Site Specific BMPs Plan Attachments

Attachment A - Project Site Maps and Construction Plans/Drawings (Section C.8)

PROJECT SITE MAPS, CONSTRUCTION PLANS/DRAWINGS

Attachment A

Hydrologic Criteria and Hydrology Analysis
NOAA Rainfall Data
Plate 1 & 2

Figure 1 – Project Location and Vicinity Map
Figure 2 – Flood Insurance Rate Map
Figure 3 – Discharge Points into State Waters
Figure 4 – Pre, During, and Post Construction Drainage Condition

DP-1 thru DP-3 Demolition and Erosion Control Plans
RP-1 thru RP-3 Roadway Plans

I. HYDROLOGIC CRITERIA AND HYDROLOGY ANALYSIS

For hydrologic analysis, a recurrence interval (Tm) of 25 years was used, as per State of Hawaii Department of Transportation, Highways Division, "Design Criteria for Highway Drainage", October 2010. The hydrologic analysis is based on a 25-year storm runoff with 1-hour rainfall intensity. The Rational Method was used to determine peak discharge for when the greatest and/or maximum area of disturbance occurs during construction. Descriptions of the rational method are listed below.

A. Rational Method

Rational Method Peak Flow Calculation

The Rational Method is expressed as:

$$Q = C * I * A$$

where:

Q = Flow rate in cubic feet per second (cfs)

C = Runoff coefficient

I = Rainfall intensity in inches per hour for a duration equal to the time of concentration.

A = Drainage area in acres

Drainage Area

Even though the total project area was determined to be 2.1 acres, the construction site area to be disturbed is 1.6 acres.

Rainfall Intensity and Hydrologic Criteria

The runoff times of concentration and correction factor were determined in accordance with Plates 1 and 2 per Department of Public Works and Waste Management, County of Maui, "Rules for the Design of Storm Drainage Facilities in the County of Maui". Due to the length, ground characteristics and slope of the runoff at this project site, the minimum time of concentration of 10 minutes was used in the hydrologic calculation. According to the NOAA Atlas 14, a 1 hour rainfall intensity of 2.26 inches was determined. Using Plate 2 – Intensity Duration 1 hr. Rainfall Curves, the corrected rainfall intensity was calculated to be 4.6 in/hr.

Runoff Coefficient

The existing runoff coefficient was determined using Table 2 per Maui County standards. The runoff coefficient of 0.95 was selected based on the drainage area being an asphaltic street.

II. RESULTS

The following includes the results for the hydrologic analysis for the site:

$$Q = C * I * A$$

$$Q = (0.95) * (4.6 \text{ in/hr}) * (1.6 \text{ ac})$$

$$Q = 7.0 \text{ cfs}$$

NOAA Atlas 14, Volume 4, Version 3
Location name: Lahaina, Hawaii, US*
Latitude: 20.8849°, Longitude: -156.6844°
Elevation: 3 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.244 (0.211–0.287)	0.327 (0.278–0.388)	0.443 (0.377–0.529)	0.532 (0.448–0.638)	0.655 (0.542–0.794)	0.749 (0.610–0.916)	0.847 (0.675–1.05)	0.945 (0.733–1.19)	1.08 (0.805–1.39)	1.18 (0.851–1.55)
10-min	0.361 (0.313–0.426)	0.485 (0.413–0.575)	0.657 (0.559–0.784)	0.789 (0.665–0.946)	0.972 (0.803–1.18)	1.11 (0.904–1.36)	1.26 (1.00–1.56)	1.40 (1.09–1.76)	1.60 (1.19–2.06)	1.75 (1.26–2.29)
15-min	0.454 (0.393–0.535)	0.609 (0.518–0.723)	0.826 (0.702–0.984)	0.991 (0.835–1.19)	1.22 (1.01–1.48)	1.40 (1.14–1.71)	1.58 (1.26–1.95)	1.76 (1.37–2.21)	2.01 (1.50–2.59)	2.20 (1.59–2.88)
30-min	0.638 (0.553–0.753)	0.857 (0.730–1.02)	1.16 (0.988–1.39)	1.40 (1.18–1.67)	1.72 (1.42–2.08)	1.96 (1.60–2.40)	2.22 (1.77–2.75)	2.48 (1.92–3.11)	2.83 (2.11–3.64)	3.10 (2.23–4.05)
60-min	0.840 (0.728–0.991)	1.13 (0.960–1.34)	1.53 (1.30–1.82)	1.84 (1.55–2.20)	2.26 (1.87–2.74)	2.58 (2.10–3.16)	2.92 (2.33–3.62)	3.26 (2.53–4.09)	3.73 (2.78–4.79)	4.08 (2.94–5.33)
2-hr	1.13 (0.981–1.34)	1.54 (1.32–1.83)	2.09 (1.78–2.49)	2.51 (2.11–3.00)	3.07 (2.54–3.71)	3.51 (2.85–4.29)	3.95 (3.14–4.88)	4.40 (3.41–5.52)	4.99 (3.71–6.40)	5.45 (3.91–7.11)
3-hr	1.29 (1.11–1.52)	1.77 (1.52–2.10)	2.42 (2.05–2.89)	2.91 (2.44–3.49)	3.58 (2.96–4.34)	4.09 (3.31–5.00)	4.61 (3.66–5.71)	5.13 (3.97–6.45)	5.84 (4.34–7.50)	6.38 (4.56–8.34)
6-hr	1.58 (1.36–1.87)	2.19 (1.87–2.60)	3.02 (2.55–3.61)	3.66 (3.07–4.39)	4.54 (3.74–5.50)	5.21 (4.22–6.38)	5.91 (4.68–7.32)	6.62 (5.10–8.31)	7.57 (5.60–9.71)	8.30 (5.92–10.8)
12-hr	1.87 (1.60–2.21)	2.61 (2.22–3.09)	3.64 (3.08–4.34)	4.46 (3.73–5.34)	5.60 (4.60–6.78)	6.51 (5.25–7.95)	7.45 (5.88–9.21)	8.44 (6.49–10.6)	9.81 (7.23–12.6)	10.9 (7.72–14.2)
24-hr	2.27 (1.95–2.67)	3.19 (2.73–3.75)	4.51 (3.85–5.31)	5.58 (4.73–6.59)	7.13 (5.98–8.44)	8.39 (6.98–9.98)	9.74 (8.00–11.6)	11.2 (9.08–13.5)	13.3 (10.5–16.1)	15.0 (11.7–18.3)
2-day	2.70 (2.39–3.07)	3.78 (3.34–4.31)	5.36 (4.71–6.12)	6.66 (5.84–7.63)	8.57 (7.43–9.86)	10.2 (8.73–11.7)	11.9 (10.1–13.8)	13.8 (11.5–16.1)	16.5 (13.5–19.5)	18.8 (15.1–22.3)
3-day	2.87 (2.54–3.27)	4.02 (3.56–4.58)	5.69 (5.01–6.50)	7.07 (6.20–8.09)	9.07 (7.88–10.4)	10.7 (9.22–12.4)	12.5 (10.6–14.5)	14.4 (12.1–16.9)	17.2 (14.1–20.3)	19.6 (15.7–23.2)
4-day	3.05 (2.70–3.47)	4.27 (3.78–4.86)	6.03 (5.31–6.88)	7.48 (6.56–8.56)	9.57 (8.32–11.0)	11.3 (9.71–13.0)	13.1 (11.2–15.2)	15.1 (12.7–17.6)	18.0 (14.8–21.2)	20.3 (16.4–24.1)
7-day	3.36 (2.98–3.82)	4.71 (4.17–5.36)	6.63 (5.85–7.57)	8.19 (7.18–9.37)	10.4 (9.04–12.0)	12.2 (10.5–14.1)	14.1 (12.0–16.4)	16.2 (13.6–18.9)	19.1 (15.7–22.4)	21.4 (17.2–25.4)
10-day	3.65 (3.23–4.15)	5.13 (4.52–5.81)	7.19 (6.30–8.17)	8.85 (7.73–10.1)	11.2 (9.67–12.8)	13.1 (11.2–15.0)	15.0 (12.7–17.4)	17.2 (14.3–19.9)	20.1 (16.4–23.5)	22.4 (18.0–26.5)
20-day	4.36 (3.87–4.96)	6.10 (5.40–6.94)	8.49 (7.48–9.69)	10.4 (9.10–11.9)	13.0 (11.3–14.9)	15.0 (12.9–17.3)	17.1 (14.5–19.8)	19.3 (16.2–22.5)	22.3 (18.3–26.2)	24.6 (19.8–29.2)
30-day	4.91 (4.36–5.59)	6.85 (6.08–7.80)	9.51 (8.39–10.8)	11.6 (10.2–13.2)	14.4 (12.5–16.5)	16.5 (14.2–19.1)	18.7 (15.9–21.7)	21.0 (17.6–24.5)	24.0 (19.7–28.3)	26.4 (21.2–31.3)
45-day	5.70 (5.05–6.47)	7.96 (7.05–9.05)	11.0 (9.73–12.6)	13.4 (11.7–15.3)	16.5 (14.3–18.9)	18.9 (16.2–21.8)	21.3 (18.1–24.7)	23.7 (19.9–27.6)	26.9 (22.1–31.6)	29.3 (23.6–34.8)
60-day	6.24 (5.54–7.10)	8.75 (7.75–9.96)	12.1 (10.7–13.8)	14.6 (12.8–16.7)	18.0 (15.6–20.7)	20.5 (17.6–23.7)	23.1 (19.6–26.7)	25.6 (21.4–29.9)	29.0 (23.7–34.1)	31.5 (25.3–37.4)

