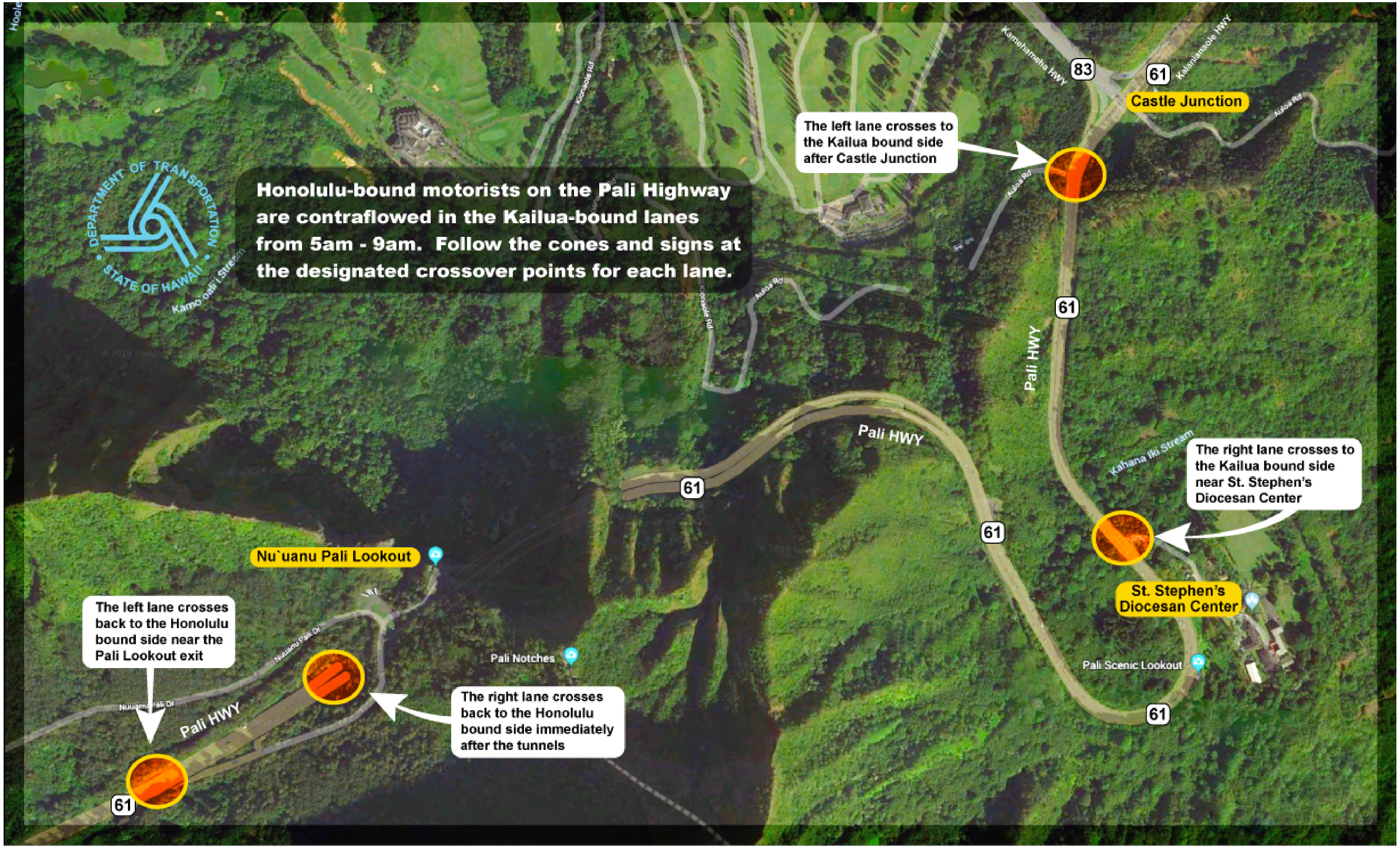
PALI HIGHWAY REPAIR PROJECT

…and State Highways resilience strategies.

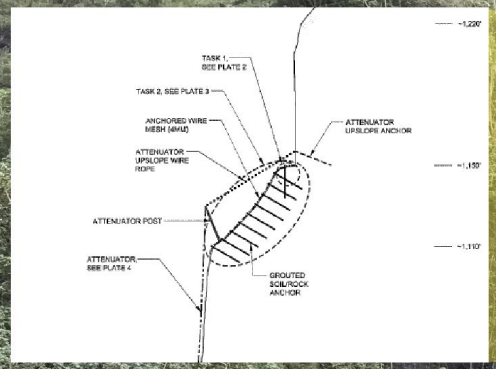
OUTLINE

- Why is resilience of the highway system important?
- Recent impacts to the highway system & repair strategies
  - Pali Highway Emergency Repairs
  - Kuhio Highway Emergency Repairs
  - Lower East Rift Zone Event - Kilauea
  - Kamehameha Highway Emergency Repairs
- Long-term Strategy


