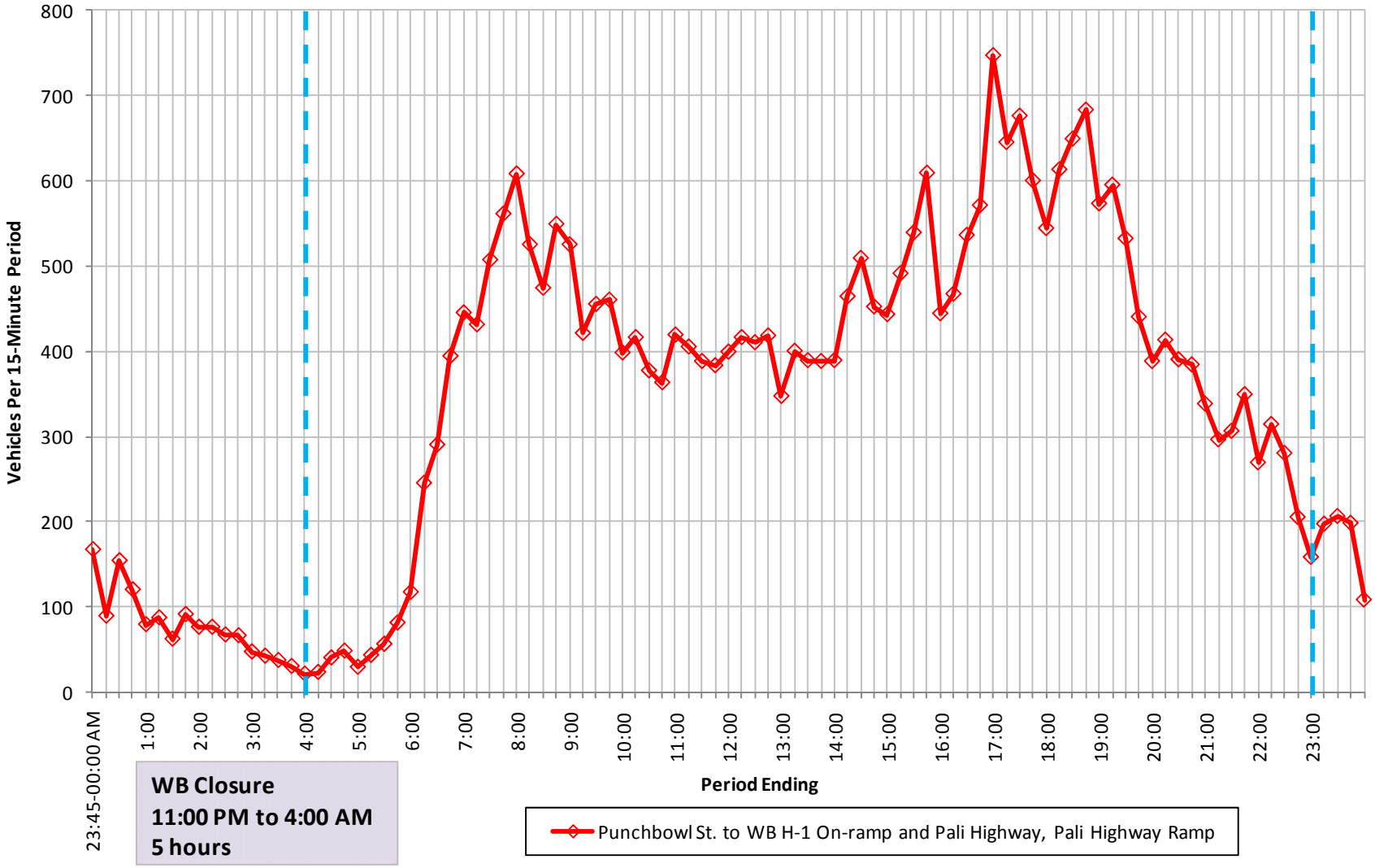


Figure 34 - H1WB-416 (2 WB Lanes Open)
15-Minute Plot - H-1 Freeway at Nuuanu Stream Bridge

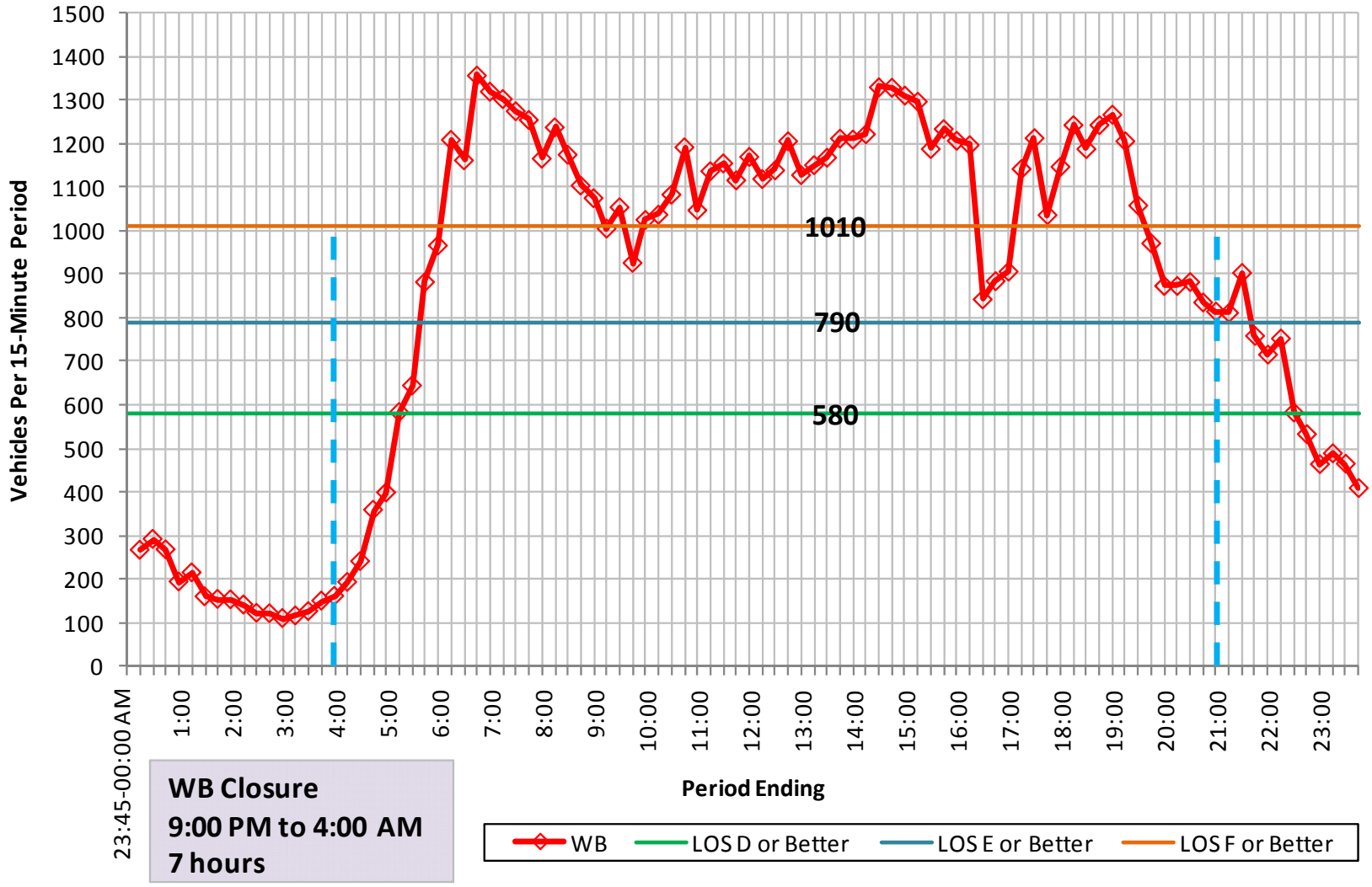


Figure 35 - H1WB-416 (1 WB Lane Open)
15-Minute Plot - H-1 Freeway at Nuuanu Stream Bridge

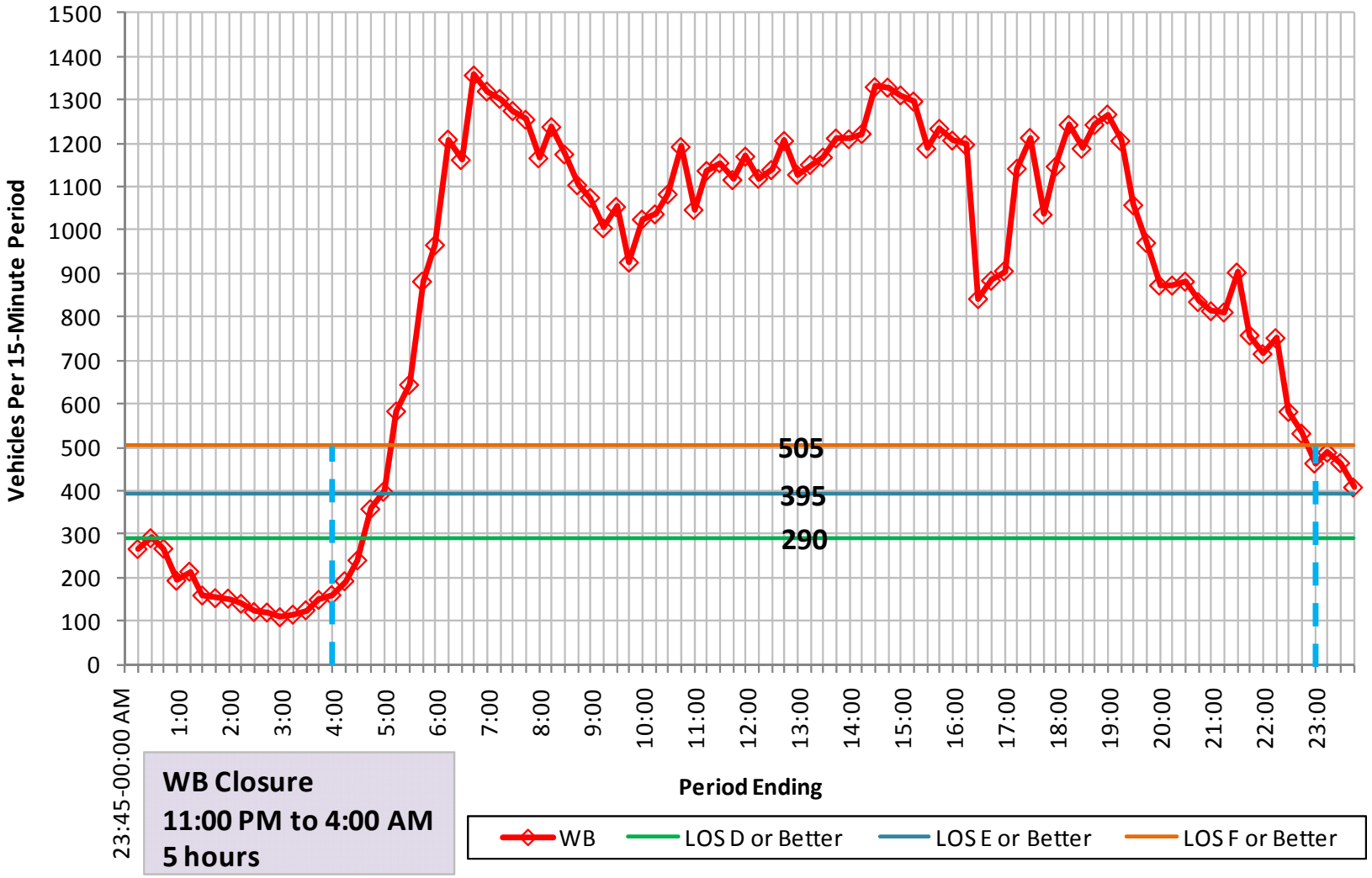


Figure 36 - H1WB-417 (2 WB Lanes Open)
15-Minute Plot - H-1 Freeway 0.5 Miles West of Ward and Palama Street Off Ramp