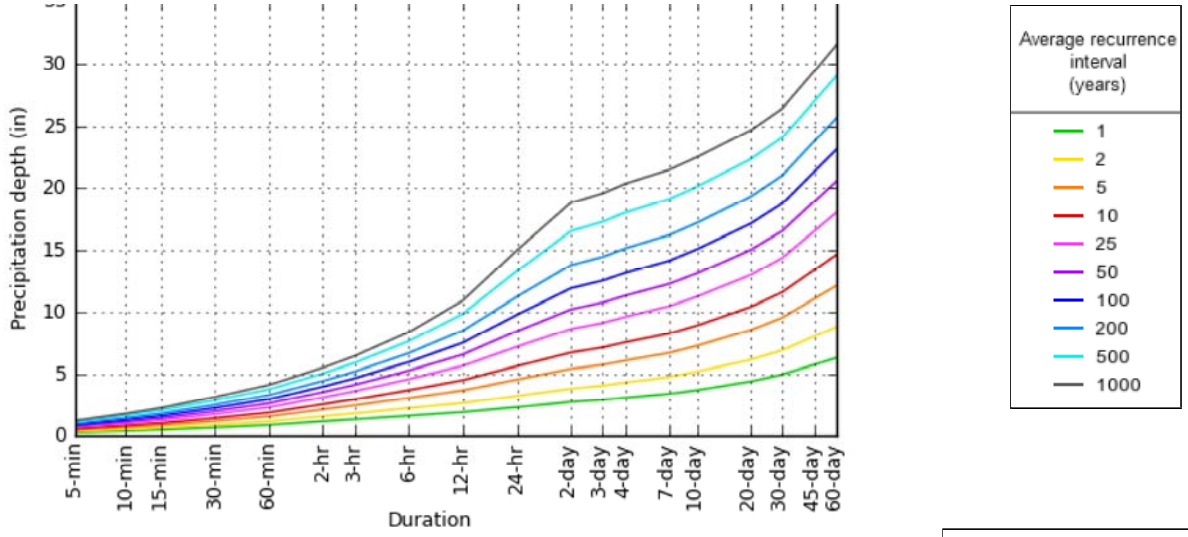
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

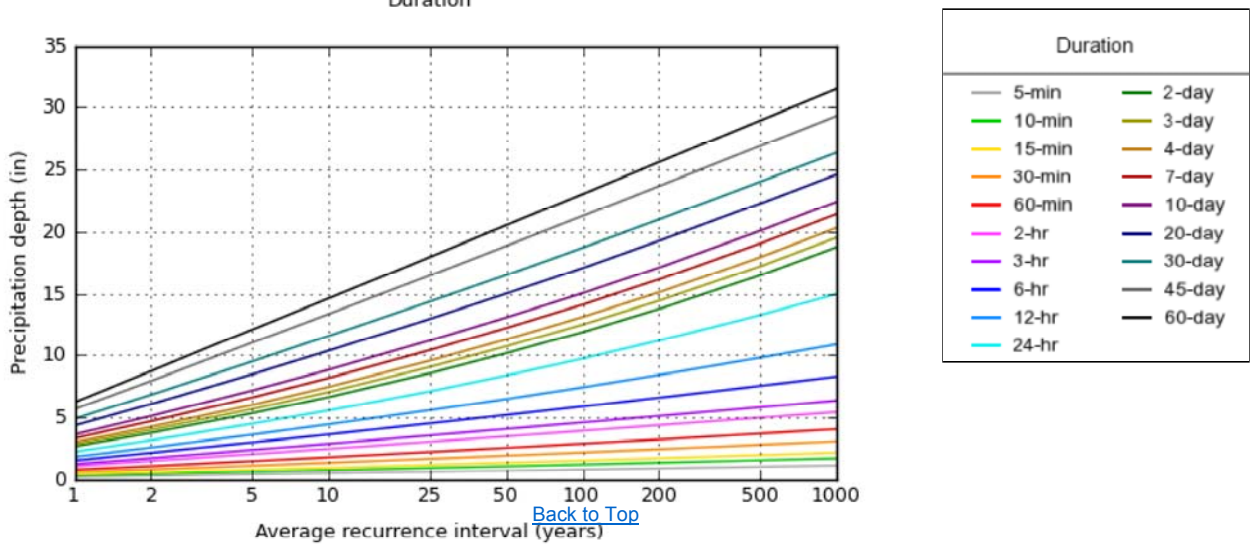
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper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