Pali Highway - Before



Honolulu-bound motorists on the Pali Highway are contraflowed in the Kailua-bound lanes from 5am - 9am. Follow the cones and signs at the designated crossover points for each lane.
DEPARTMENT OF TRANSPORTATION STATE OF HAWAII
The left lane crosses to the Kailua bound side after Castle Junction
Castle Junction
83
61
Kamehameha HWY
Kalanianaole HWY
Pali HWY
The right lane crosses to the Kailua bound side near St. Stephen's Diocesan Center
St. Stephen's Diocesan Center
Pali Scenic Lookout
Nu`uanu Pali Lookout
Pali Notches
The left lane crosses back to the Honolulu bound side near the Pali Lookout exit
The right lane crosses back to the Honolulu bound side immediately after the tunnels
Kahana Iki Stream

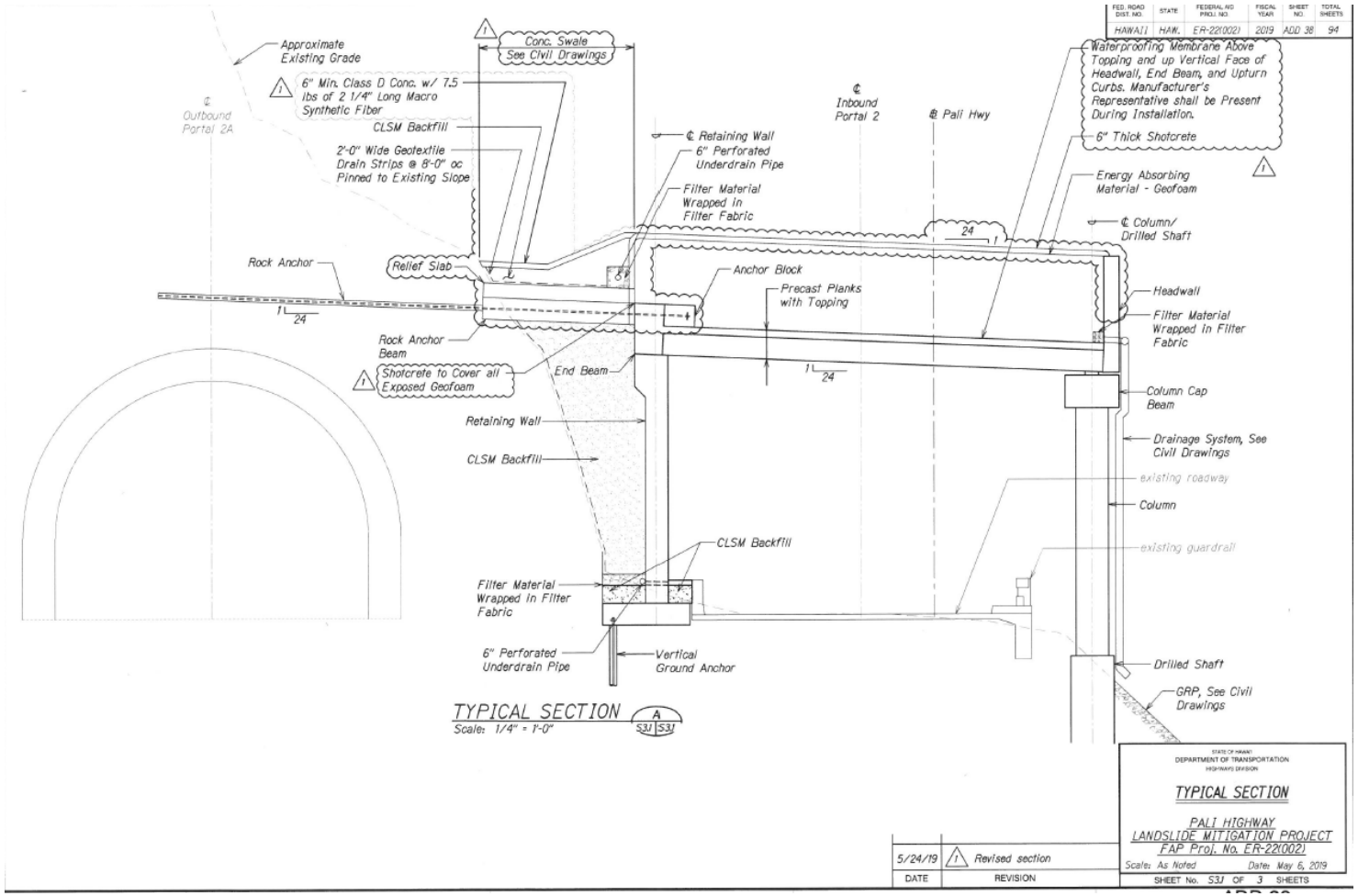


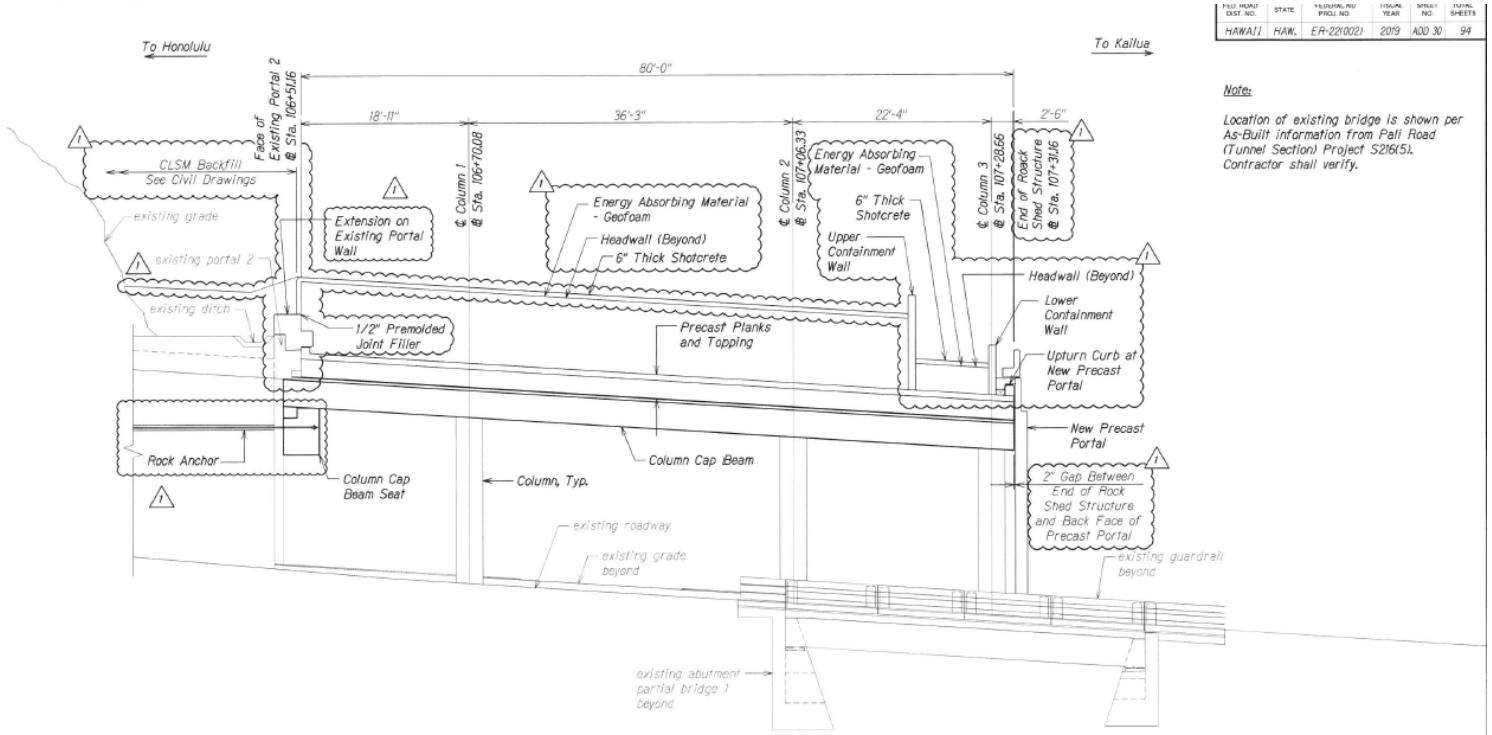
Reinforce slope under Old Pali Road through installation of soil nail, shot-crete, and mesh attenuators to catch loose material.

Extend Pali Tunnel #2 IB to provide rockfall protection for the Honolulu bound roadway between tunnels.

Secure rockface above existing tunnel with soil nail and mesh. (Example shown from Kuhio Highway Emergency Work).