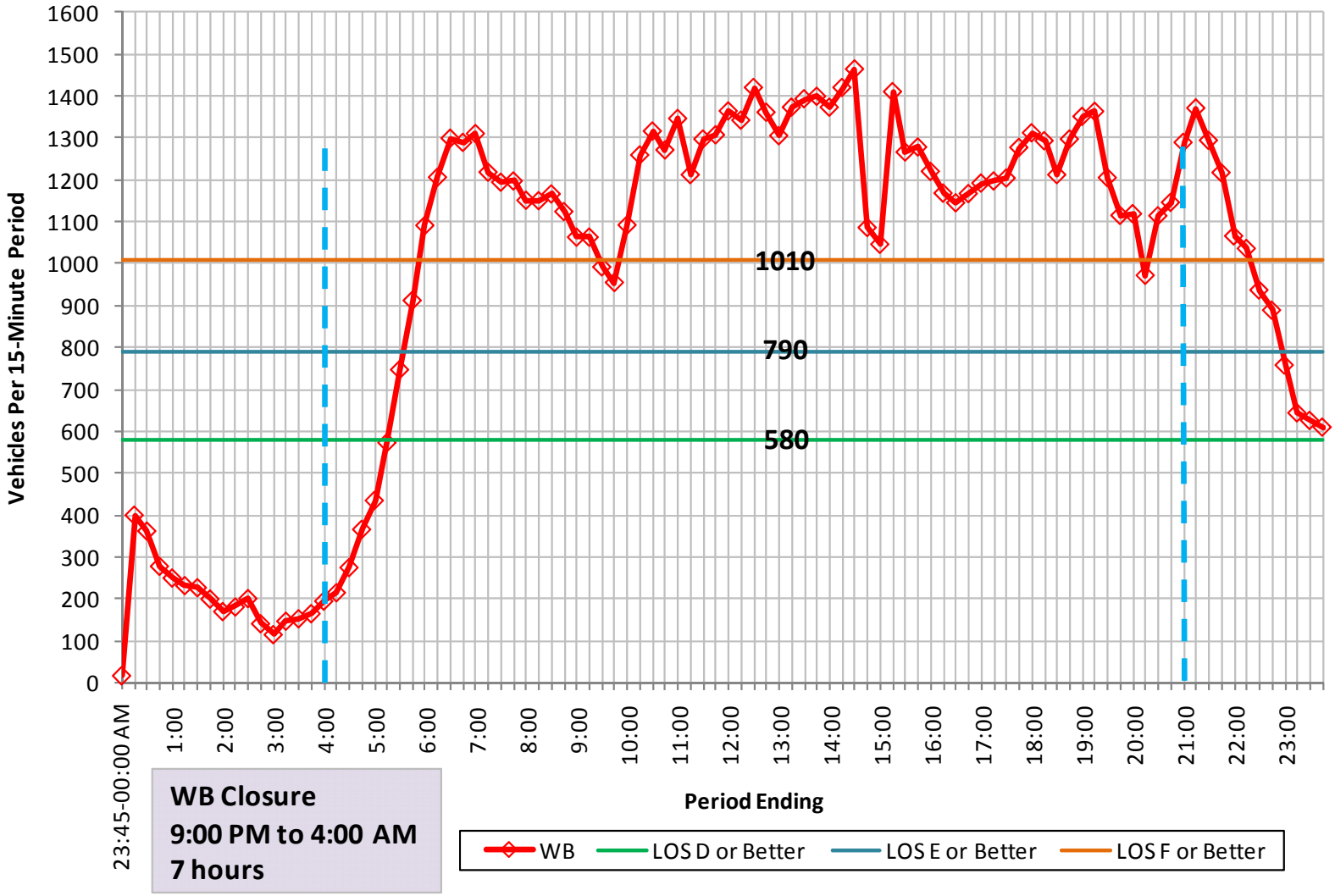


Figure 37 - H1WB-417 Detour Route (Palama Ramp Closed)
15-Minute Plot - Palama Street, North King Street, Vineyard Boulevard

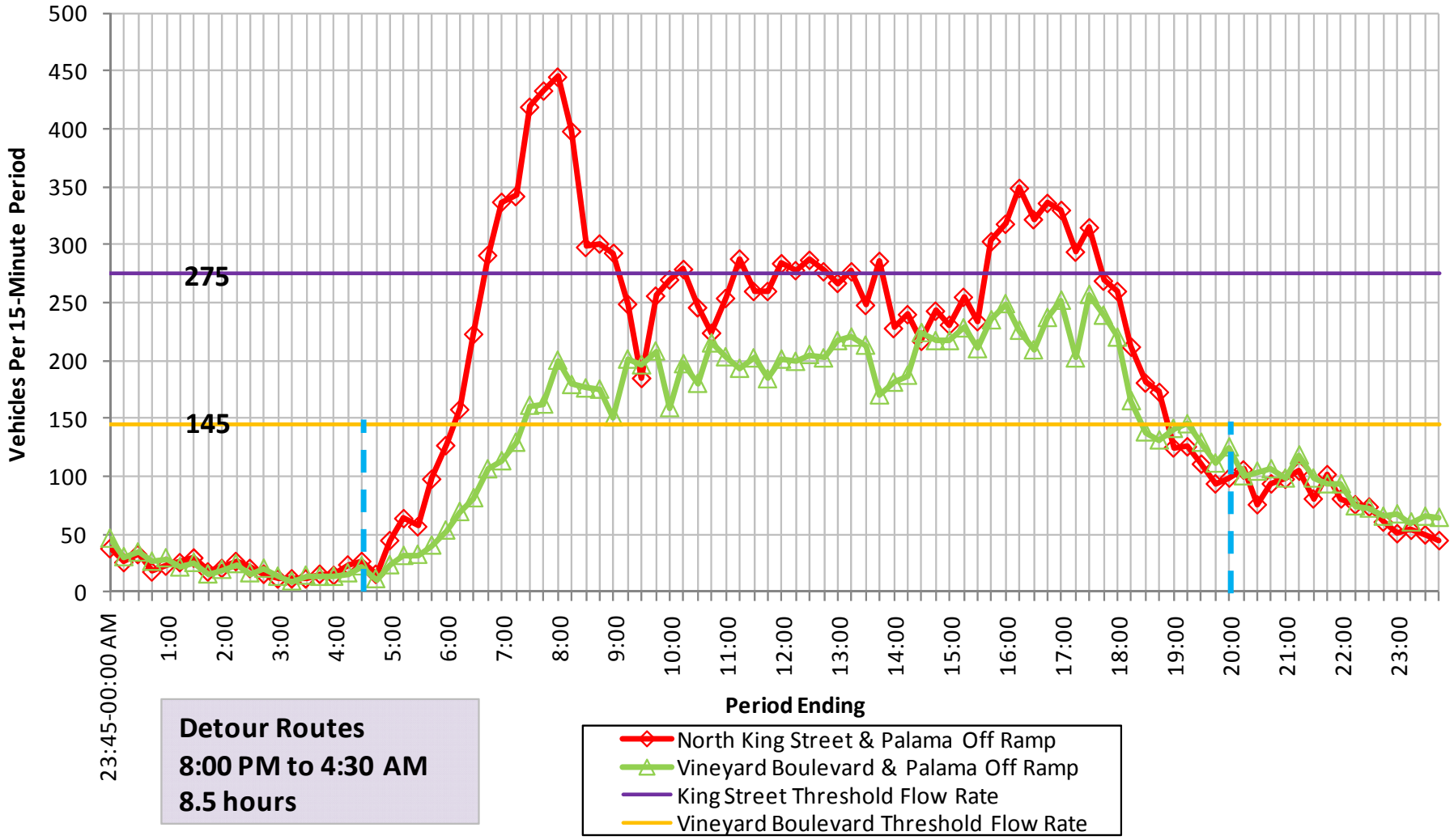


Figure 38 - H1WB-417 (1 WB Lane Open)
15-Minute Plot - H-1 Freeway 0.5 Miles West of Ward and Palama Street Off Ramp

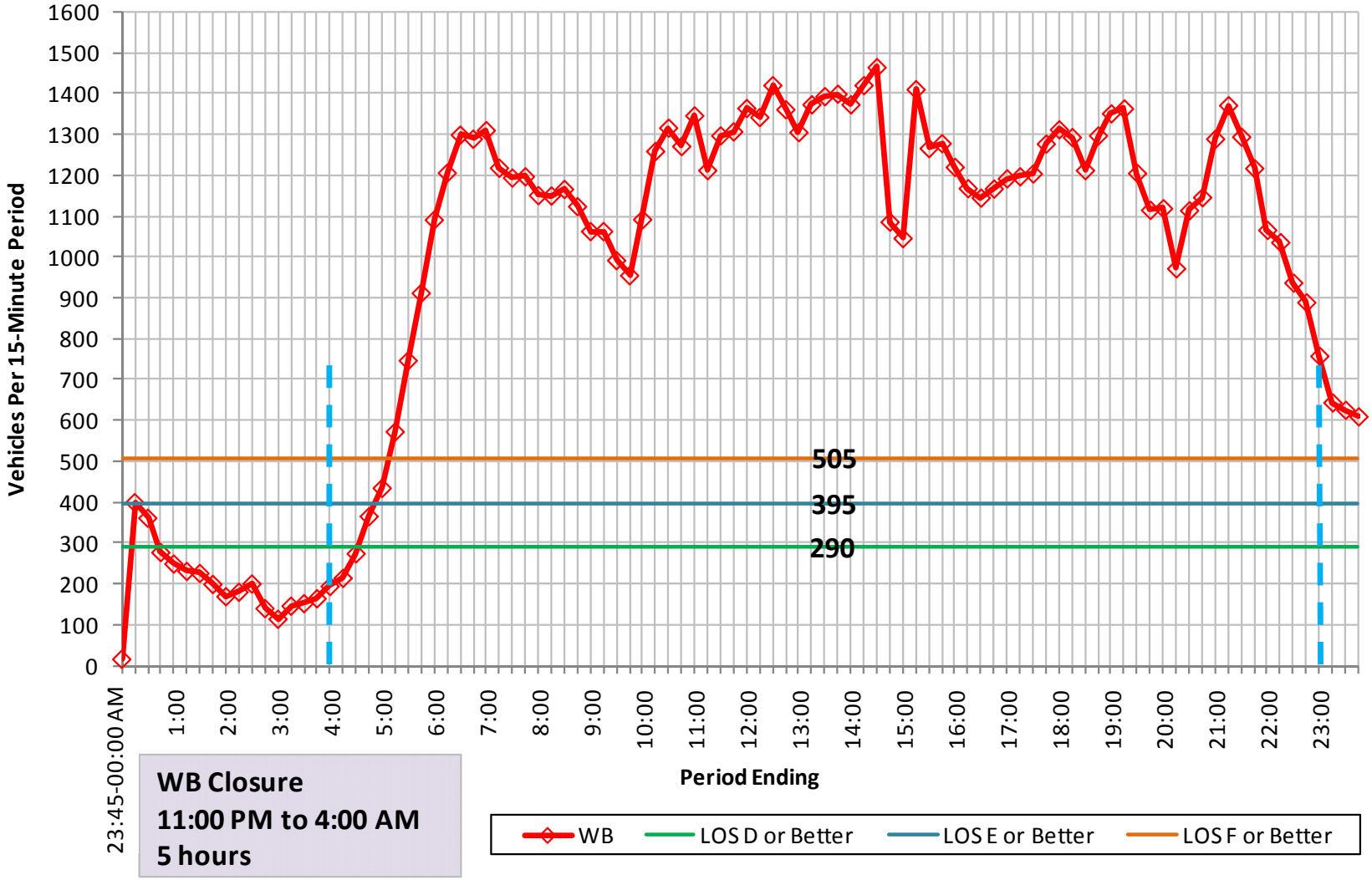


Figure 39 - H1WB-417 Detour Route (Palama Ramp Closed)
15-Minute Plot - Palama Street, North King Street, Vineyard Boulevard

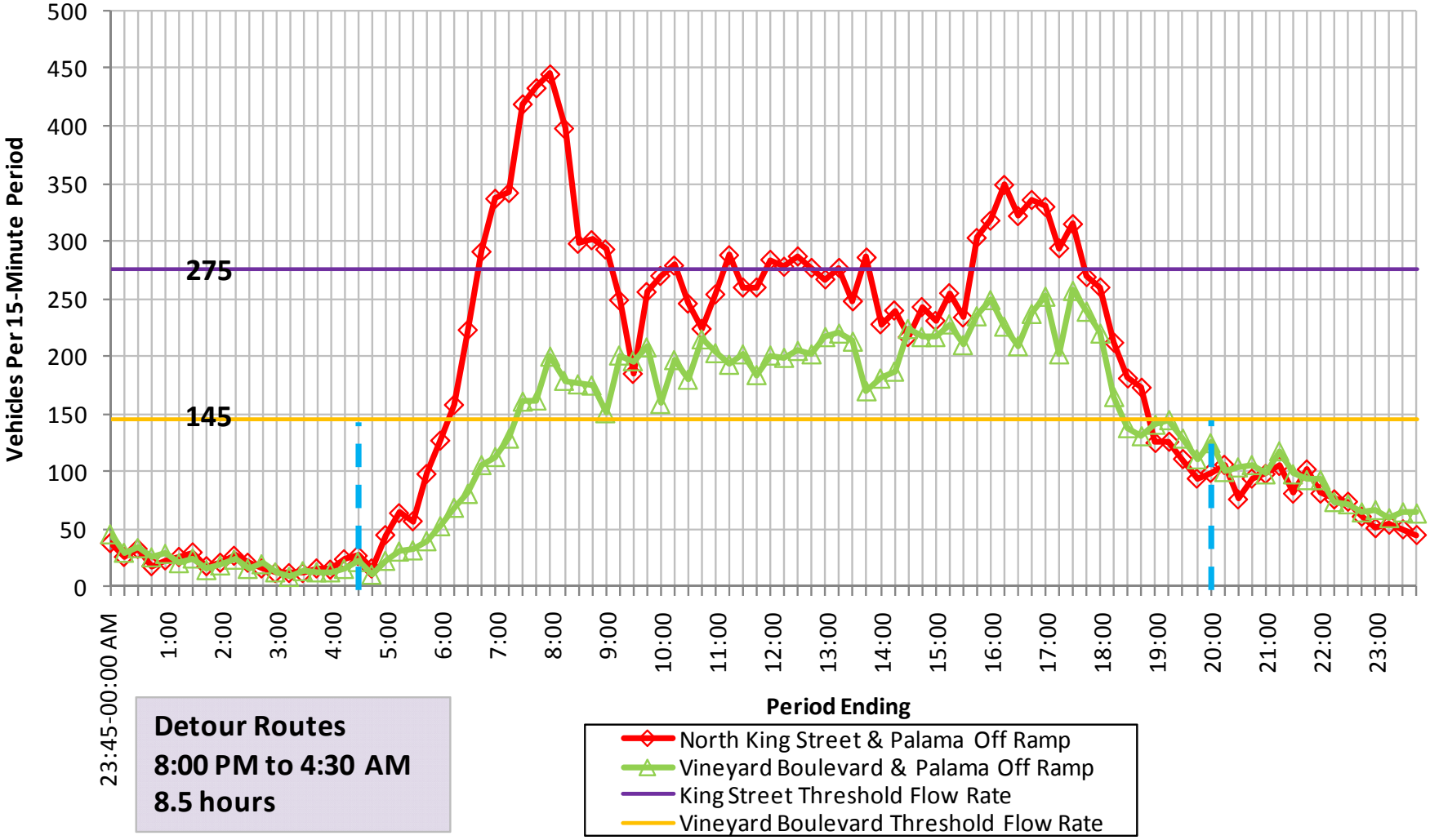


Figure 40 - H1WB-418 (2 WB Lanes Open)
15-Minute Plot - H-1 Freeway at Nuuanu Stream Bridge