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical





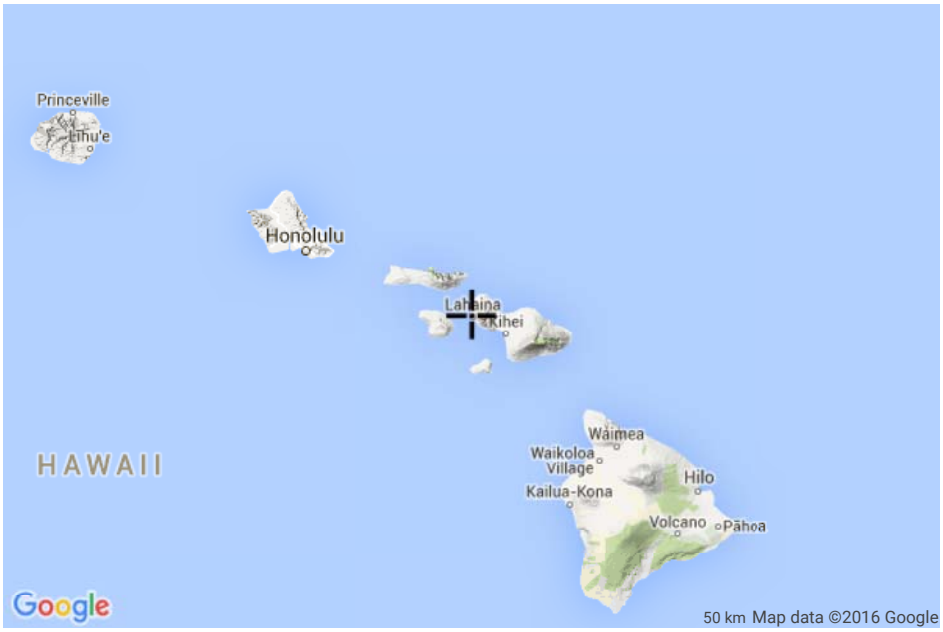
Back to Top

Maps & aerials

NOAA Atlas 14, Volume 4, Version 3

Created (GMT): Mon Feb 8 18:35:55 2016

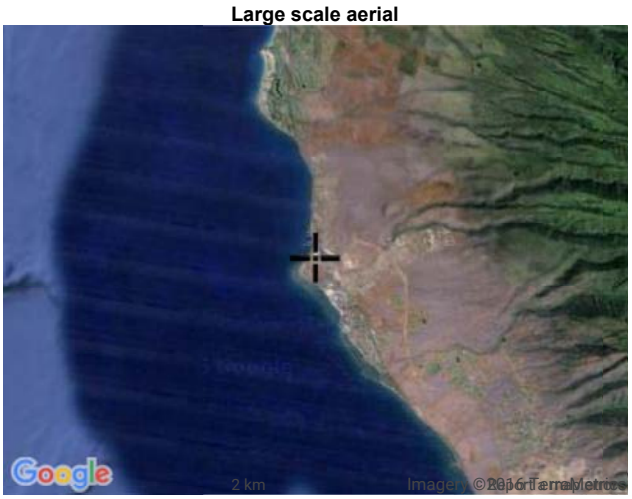
Small scale terrain