Pali Highway - Concept


Approximate Existing Grade
Conc. Swale See Civil Drawings
6" Min. Class D Conc. w/ 7.5 lbs of 2 1/4" Long Macro Synthetic Fiber
℄ Outbound Portal 2A
CLSM Backfill
2'-0" Wide Geotextile Drain Strips @ 8'-0" oc Pinned to Existing Slope
℄ Retaining Wall
6" Perforated Underdrain Pipe
Filter Material Wrapped in Filter Fabric
℄ Inbound Portal 2
℄ Pali Hwy
Waterproofing Membrane Above Topping and up Vertical Face of Headwall, End Beam, and Upturn Curbs. Manufacturer's Representative shall be Present During Installation.
6" Thick Shotcrete
Energy Absorbing Material - Geofoam
℄ Column/ Drilled Shaft
Rock Anchor
Relief Slab
Anchor Block
Precast Planks with Topping
Headwall
Filter Material Wrapped in Filter Fabric
Rock Anchor Beam
Shotcrete to Cover all Exposed Geofoam
End Beam
Column Cap Beam
Retaining Wall
Drainage System, See Civil Drawings
CLSM Backfill
existing roadway
Column
CLSM Backfill
existing guardrail
Filter Material Wrapped in Filter Fabric
6" Perforated Underdrain Pipe
Vertical Ground Anchor
Drilled Shaft
GRP, See Civil Drawings
24
1
24
1
24
TYPICAL SECTION
Scale: 1/4" = 1'-0"
A
S3J
S3J
FED. ROAD DIST. NO.
STATE
FEDERAL NO. PROJ. NO.
FISCAL YEAR
SHEET NO.
TOTAL SHEETS
HAWAII
HAW.
ER-22(002)
2019
ADD 38
94
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
TYPICAL SECTION
PALI HIGHWAY
LANDSLIDE MITIGATION PROJECT
FAP Proj. No. ER-22(002)
Scale: As Noted
Date: May 6, 2019
SHEET No. S3J OF 3 SHEETS
5/24/19
Revised section
DATE
REVISION



LONGITUDINAL SECTION AT ℄ ROCK SHED (A, S1.2 | S1.2)

Scale: 3/16" = 1'-0"

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	ER-22(002)	2019	A00 30	94

Note:

Location of existing bridge is shown per As-Built information from Pali Road (Tunnel Section) Project S216(5). Contractor shall verify.

DATE	REVISION
5/24/19	1 Revised Section

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

LONGITUDINAL SECTION

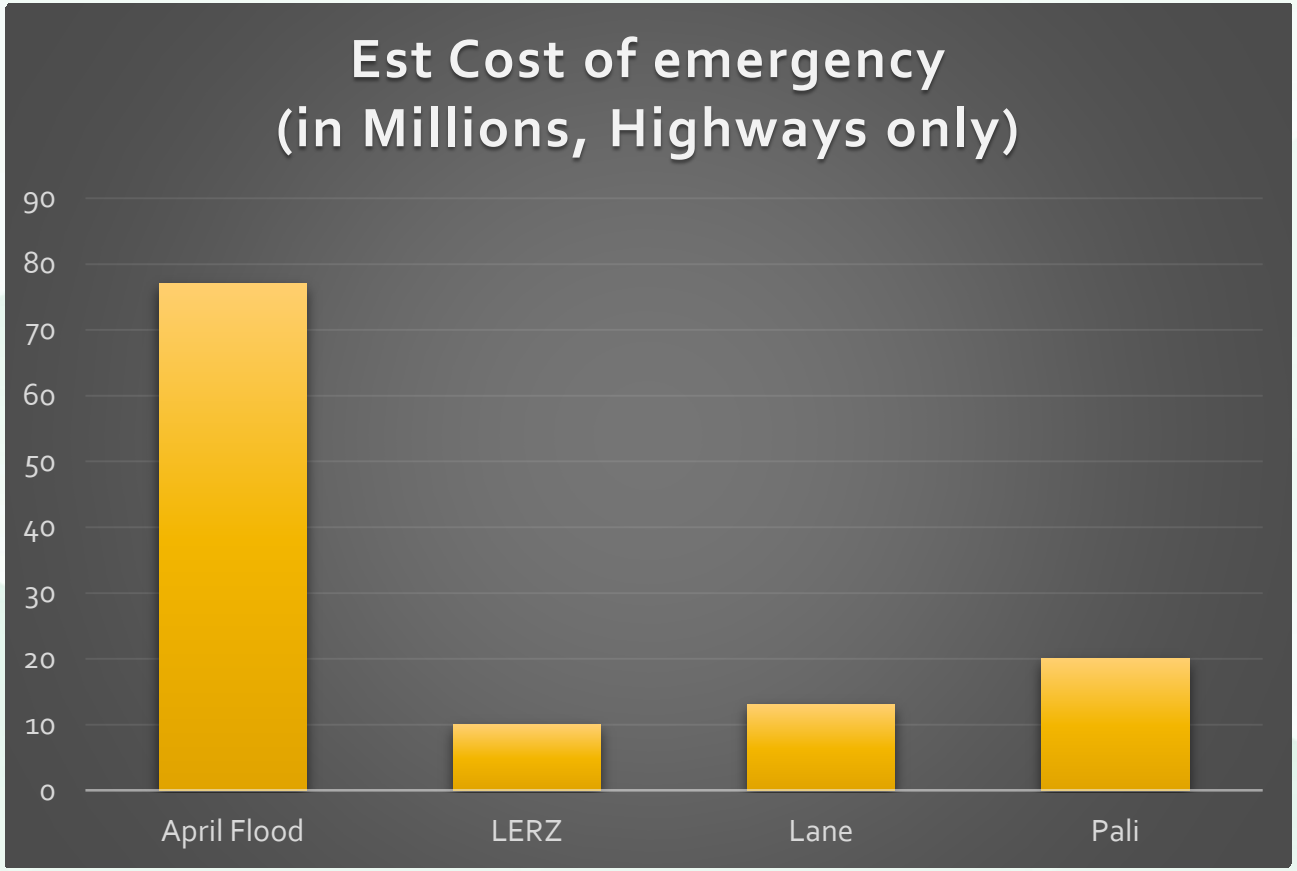
PALI HIGHWAY
LANDSLIDE MITIGATION PROJECT
FAP Proj. No. ER-22(002)