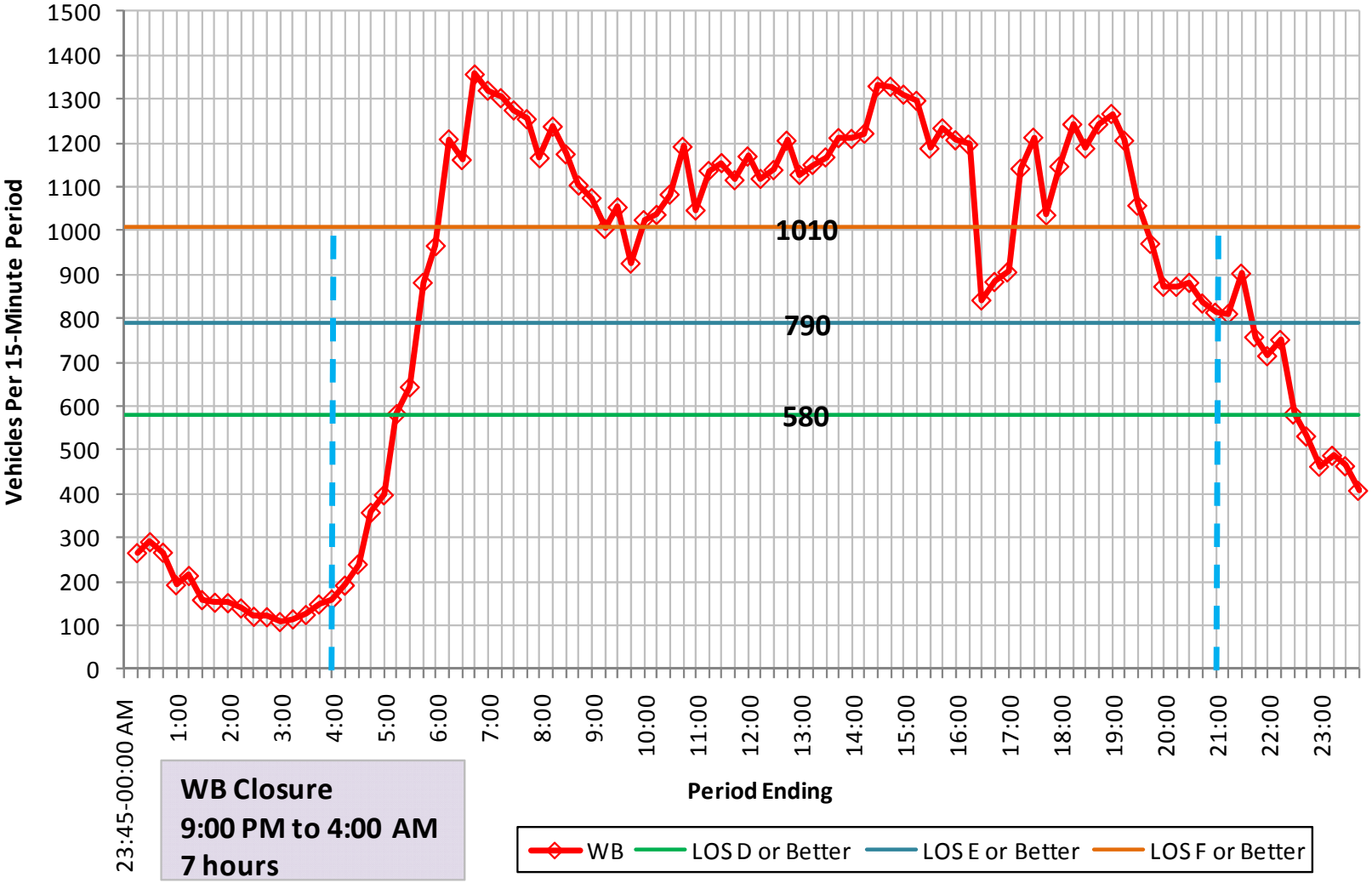


Figure 41 - H1WB-418 (1 WB Lane Open)
15-Minute Plot - H-1 Freeway at Nuuanu Stream Bridge

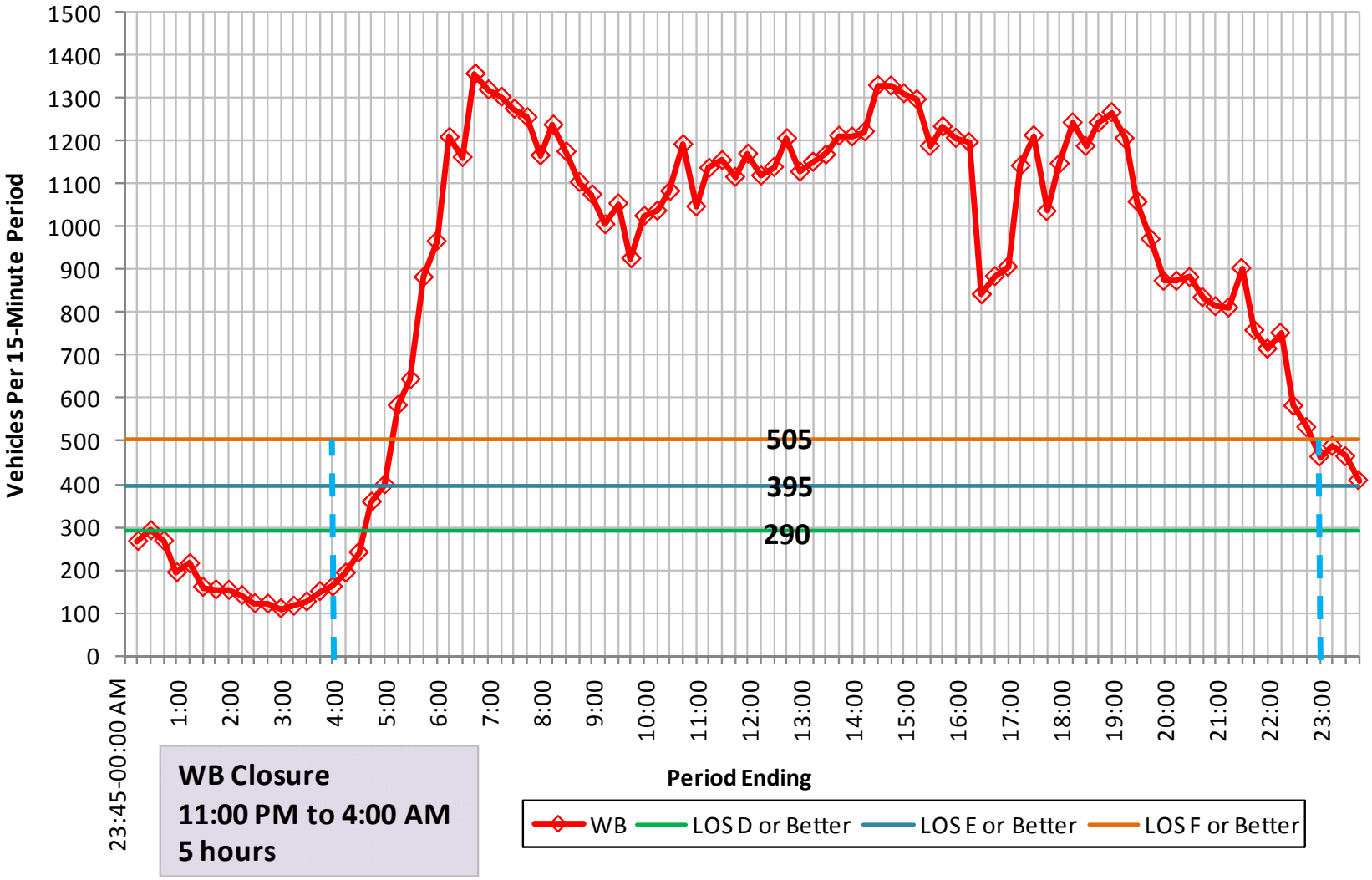


Figure 42 - H1WB-420 - (3 WB Lanes Open)
15-Minute Plot - H-1 Freeway at Nuuanu Stream Bridge

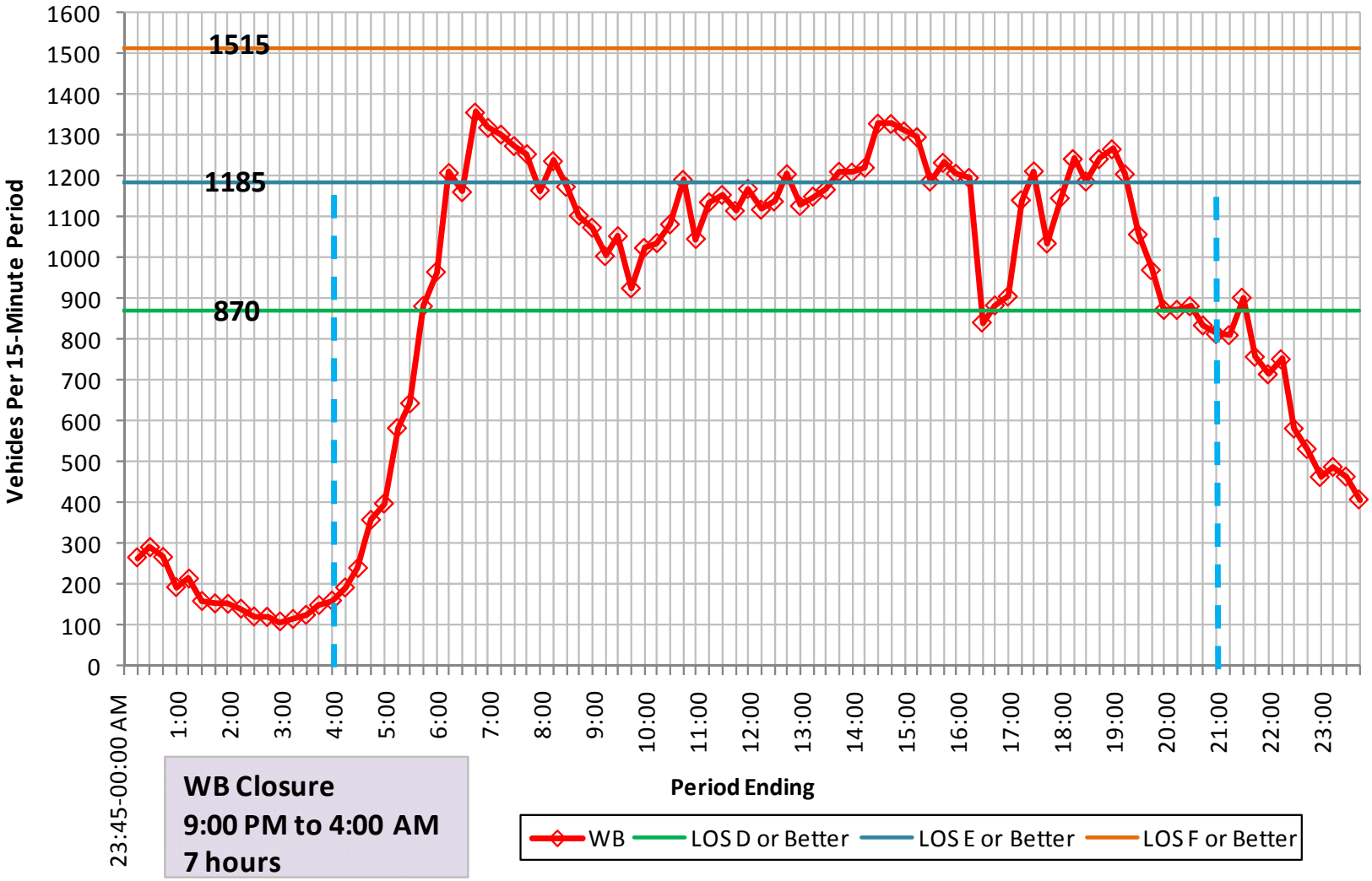


Figure 43 - H1WB-420 - (2 WB Lanes Open)
15-Minute Plot - H-1 Freeway at Nuuanu Stream Bridge