Large scale terrain

Large scale map

Large scale aerial



Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910

Questions?: HDSC.Questions@noaa.gov

Disclaimer

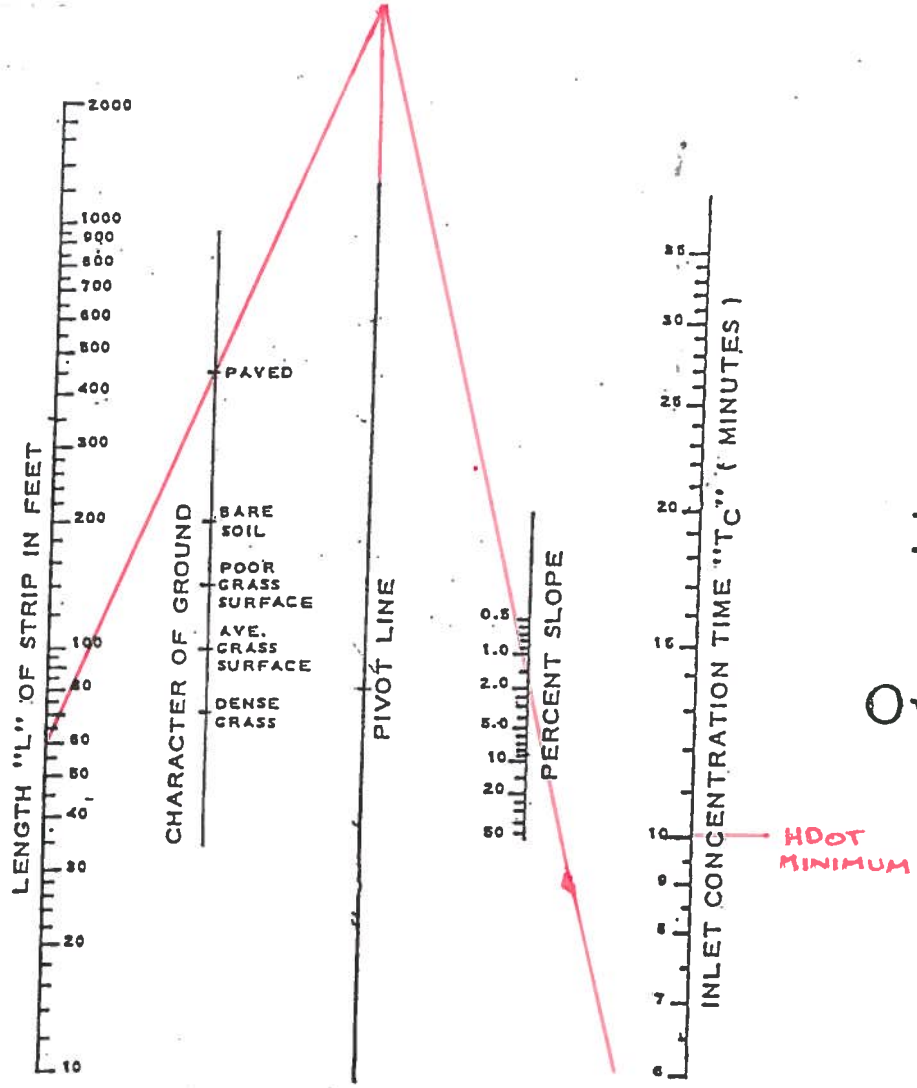
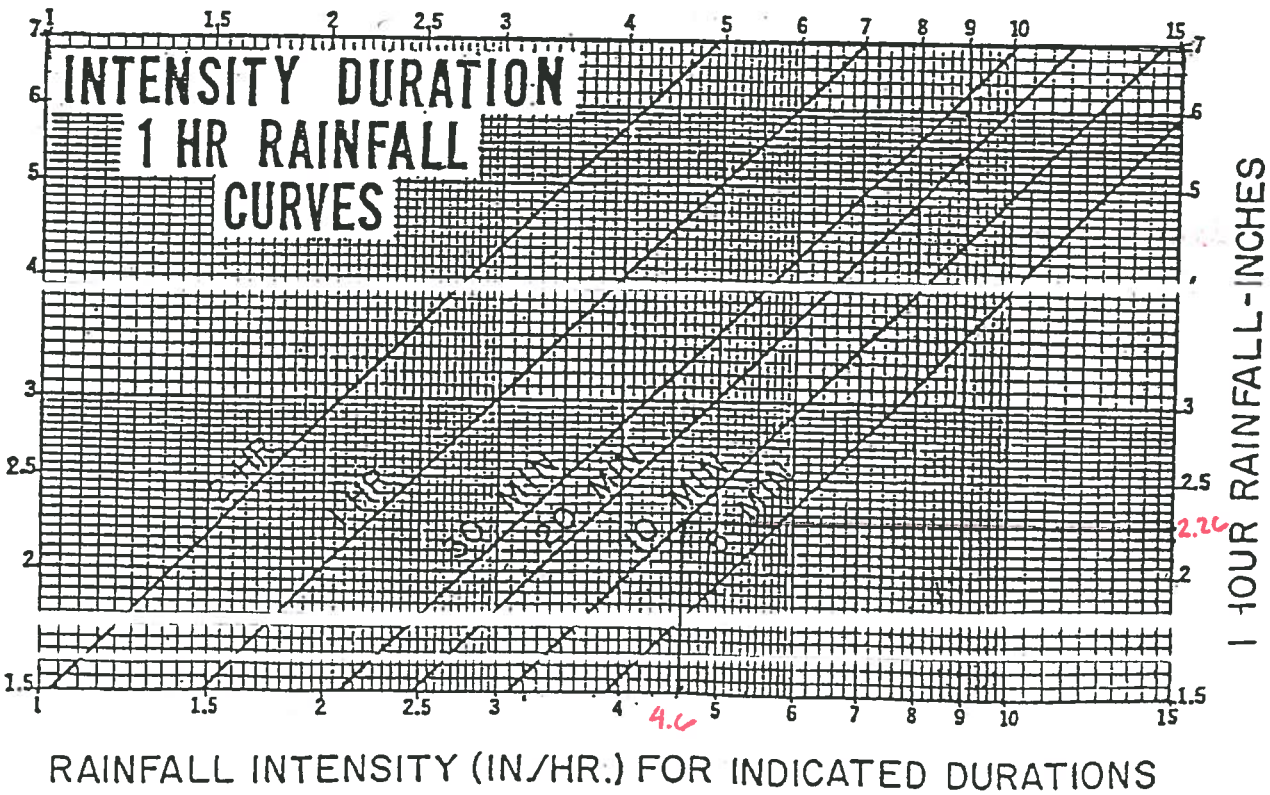
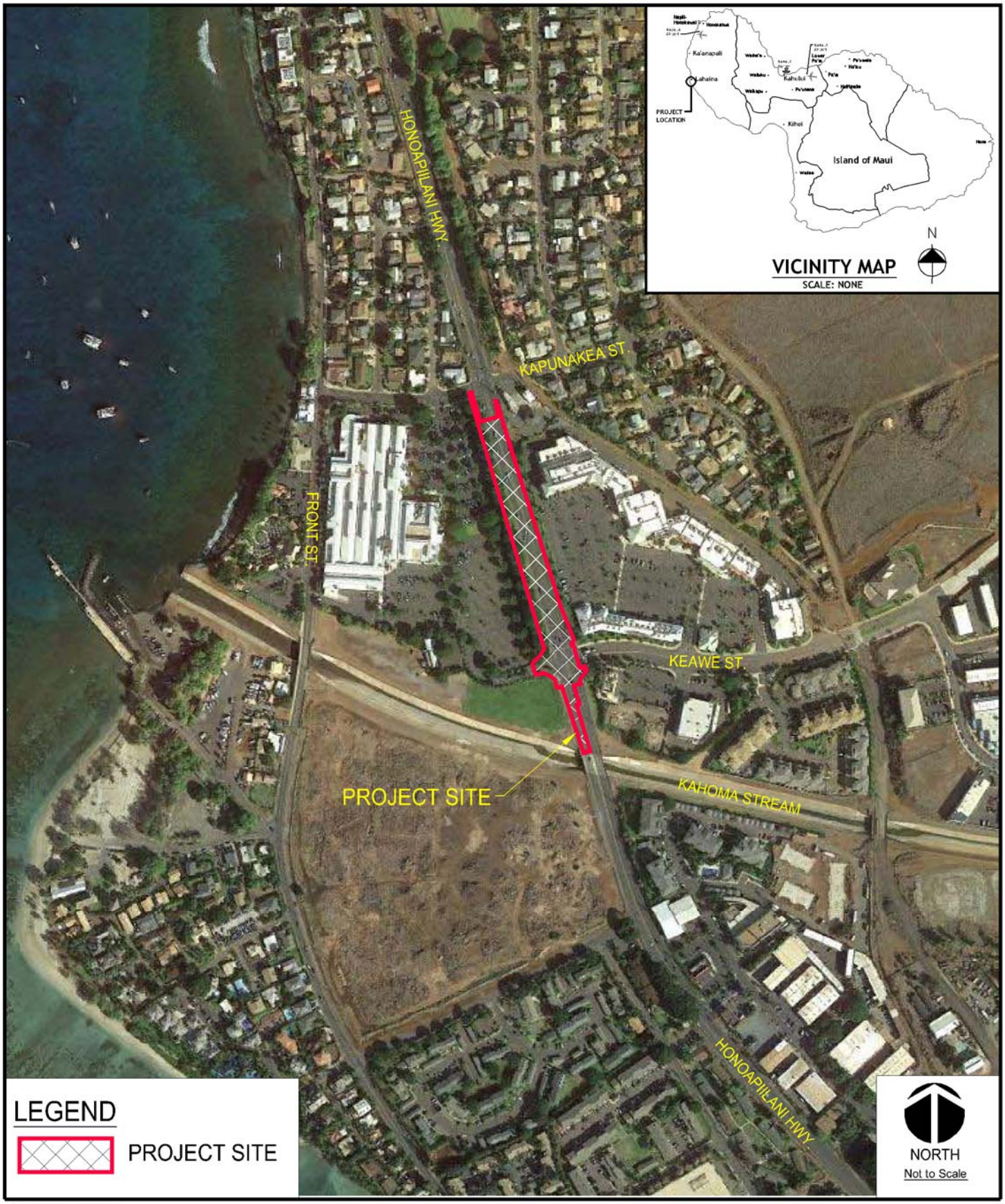