Scale: As Noted Date: May 6, 2019

SHEET No. S1.2 OF 6 SHEETS

Pali Highway- After

2018-2019 NATURAL DISASTERS



- April Floods – Kauai & Oahu
- East Rift Zone Eruption - Hawaii Island
- Hurricane Lane - Hawaii Island, Maui, Oahu, Kauai
- Tropical Storm Olivia - Maui, Molokai, Oahu (No DDIRs submitted)
- Pali Highway and Honoapiilani Highway landslide/rockfall


PLAN
DESIGN
BUILD
OPERATE
MAINTAIN
RESCUE
RECOVER
REBUILD
EVENT

Hanalei – April 2018


Kuhio Highway - Before

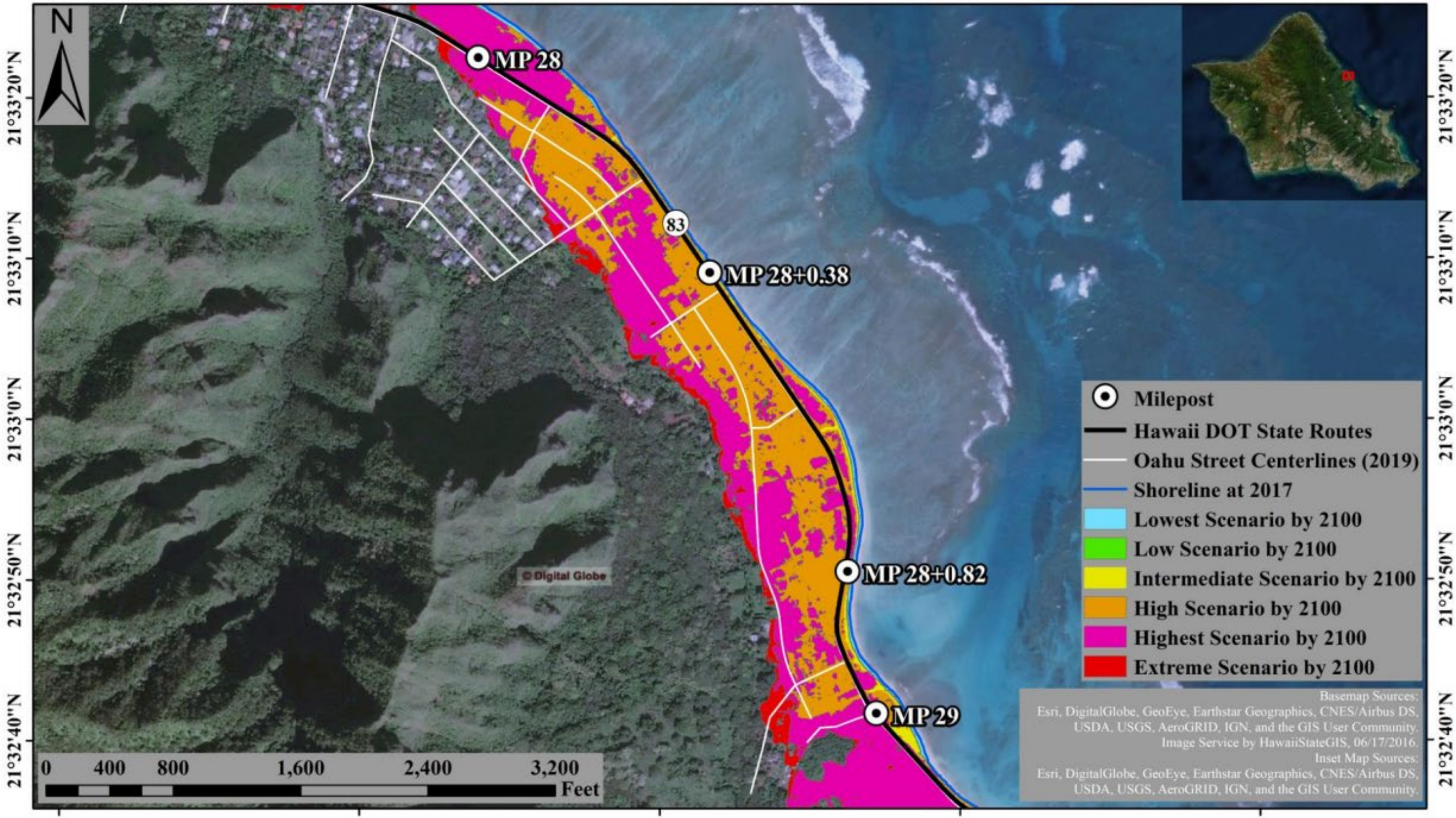