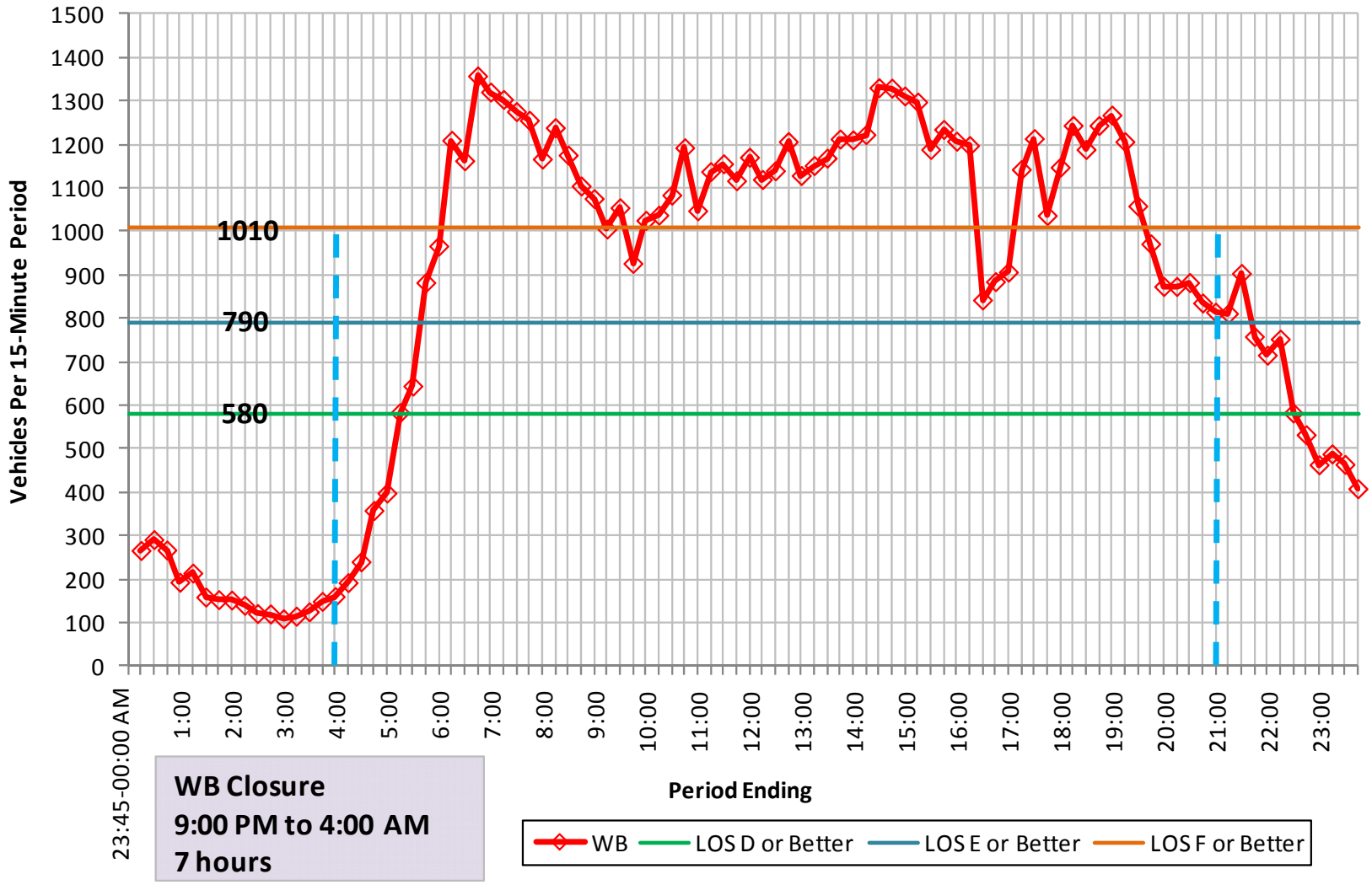


Figure 44 - H1EBR-351 (No Lanes Open)
15-Minute Plot - Kalihi Street Near Beckley Street

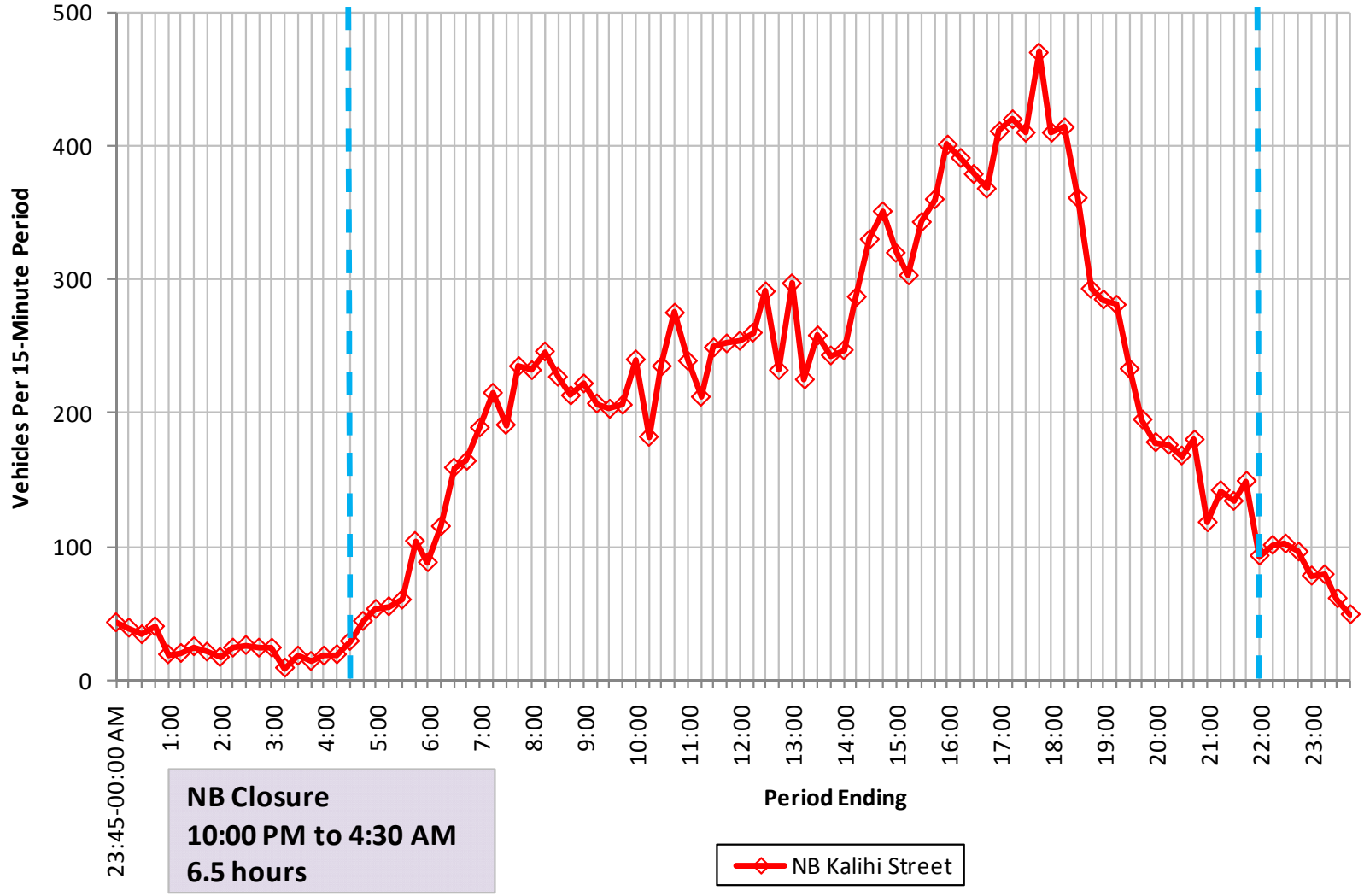


Figure 45 - 78WB-851 (2 WB Lanes Open)
15-Minute Plot - Moanalua Freeway at Moanalua Stream Bridge

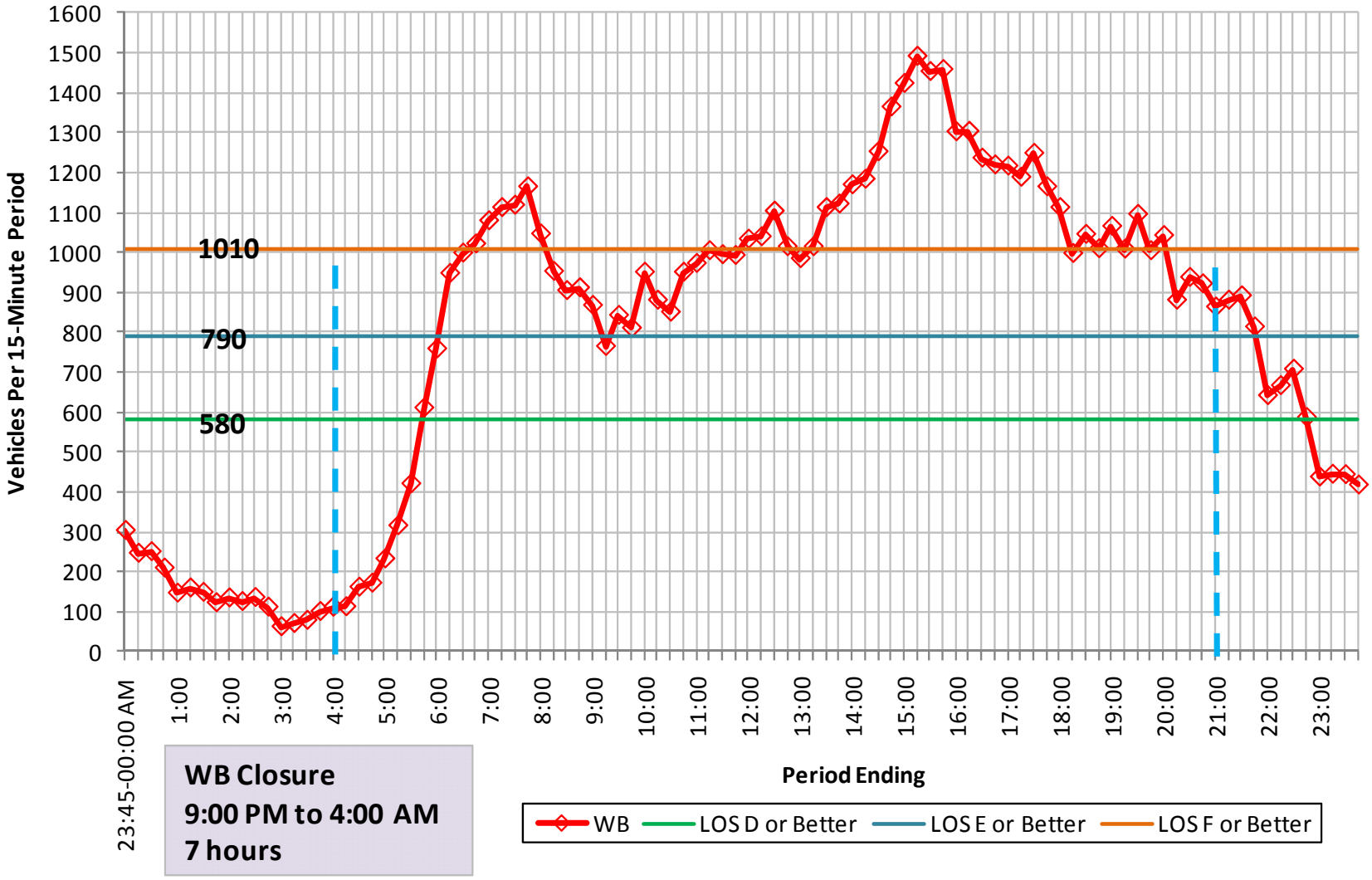


Figure 46 - 78WB-851 (1 WB Lane Open)
15-Minute Plot - Moanalua Freeway at Moanalua Stream Bridge