Plate 1

Overland Flow Chart

Plate 2



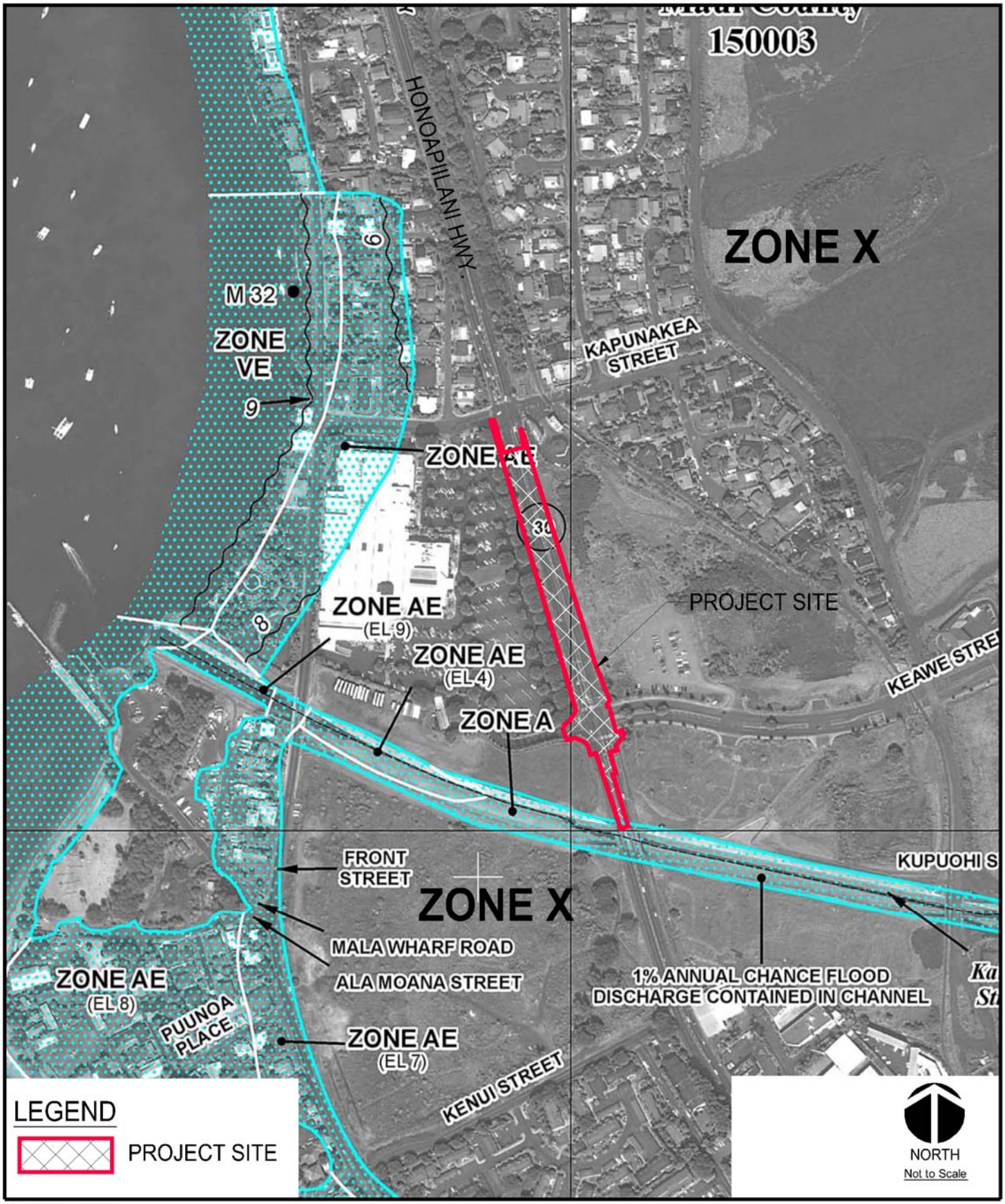


WILSON OKAMOTO CORPORATION

FIGURE 1

PROJECT LOCATION AND VICINITY MAP

HONOAPIILANI HIGHWAY IMPROVEMENTS, KAPUNAKEA STREET TO KEAWE STREET,
PROJECT NO. 30b-01-16 | LAHAINA,MAUI,HAWAII



WILSON OKAMOTO CORPORATION

FIGURE 2

FLOOD INSURANCE RATE MAP

HONOAPIILANI HIGHWAY IMPROVEMENTS, KAPUNAKEA STREET TO KEAWE STREET,
PROJECT NO. 30b-01-16 | LAHAINA,MAUI,HAWAII

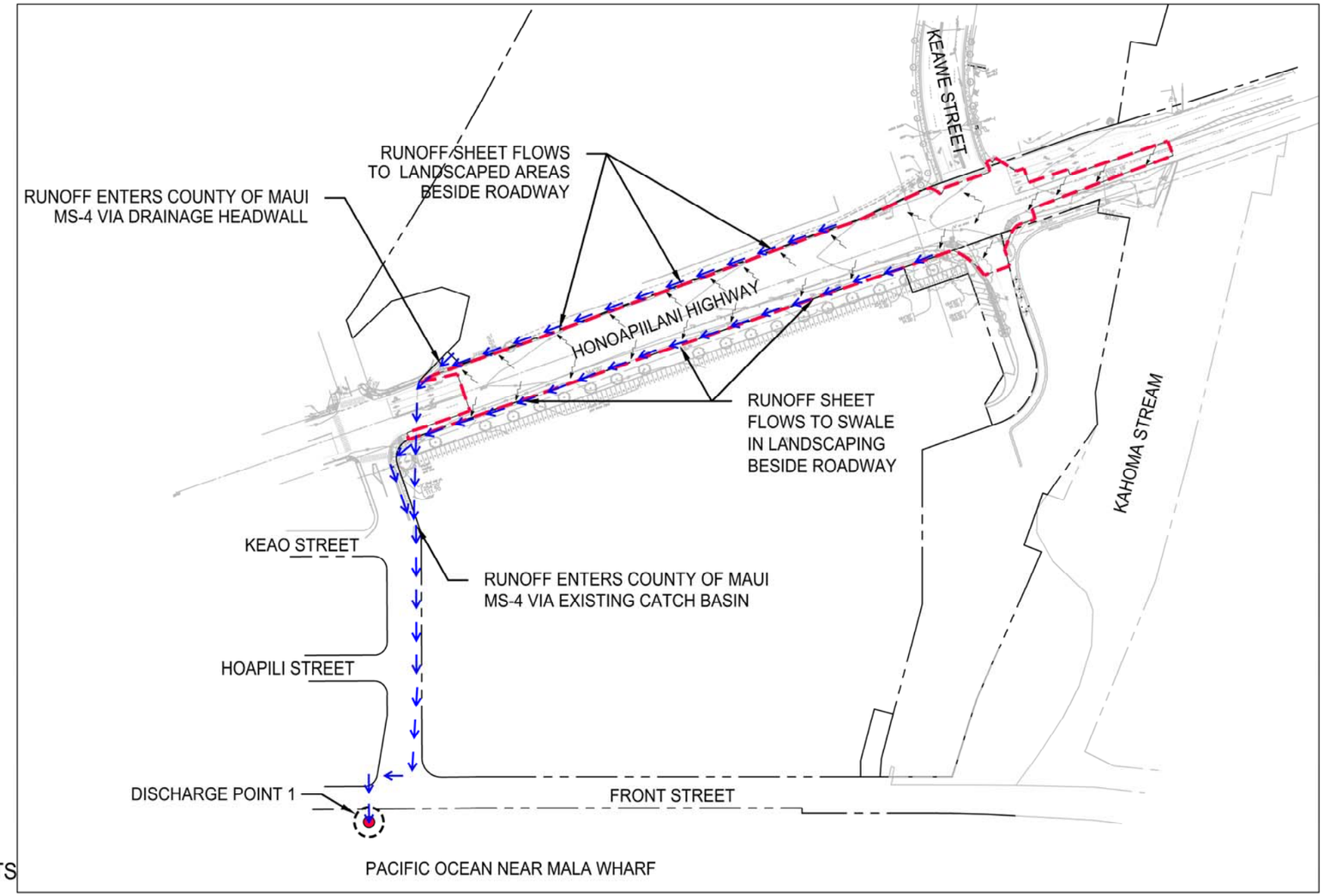
WILSON OKAMOTO CORPORATION

FIGURE 3

DISCHARGE POINTS INTO STATE WATERS

HONOAPIILANI HIGHWAY IMPROVEMENTS, KAPUNAKEA STREET TO KEAWE STREET,
PROJECT NO. 30b-01-16 | LAHAINA,MAUI,HAWAII

DISCHARGE POINT 1
PACIFIC OCEAN AT MALA WHARF
LATITUDE 20° 53' 15" N
LONGITUDE 156° 41' 06" W



LEGEND

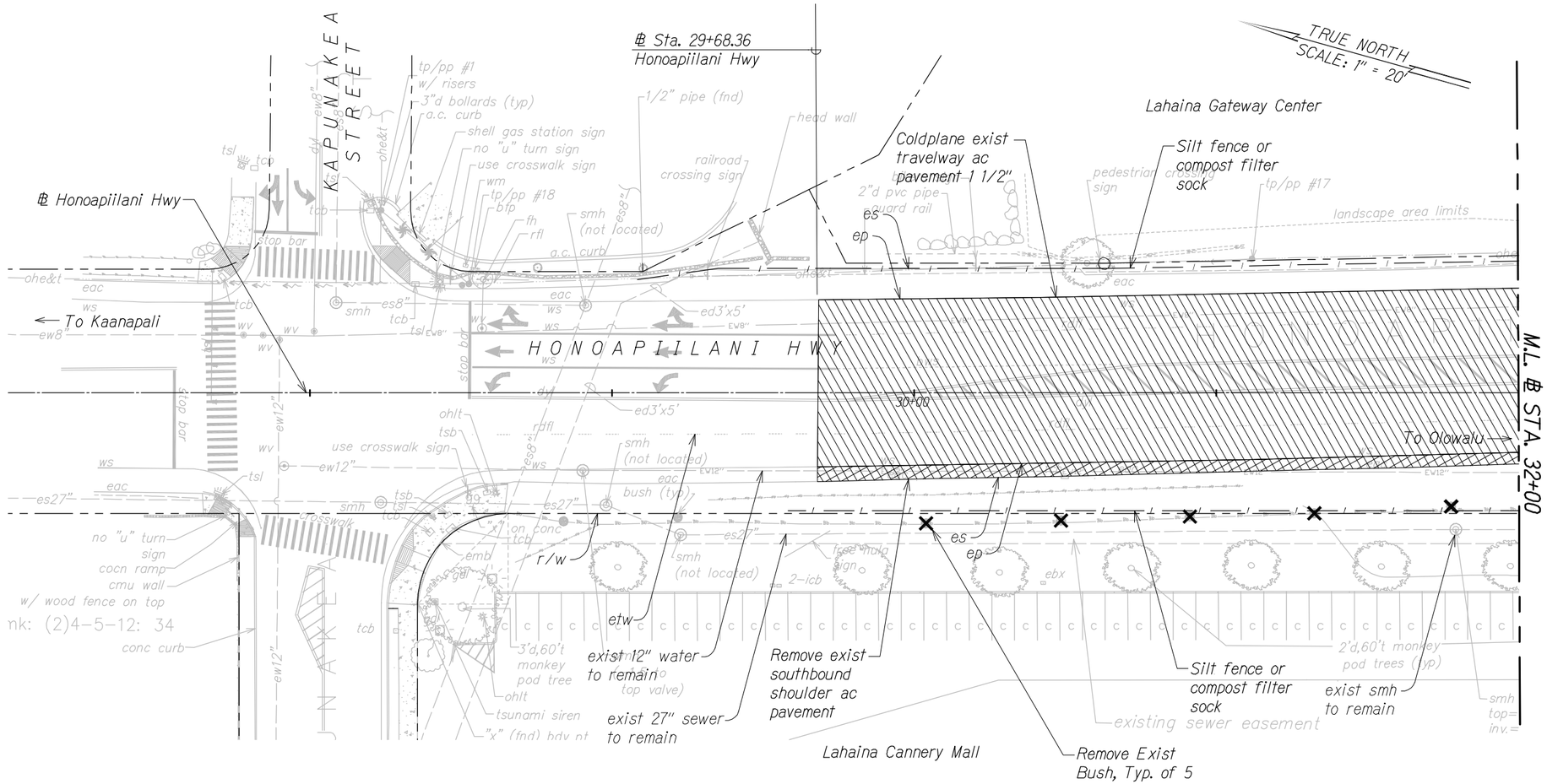
- PROJECT LIMITS
- SITE RUNOFF FLOW
- OFF SITE RUNOFF FLOW
- DISCHARGE POINT

NORTH
Not to Scale

WILSON OKAMOTO CORPORATION

FIGURE 4
PRE, DURING, AND POST CONSTRUCTION DRAINAGE CONDITION

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	--	2016	23	77



Note:

1. See 'Pavement Marking And Signing Plans' For Sign Removal And Relocation.

Legend:

- Remove exist southbound shoulder ac pavement
- Coldplane exist travelway ac pavement 1 1/2"
- Silt fence or compost filter sock

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	
	TRACED BY	
NOTE BOOK	DESIGNED BY	
	QUANTITIES BY	
No.	CHECKED BY	

BRIAN A. LOCK
LICENSED PROFESSIONAL ENGINEER
No. 9867-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

WILSON OKAMOTO CORPORATION — APRIL 30, 2016 LIC. EXP. DATE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DEMOLITION AND EROSION CONTROL PLANS

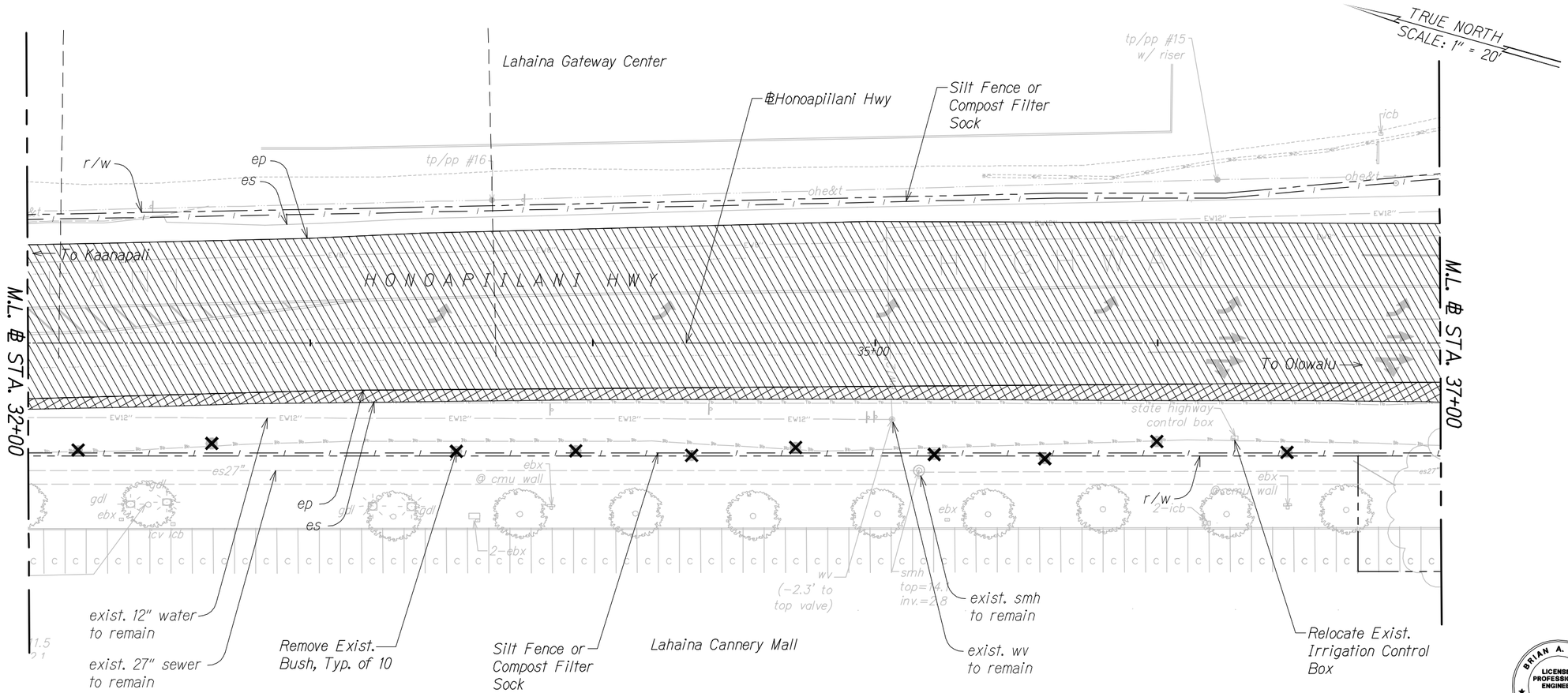
HONOAPIILANI HIGHWAY WIDENING
Kapunakea Street to Keawe Street
Proj. No. --

Scale: 1" = 20' Date: August 2015

SHEET No. DP-1 OF 3 SHEETS

60% DESIGN 23

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	--	2016	24	77



Note:

1. See 'Pavement Marking And Signing Plans' For Sign Removal And Relocation.

Legend:

- Remove exist southbound shoulder ac pavement
- Coldplane exist travelway ac pavement 1 1/2"
- Silt fence or compost filter sock

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	
NOTE BOOK	TRACED BY	
	DESIGNED BY	
No.	QUANTITIES BY	
	CHECKED BY	

BRIAN A. LOCK
LICENSED PROFESSIONAL ENGINEER
No. 9867-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

APRIL 30, 2016
WILSON OKAMOTO CORPORATION LIC. EXP. DATE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

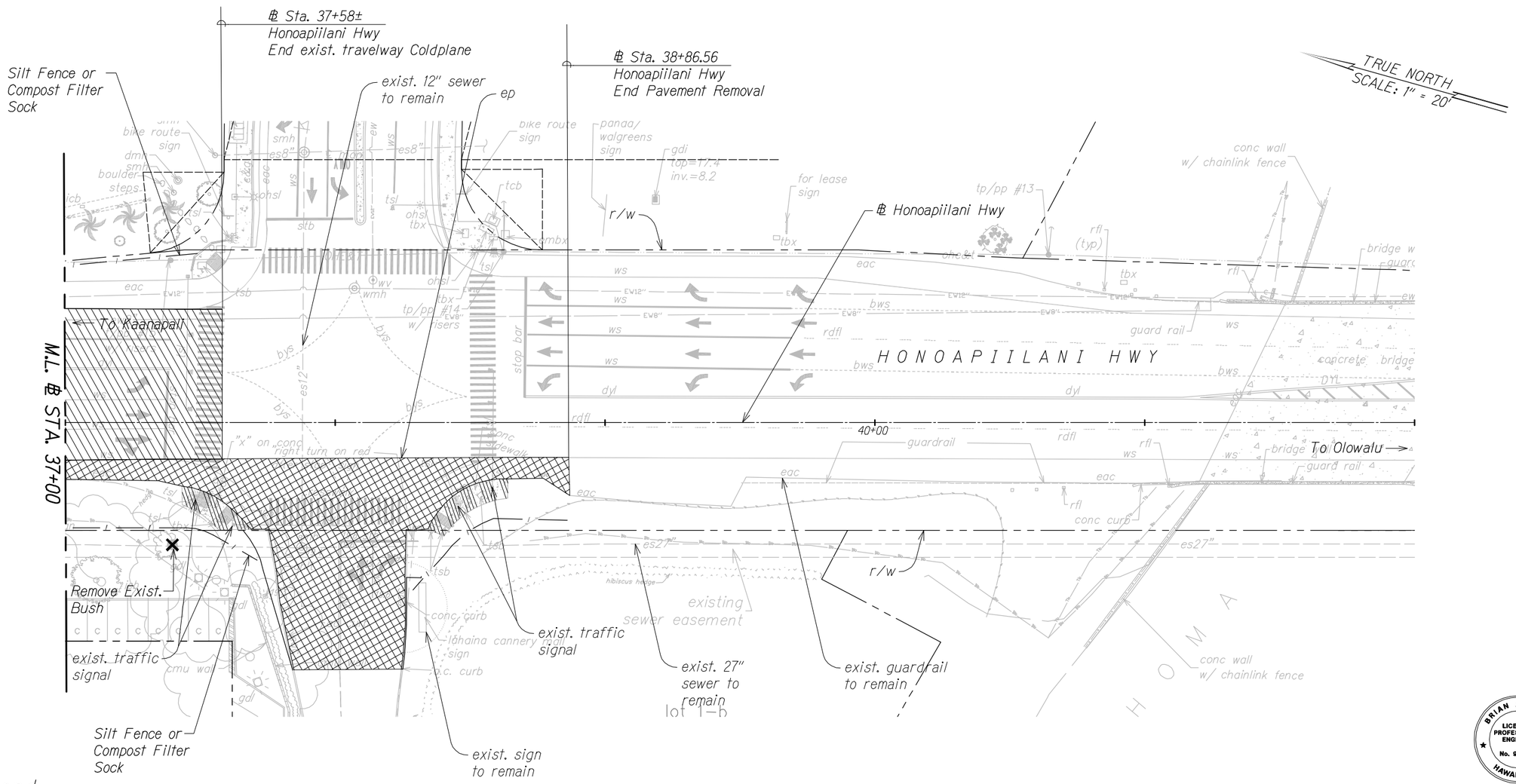
DEMOLITION AND EROSION CONTROL PLANS

HONOAPIILANI HIGHWAY WIDENING
Kapunakea Street to Keawe Street
Proj. No. --

Scale: 1" = 20' Date: August 2015

SHEET No. DP-2 OF 3 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	--	2016	25	77