Kuhio Highway - After


LERZ

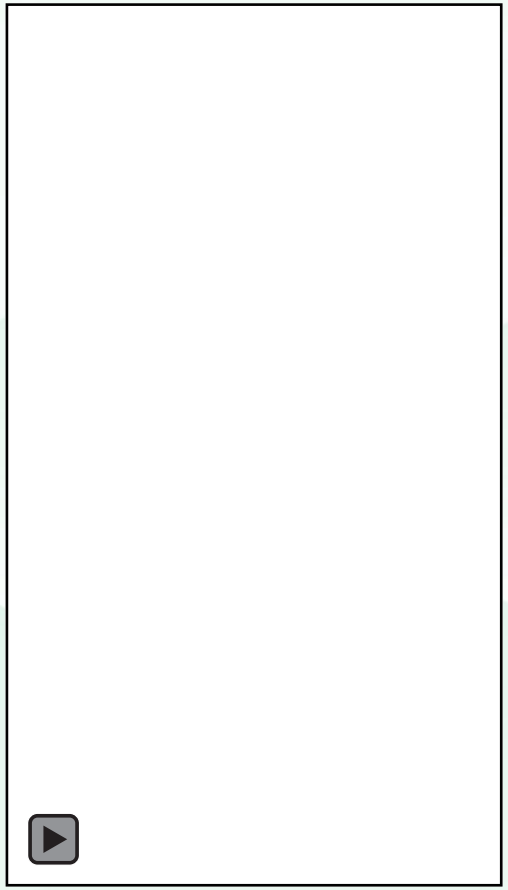

FOREMAN

Coastal Highway Protection

Map of Sea Level Rise Inundation by 2100 along Mile 28, SR 83, East Shore, Oahu

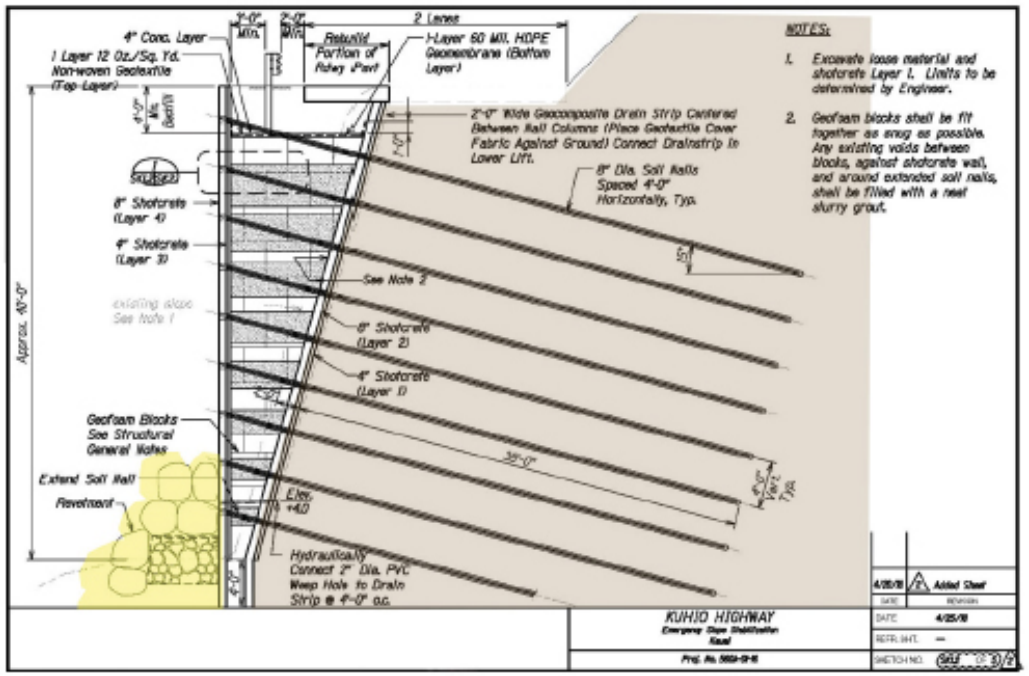


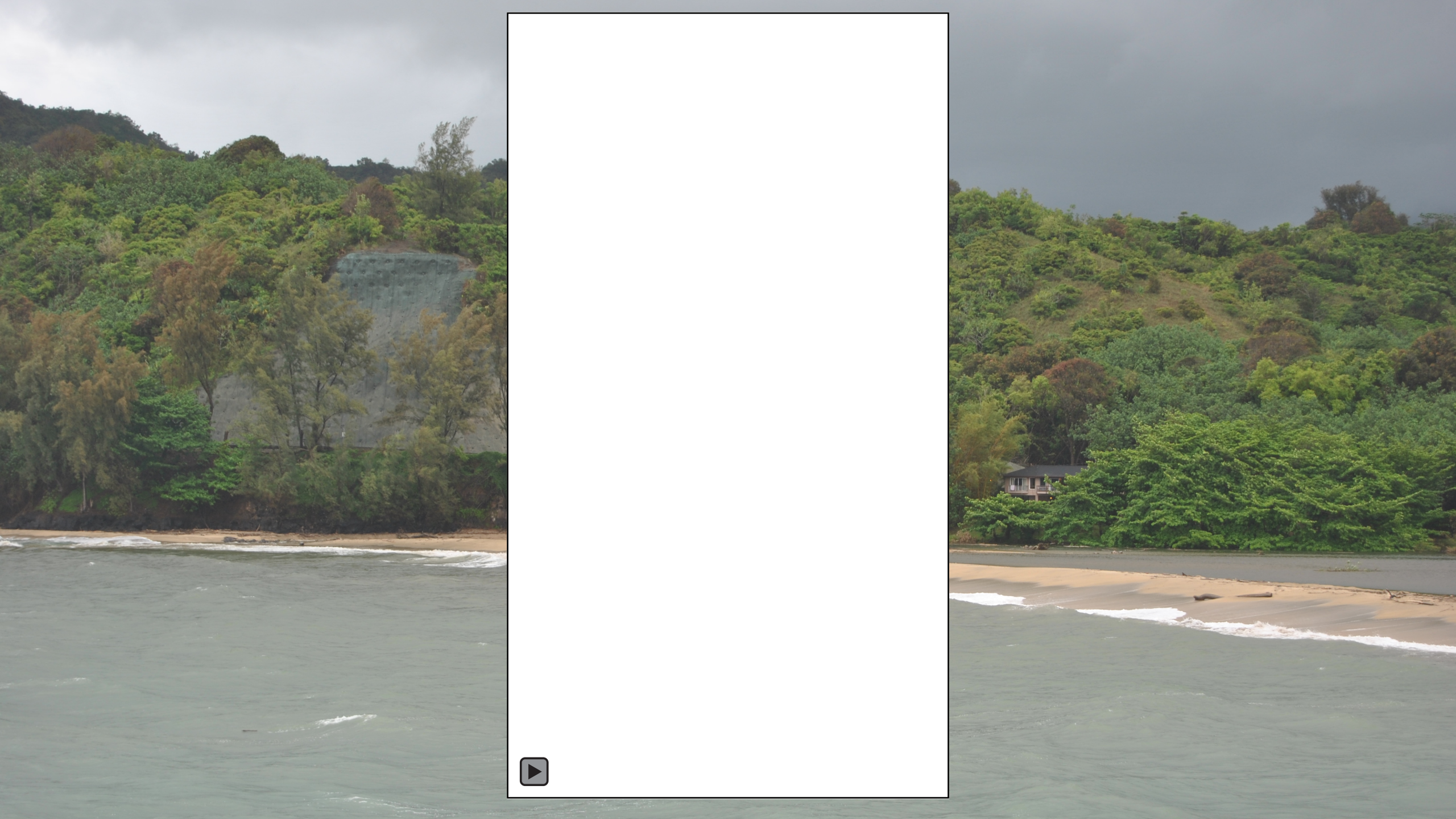
ROCKFALL MITIGATION



1.	Kamehameha Highway (Route 83), MM 5.4-5.52	$20 Million
2.	Hawaii Belt Road (Route 19), MM 21.04-21.49	$11.7 Million
3.	Hawaii Belt Road (Route 19), MM 25.77-26.06	$7.19 Million
4.	Kuhio Highway (Route 56), MM 24.79-25.01	$8.21 Million
5.	Hawaii Belt Road (Route 19), MM 21.6-21.85	$1.03 Million
6.	Kuhio Highway (Route 560), MM 0.66-1.17	$20.1 Million
7.	Honoapiilani Highway (Route 30), MM 10.33-10.44	$2.57 Million
8.	Pali Highway (Route 61), MM 5.95-6.04	$2.52 Million
9.	Pali Highway (Route 61), MM 5.69-5.9	$20.3 Million
10.	Pali Highway (Route 61), MM 6.04-6.55	$10.7 Million

Repair Site 2 Design

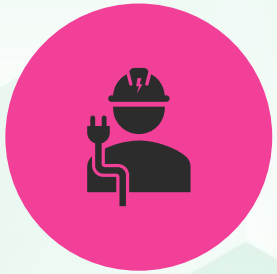




WHAT CAN WE DO?

Create policies for adaptation, protection or managed retreat that take communities and funding into account.