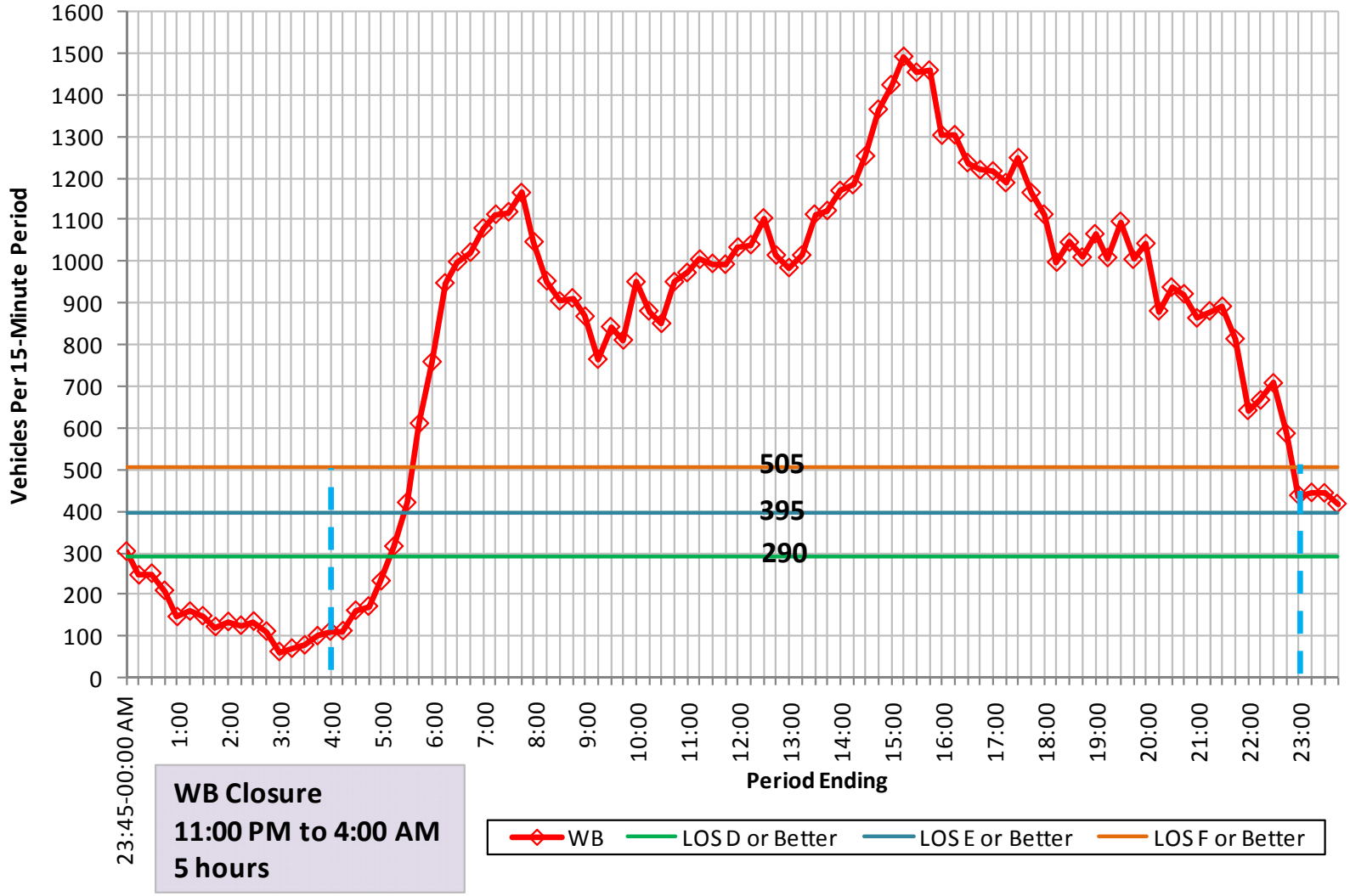


Figure 47 - H1EB-205 (4 EB Lanes Open)
15-Minute Plot - H-1 Freeway EB at Halawa Stream Bridge

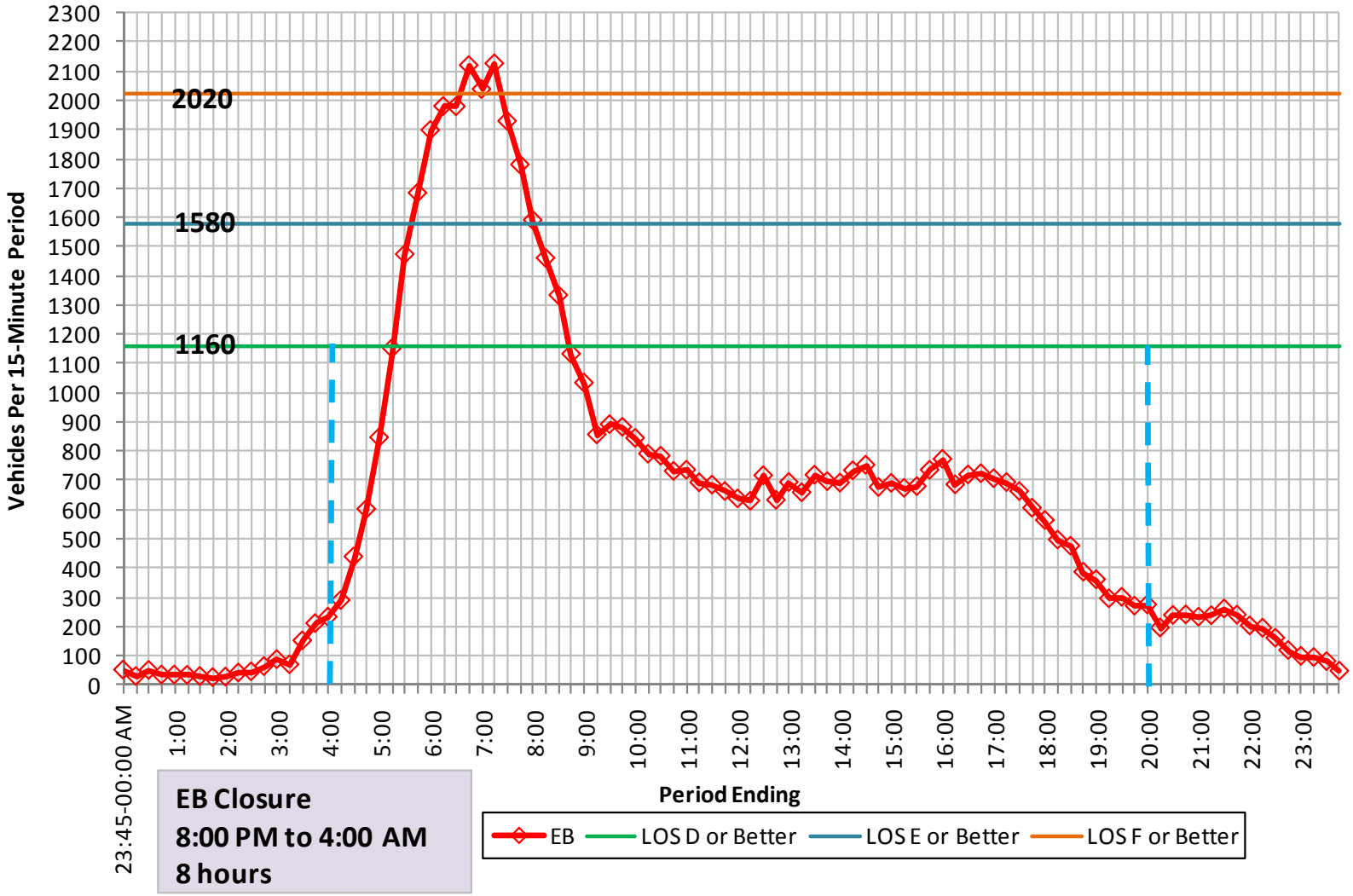


Figure 48 - H1EB-205 (3 EB Lanes Open)
15-Minute Plot - H-1 Freeway EB at Halawa Stream Bridge

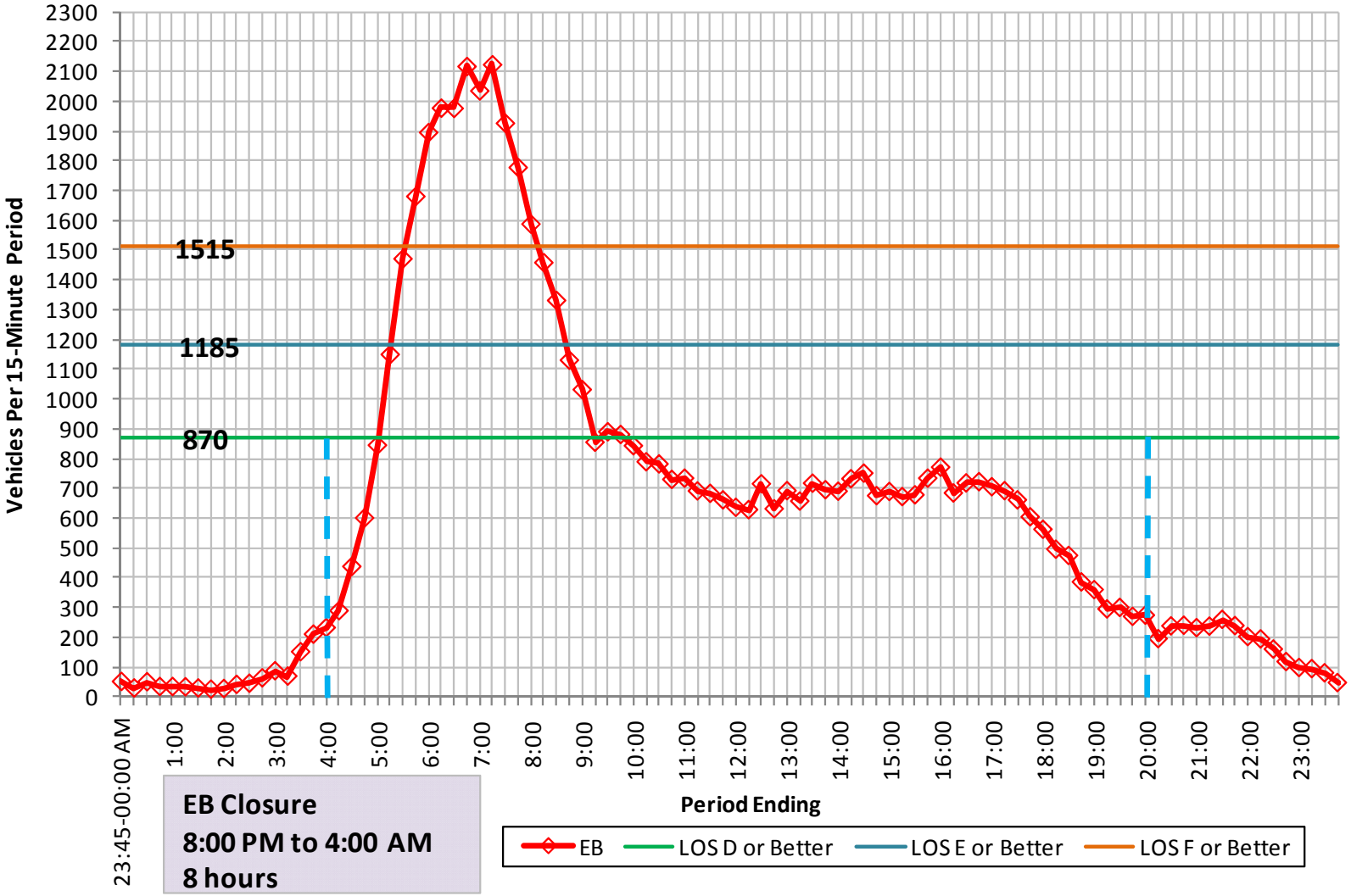


Figure 49 - 78EBR-822 (1 Hwy 99 Lane Open & 1 Hwy 78 Lane Open)
15-Minute Plot - Kamehameha Highway to Stadium/Pearl Harbor and Honolulu