Legend:

- Remove exist southbound shoulder ac pavement
- Coldplane exist travelway ac pavement 1 1/2"
- Remove Exist. Concrete Sidewalk
- Silt fence or compost filter sock

Note:

1. See 'Pavement Marking And Signing Plans' For Sign Removal And Relocation.
2. See "Traffic Signal Plans" For Exist. Traffic Signal Demolition.

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	
	TRACED BY	
NOTE BOOK	DESIGNED BY	
	QUANTITIES BY	
No.	CHECKED BY	

BRIAN A. LOCK
LICENSED PROFESSIONAL ENGINEER
No. 9867-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

APRIL 30, 2016
WILSON OKAMOTO CORPORATION LIC. EXP. DATE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DEMOLITION AND EROSION CONTROL PLANS

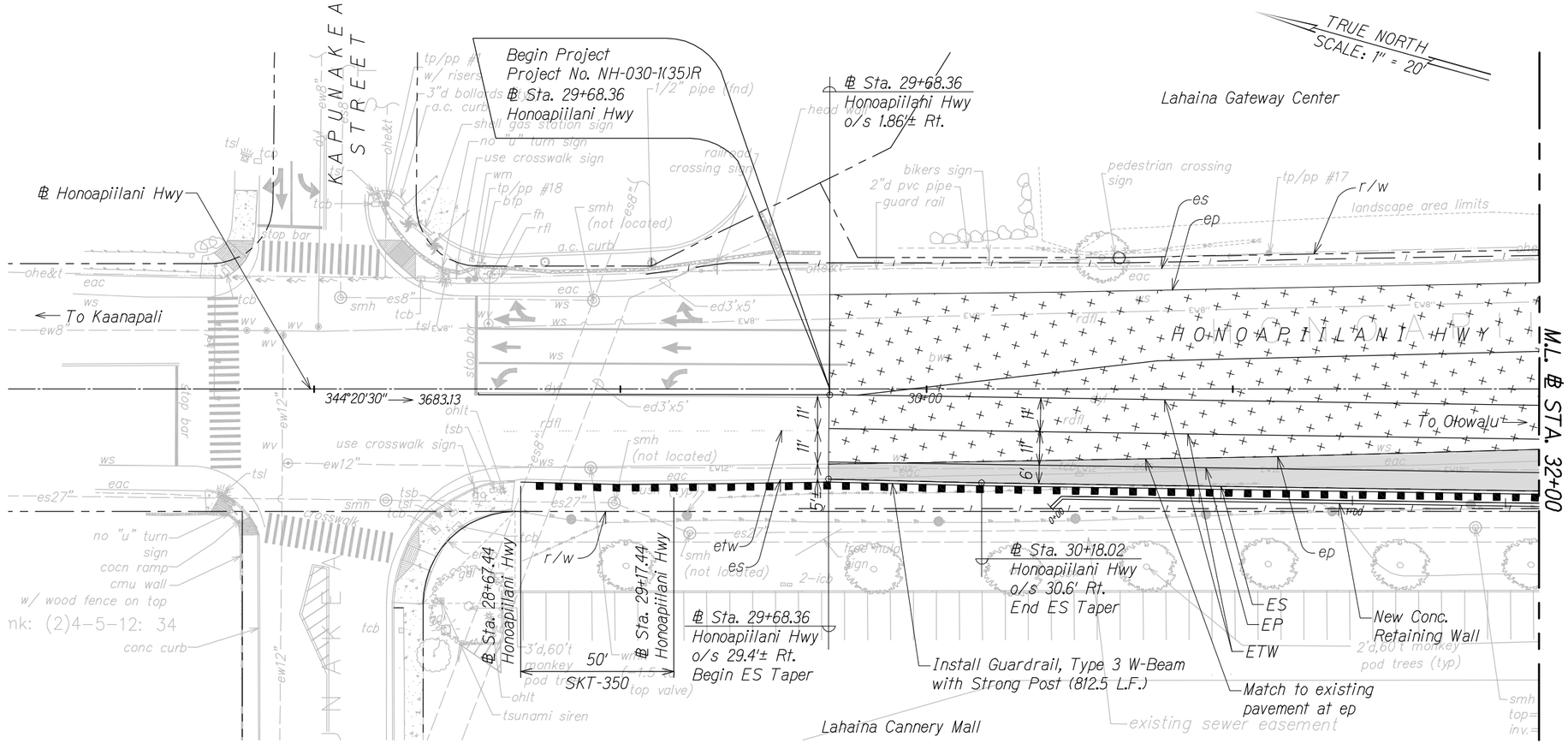
HONOAPIILANI HIGHWAY WIDENING
Kapunakea Street to Keawe Street
Proj. No. --

Scale: 1" = 20' Date: August 2015

SHEET No. DP-3 OF 3 SHEETS

60% DESIGN 25

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	--	2016	26	77



Legend:

New HMA Pavement

1 1/2" HMA Repave

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	
	TRACED BY	
NOTE BOOK	DESIGNED BY	
	QUANTITIES BY	
No.	CHECKED BY	

BRIAN A. LOCK
LICENSED PROFESSIONAL ENGINEER
No. 9867-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

APRIL 30, 2016
WILSON OKAMOTO CORPORATION LIC. EXP. DATE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY PLANS

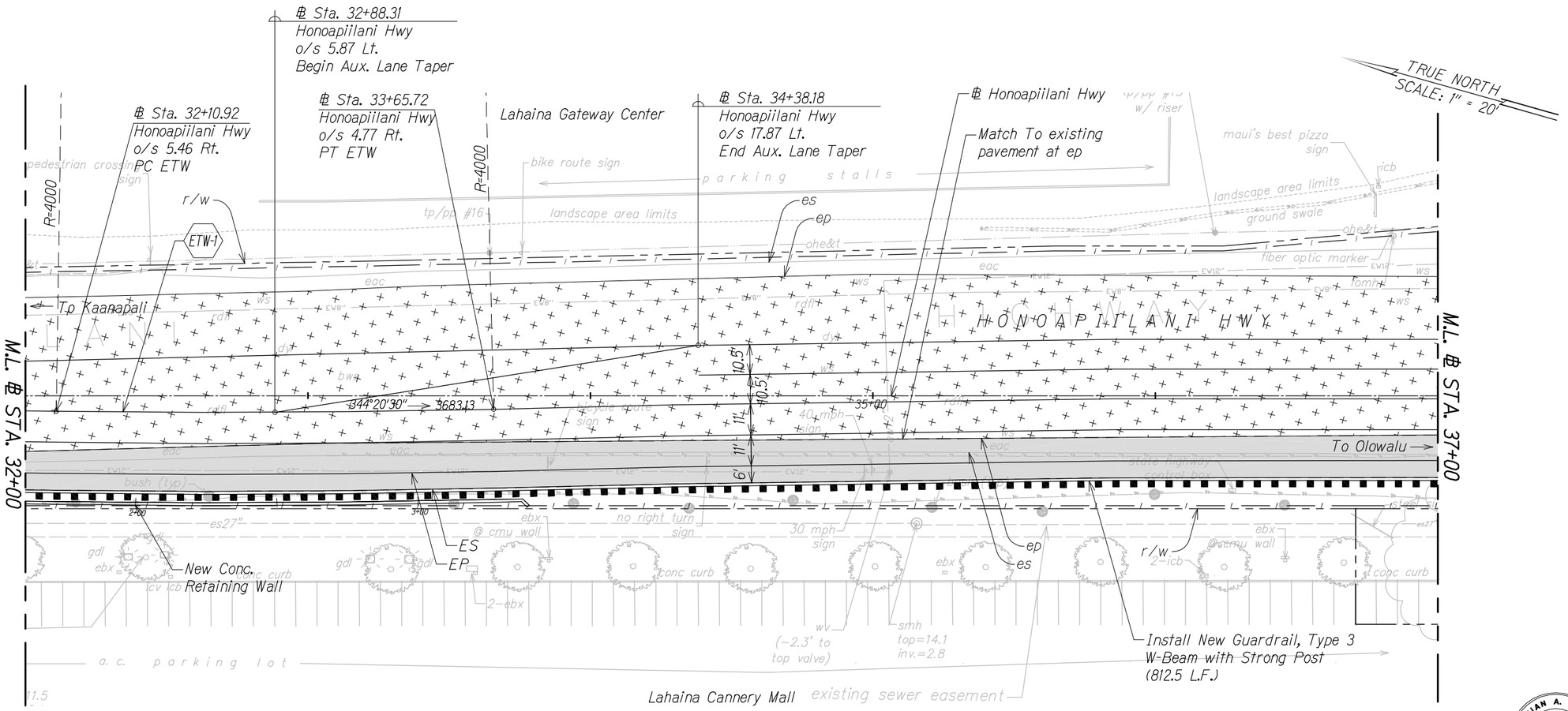
HONOAPIILANI HIGHWAY WIDENING
Kapunakea Street to Keawe Street
Proj. No. --