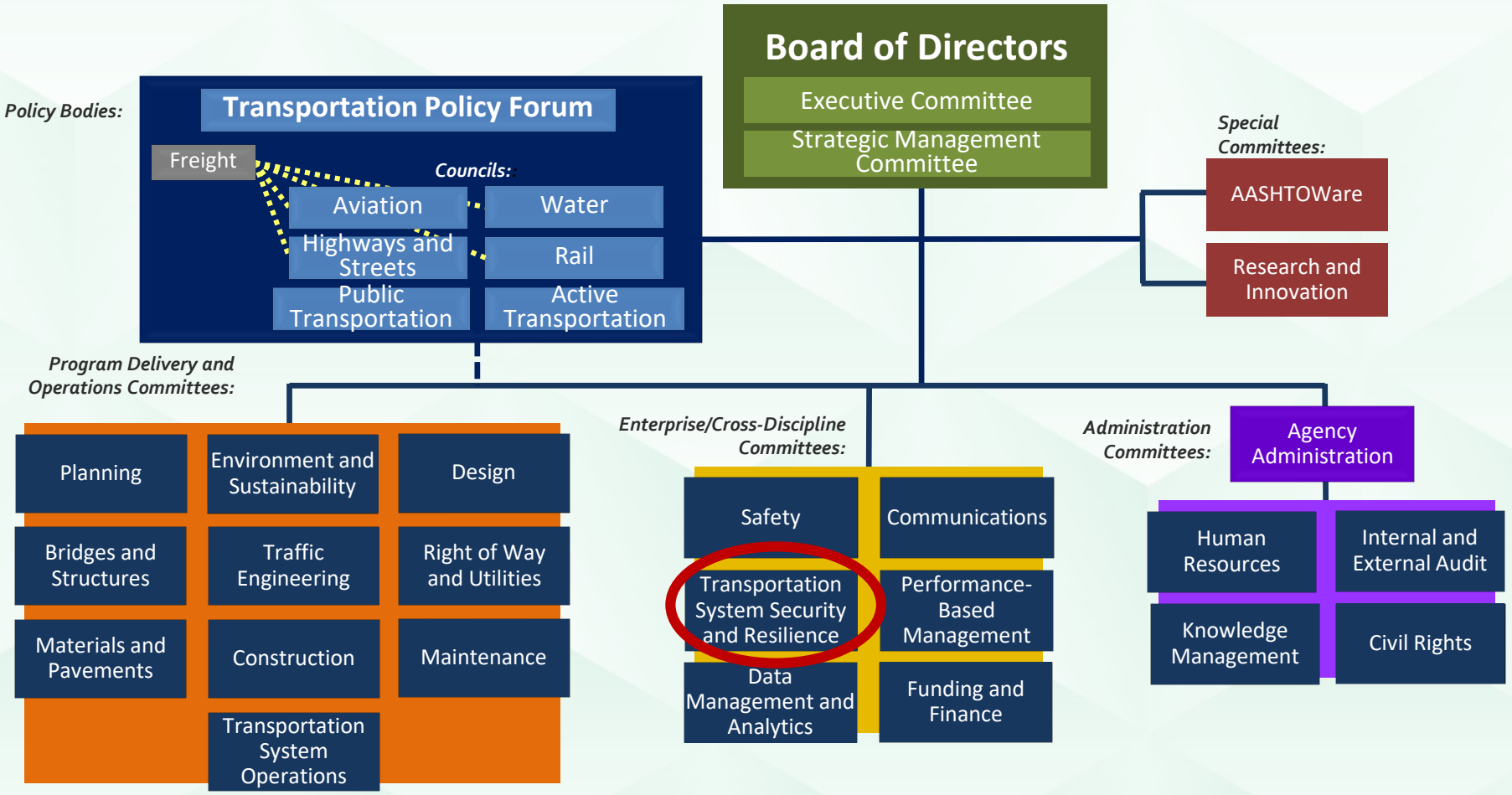
Work with experts to prioritize sites and design mitigation measures.



Work with stakeholders on land use, access, and other considerations.

Future decisions for roads require more than just DOT buy-in. Need alignment with State, County and Fed agencies and community.

TRANSPORTATION POLICY




9181
784
FOR OFFICIAL USE ON
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
H286
CUTTER CHEVROLET


PROTERRA CATALYST
BATTERY ELECTRIC


ROADTEC
SB-2500C

RESILIENCY STUDY

- Kicked-off resiliency study in December 2019 to develop a comprehensive inventory of potential extreme weather and climate change system impacts to our Highway system.
- The study is to identify:
  - locations where risks/impacts are most pressing to focus resources,
  - methods by which to incorporate climate change risks and related uncertainty into agency practice, and
  - the information/data needed to inform long-range and capital decisions
- When complete, the study will provide recommendations on how HDOT can best plan, design, operate, and maintain our infrastructure to be more resilient to current and long-term risks.

MAHALO

Ed Sniffen

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