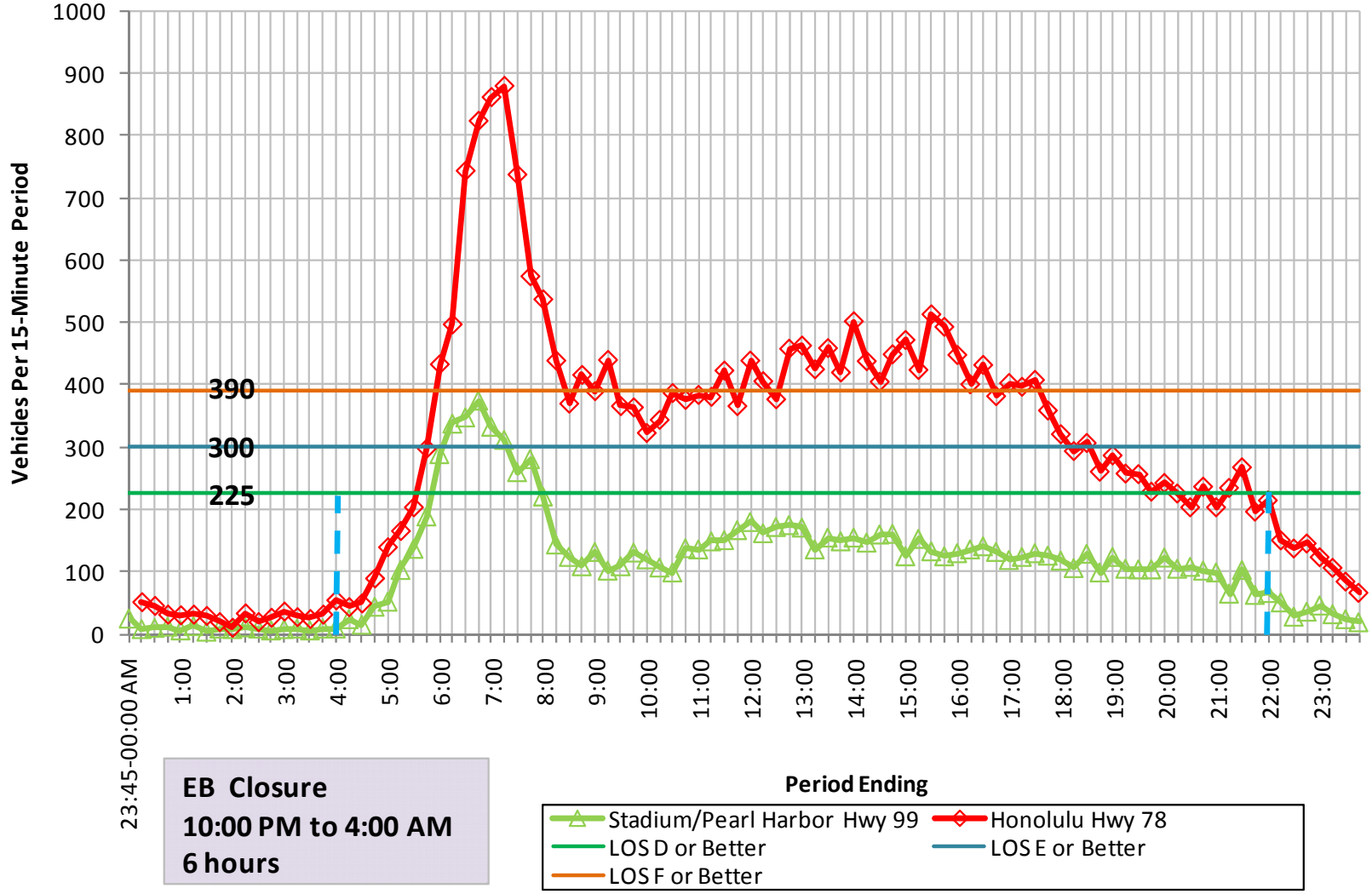


Figure 50 - 78EBR-822 (Phase 1A - 2 Hwy 99 Lanes Open)
15-Minute Plot - Kamehameha Highway to Stadium/Pearl Harbor and Honolulu

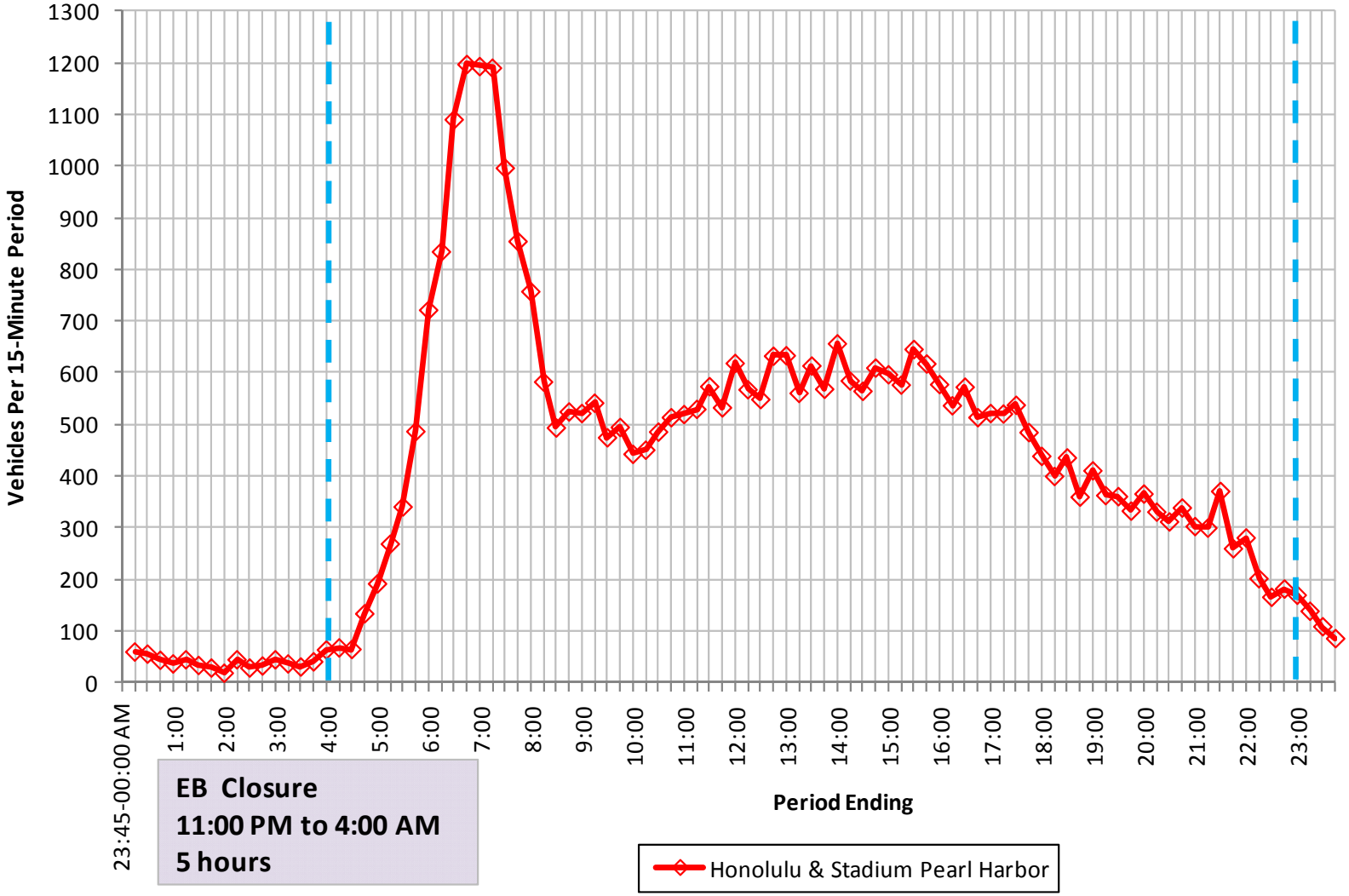
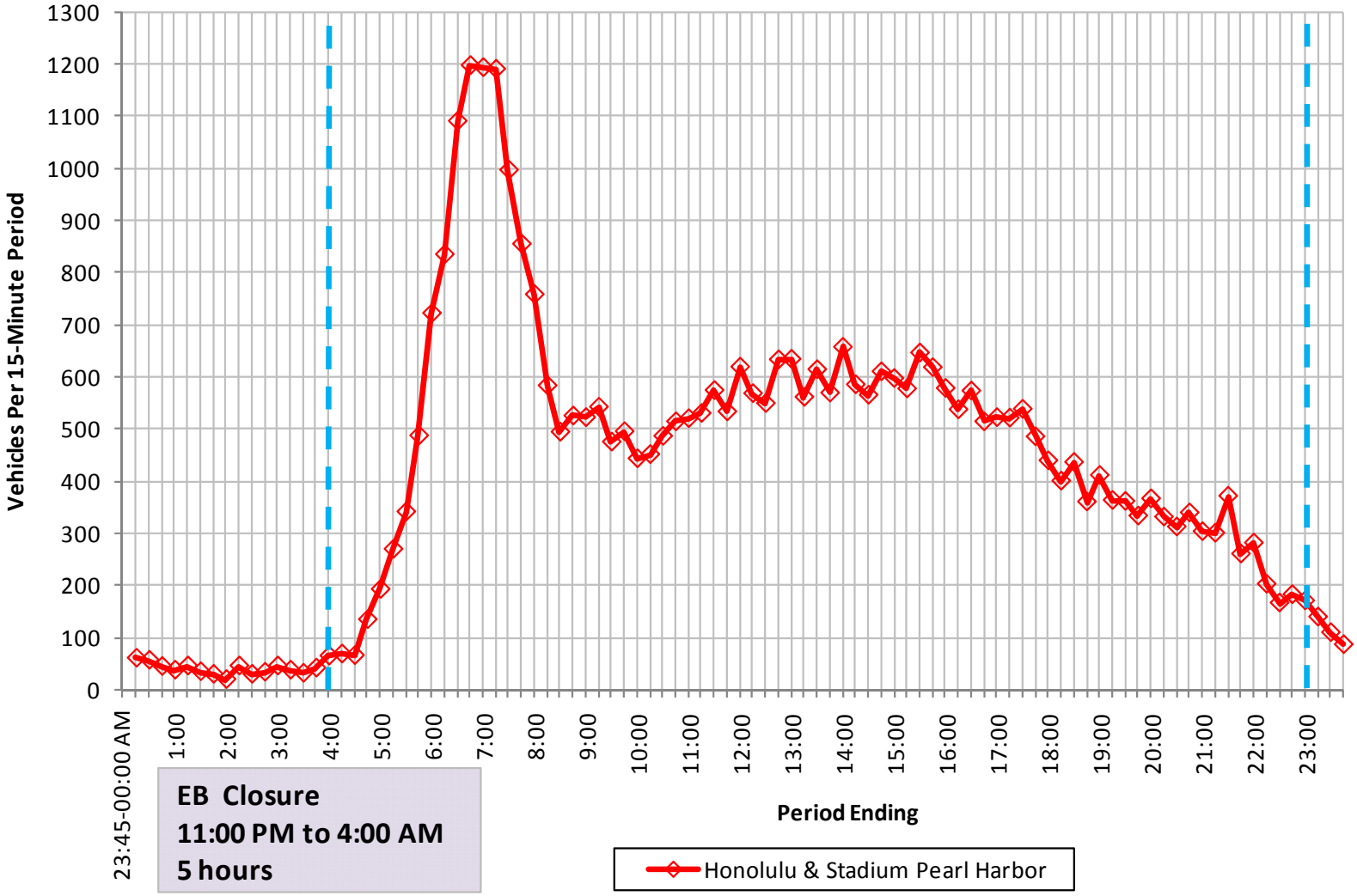


Figure 51 - 78EBR-822 (Phase 1B - 1 Hwy 78 Lane Open)
15-Minute Plot - Kamehameha Highway to Stadium/Pearl Harbor and Honolulu



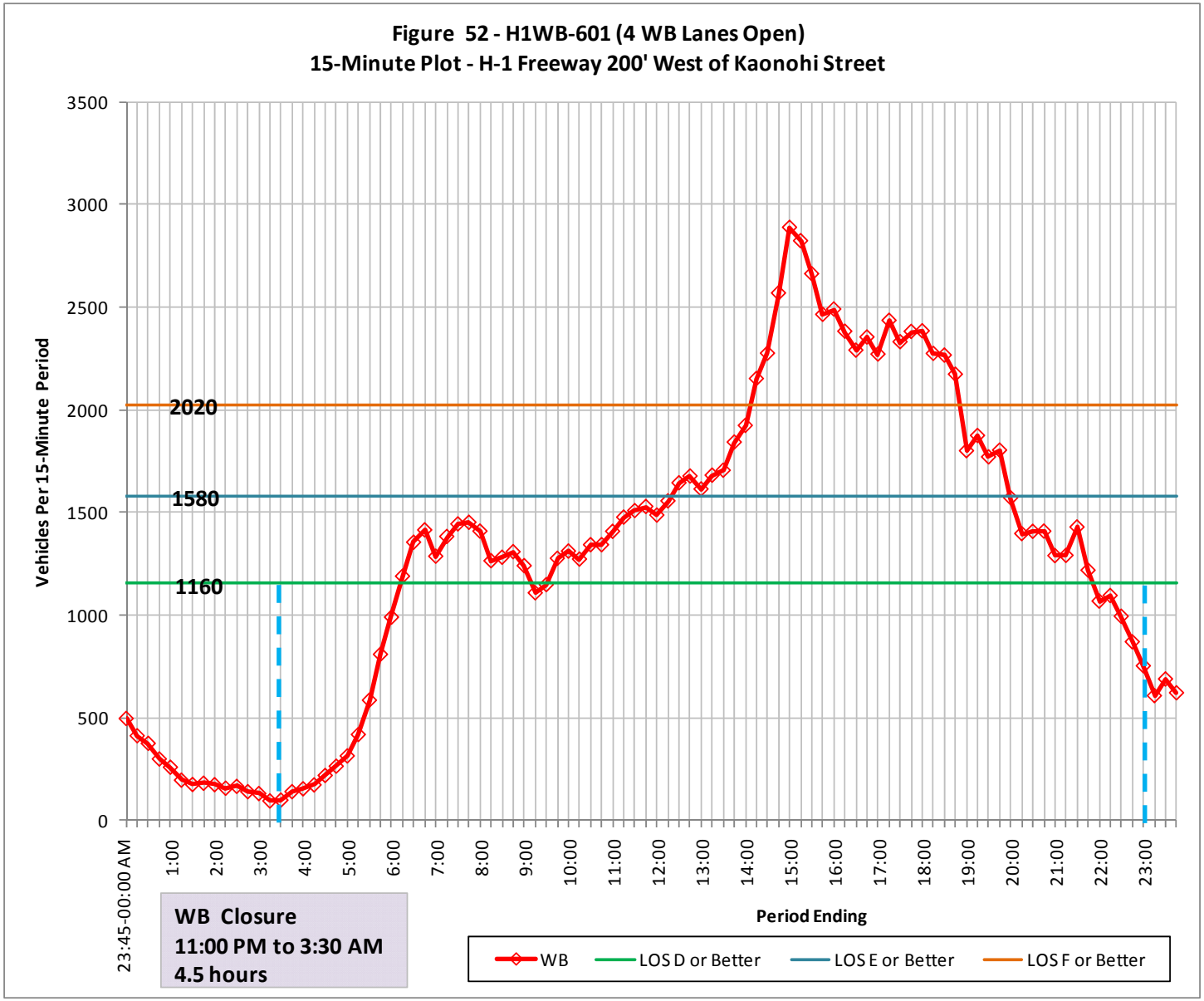


Figure 52 - H1WB-601 (4 WB Lanes Open)
15-Minute Plot - H-1 Freeway 200' West of Kaonohi Street
Vehicles Per 15-Minute Period
3500
3000
2500
2000
1500
1000
500
0
2020
1580
1160
23:45-00:00 AM
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Period Ending
WB Closure
11:00 PM to 3:30 AM
4.5 hours
WB
LOS D or Better
LOS E or Better
LOS F or Better