Scale: 1" = 20' Date: August 2015

SHEET No. RP-1 OF 3 SHEETS

60% DESIGN 26

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	--	2016	27	77



Legend:

New HMA Pavement

1 1/2" HMA Repave

CURVE DATA	
	ETW-1
Δ	2°13'03"
Δ/2	1°06'32"
R	4000'
T	77.42
C	154.81'
L_C	154.82'

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	
NOTE BOOK	TRACED BY	
	DESIGNED BY	
No.	QUANTITIES BY	
	CHECKED BY	

BRIAN A. LOCK
LICENSED PROFESSIONAL ENGINEER
No. 9867-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

APRIL 30, 2016
WILSON OKAMOTO CORPORATION LIC. EXP. DATE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY PLANS

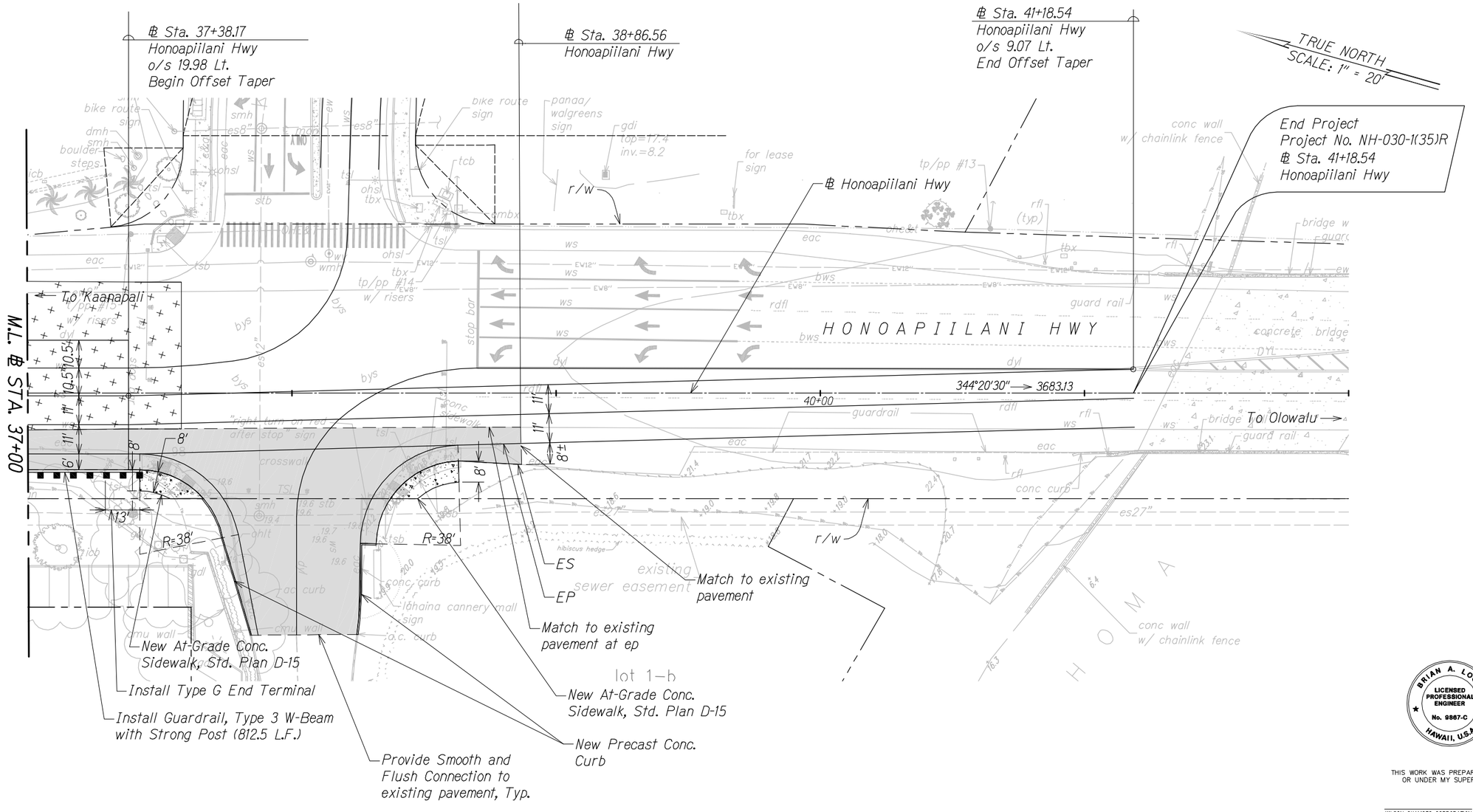
HONOAPIILANI HIGHWAY WIDENING
Kapunakea Street to Keawe Street
Proj. No. --

Scale: 1" = 20' Date: August 2015

SHEET No. RP-2 OF 3 SHEETS

60% DESIGN 27

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	--	2016	28	77



Legend:

New HMA Pavement

New Concrete Sidewalk

Note:

1. See "Intersection Plan" For Intersection and Concrete Sidewalk Layout
2. See "Traffic Signal Plan" For New Traffic Pole and Box Locations.

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	
NOTE BOOK	TRACED BY	
	DESIGNED BY	
	QUANTITIES BY	
No.	CHECKED BY	

BRIAN A. LOCK
LICENSED PROFESSIONAL ENGINEER
No. 9867-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

APRIL 30, 2016
WILSON OKAMOTO CORPORATION LIC. EXP. DATE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY PLANS

HONOAPIILANI HIGHWAY WIDENING
Kapunakea Street to Keawe Street
Proj. No. --

Scale: 1" = 20' Date: August 2015

SHEET No. RP-3 OF 3 SHEETS

60% DESIGN 28

CWB NOI Form - Honoapiilani Highway Improvements

version 2.7

(Submission #: 2D3-5KQ2-179R, revision 1)

Payment must be received before your submission can be processed.

Submission Information

Submission #:	2D3-5KQ2-179R, revision 1	**File/Reference #:**	
Submitted On:	03/17/2016	**Applicant:**	Royce Miyahara
Form:	CWB NOI Form		

Fee Details

Base Fee

Amount Due:	$500.00
Amount Paid:	$500.00

Make Payment To

Clean Water Branch
State Department of Health
919 Ala Moana Boulevard, Room 301
Honolulu, Hawaii 96814-4920