Figure 53 - H1EB-114 (4 EB Lanes Open)
15-Minute Plot - H-1 Freeway 200' West of Kaonohi Street

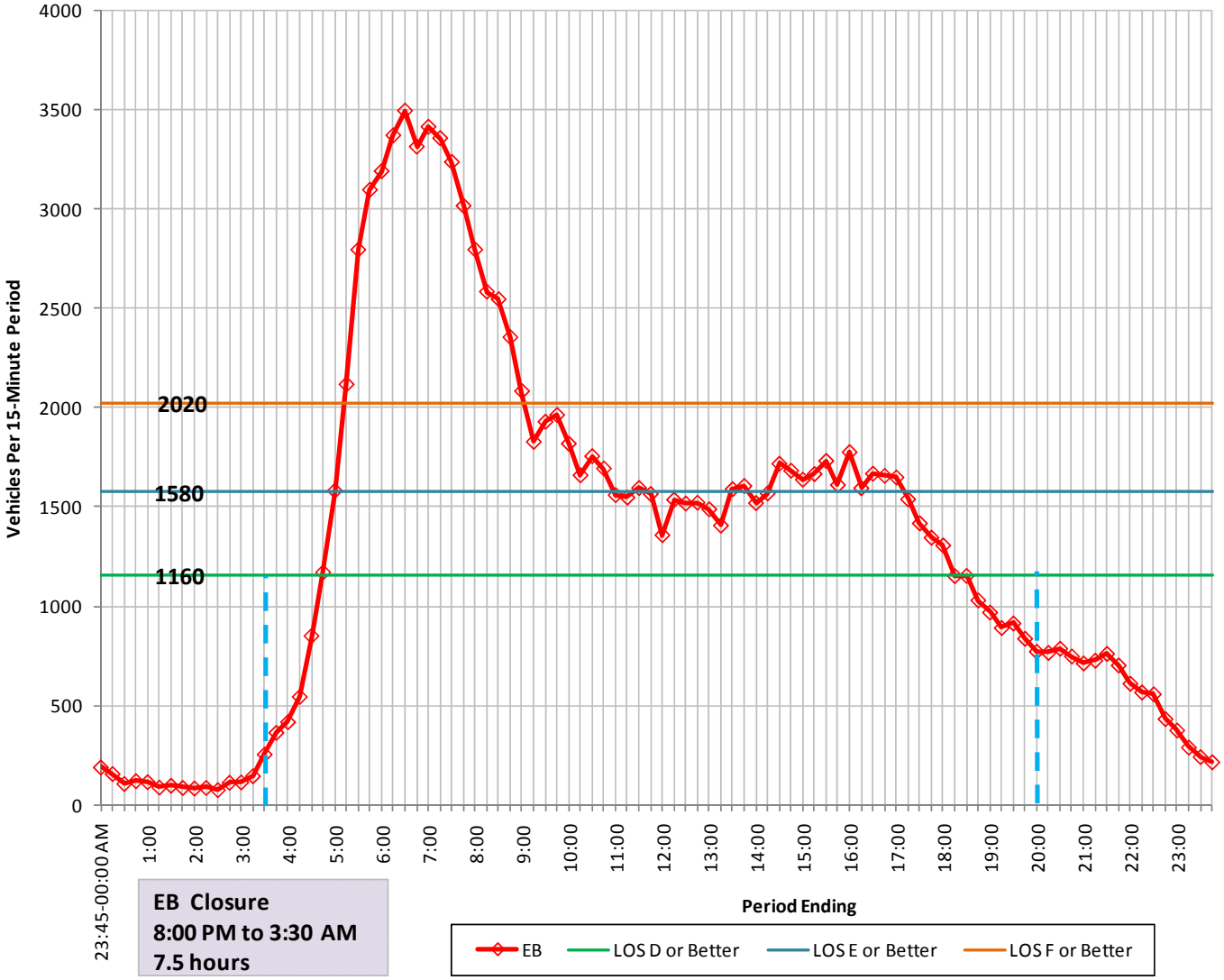


Figure 54 - H1EB-113 (4 EB Lanes Open)
15-Minute Plot - H-1 Freeway 200' West of Kaonohi Street

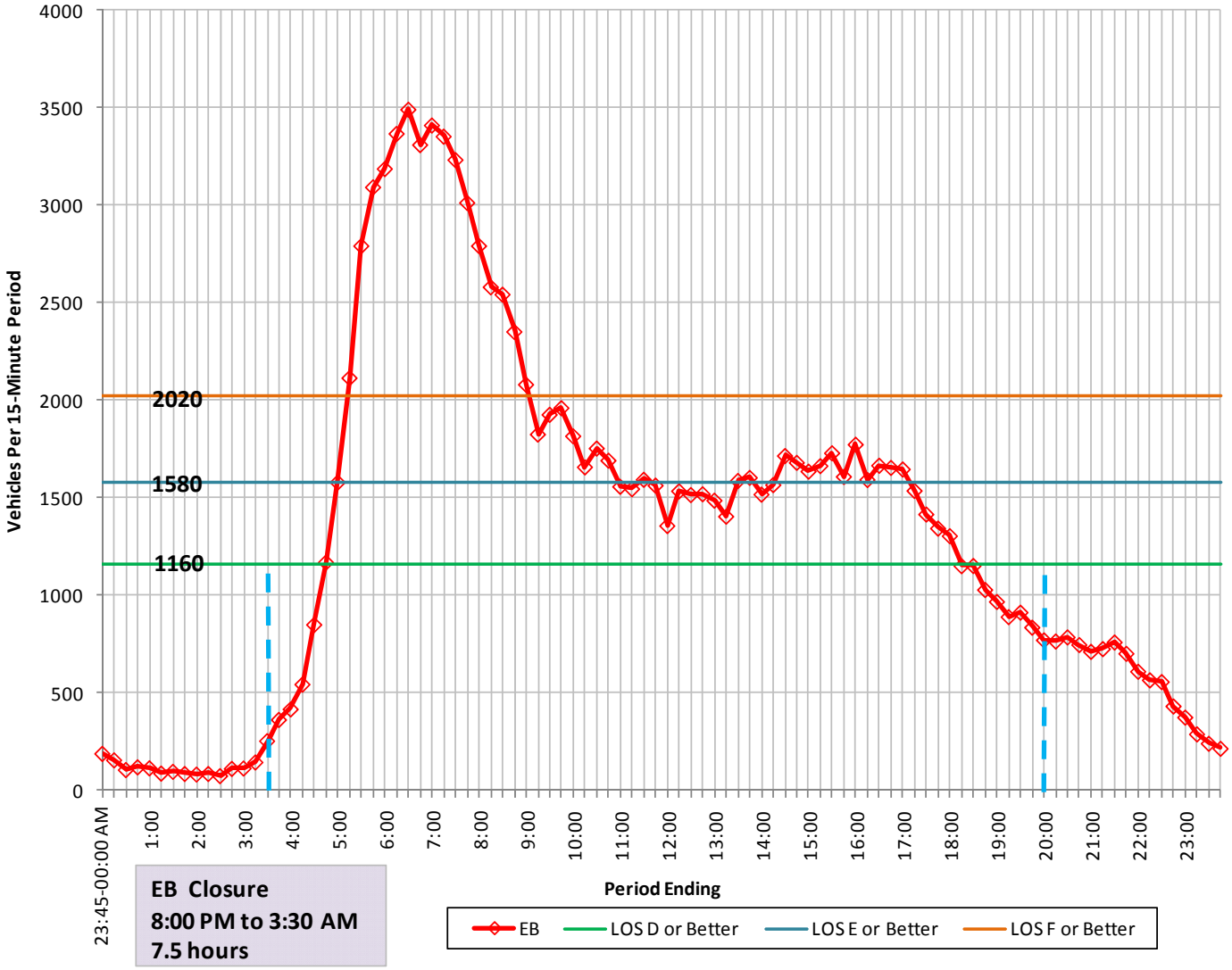


Figure 55 - H1WB-602 (4 WB Lanes Open)
15-Minute Plot - H-1 Freeway 200' West of Kaonohi Street

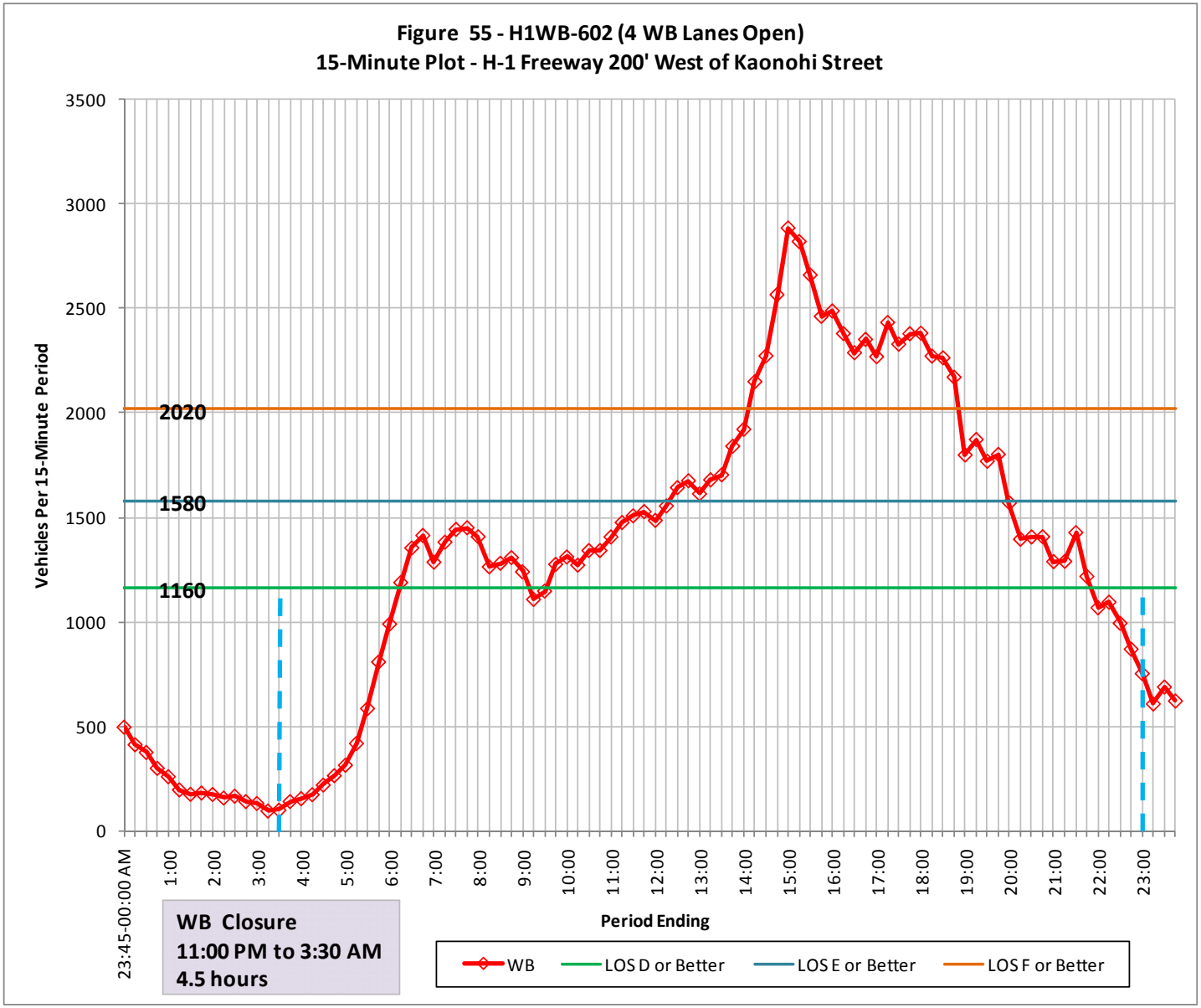


Figure 56 - H1EB-112 (4 EB Lanes Open)
15-Minute Plot - H-1 Freeway 200' West of Kaonohi Street

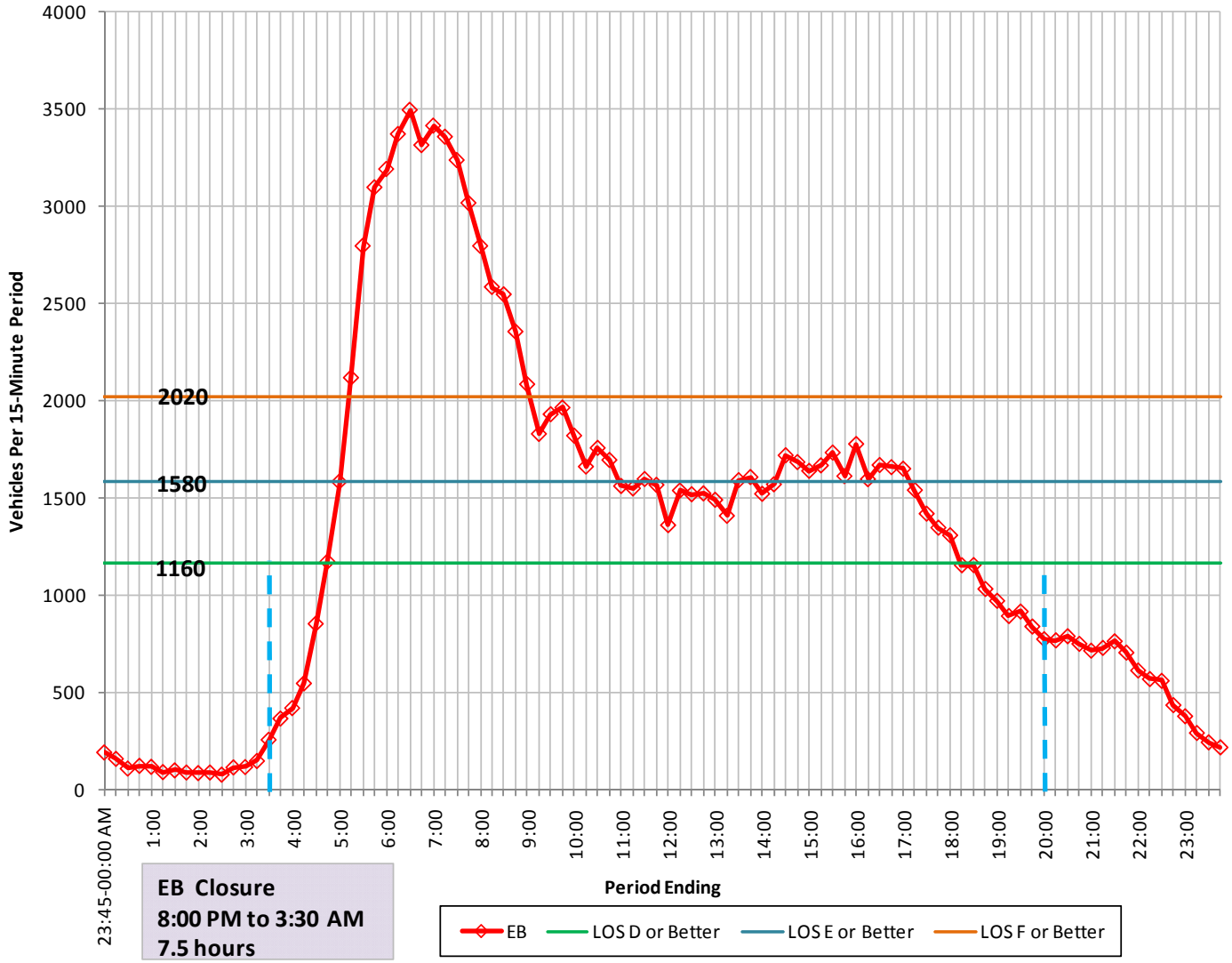


Figure 57 - H1EB-103 (2 EB Lanes Open)
15-Minute Plot - H-1 Freeway at Waikele

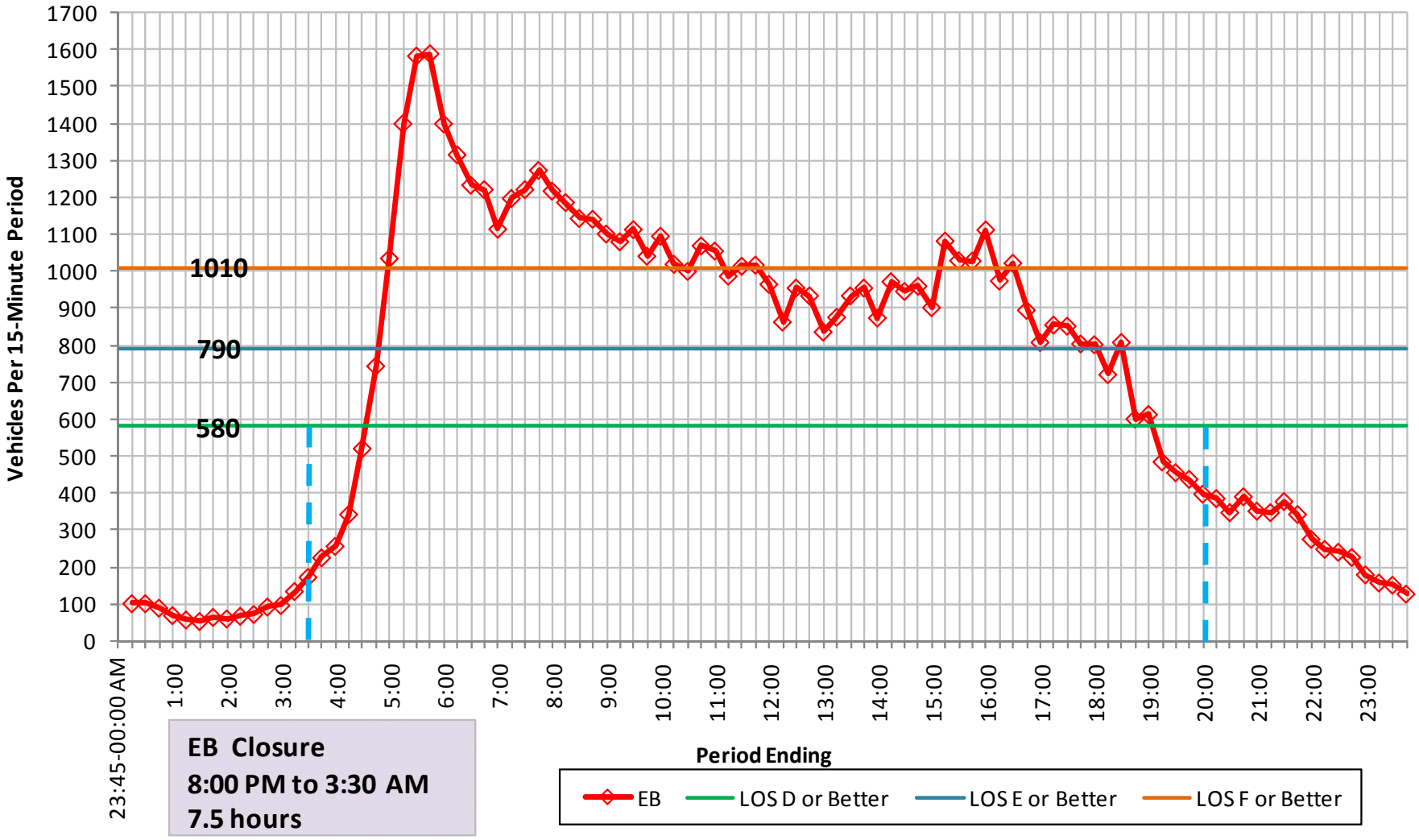
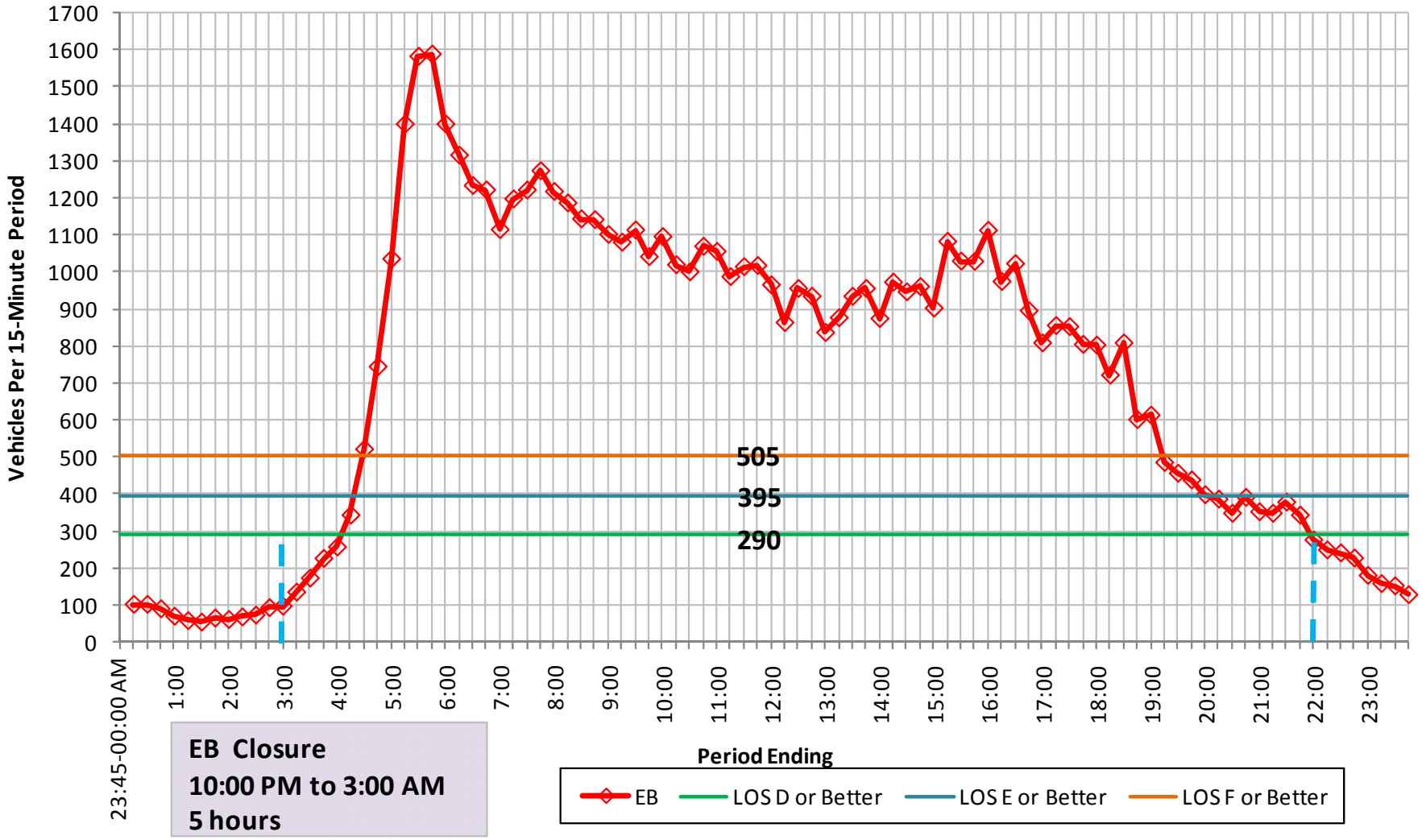


Figure 58 - H1EB-103 (1 EB Lane Open)
15-Minute Plot - H-1 Freeway at Waikele



APPENDICES

APPENDIX A

TMP LEVEL DETERMINATIONS

H-1 AND H-2 UPGRADE / REPLACEMENT OF DESTINATION SIGNS
FAP No. IM-0300(75)

1. The project is an HDOT project.

2. The project is on the Interstate Freeway System.

3. The existing traffic volume during working hours is greater than 1000 pc/lane/hr at the sign locations.

4. The project will anticipate freeway lane closures during construction and may exceed current travel time. However, delays are not expected to be longer than 30 minutes as all road closures are planned to occur at night.

5. This project is not expected to have a substantial impact to alternative routes. Delays of 30 minutes are more are not anticipated on alternative routes during roadway closures.

6. Public interest is anticipated to be high for the project work on H-1 Freeway and Moanalua Freeway. Public notification is needed.

7. Impacts to public/private access will occur during full roadway closures.

8. Roadway closures are required to perform construction work, roadway closures will occur at night.

9. There are no contra flow operations anticipated as part of the traffic control for this project.

10. There are no two-way one-lane operations anticipated as part of the traffic control for this project.

11. There will be no anticipated impact to environmental or historic features.

12. Completion time for Phase 1 of this project is estimated at 430 days.

13. Freeway lane/road closures will be implemented during night hours due to the freeway volumes that occur during the daylight hours.

Based on the above information from the “Determination of a Significant Highway Project” flow chart, the project is determined to be a Level 3 project.