FY21 HMGP

Hawaii COVID-19 Pandemic Grant

DR-4510-HI

NOTICE OF INTEREST REVIEW PACKET

Prepared for: Hawaii State Hazard Mitigation Forum

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SUMMARY

Hazard Mitigation Grant Program Allocations for COVID-19

With the growing climate change crisis facing the nation, FEMA's Hazard Mitigation Grant Program will provide funding to states, tribes, and territories for mitigation planning and projects to reduce its impacts.

On Aug. 5, 2021, FEMA announced every state, tribe, and territory that received a major disaster declaration in response to the COVID-19 pandemic will be eligible to receive 4% of those disaster costs to invest in mitigation planning and projects that reduce risks from natural disasters.

In total, $3,460,620,398 in Hazard Mitigation Grant Program funds have been authorized for the Coronavirus 2019 (COVID-19) major disaster declarations.

Hawaii Share: $24,740,226

JURISDICTION	# OF PROJECTS	COST
Hawaii County	5	$18 M
City and County of Honolulu	5	$23.5 M
Kauai County	3	$30 M
Maui County	9	$33 M
State of Hawaii	8	$6 M

JURISDICTION	# OF PROJECTS	COST
Total Project Submissions	30	$110.5M

CRITERIA

HMGP COVID-19 Funding Criteria

Background

This program support material provides detailed information about the five criteria to be used by the State Hazard Mitigation Forum (SHMF) to rank NOI submissions for the Hazard Mitigation Grant Program (HMGP) DR-4510 COVID-19. All jurisdictions within the state are considered equal priorities for this disaster declaration, as it was not location specific.

The HMGP ranking criteria is divided into five (5) key project areas:

- Risk Reduction
- Long-range Solution
- Cost Effectiveness
- Technical Feasibility
- Project Management

When the DR-4510 disaster declaration for COVID-19 was released in August 2021, HI-EMA was tasked by the Governor's office to identify priority uses for the funds.

Projects are divided into three (3) categories:

1. Structural retrofitting of existing buildings intended for sheltering
2. Redundant emergency power to critical facilities
3. High-resolution analysis of extreme weather events

A total of $24,740,226 was allocated by FEMA, this includes 10% for state management costs and 5% for subrecipient management costs, with $20,616,827.10 remaining for projects.

HI-EMA received 30 project NOI's requesting a total of $110,500,000. HI-EMA has categorized submissions into primary and secondary lists based on the qualifying criteria listed below. All NOI's that directly address one of the three priorities above are on the primary list. All NOI's that do not directly address one of the three priorities above are on the secondary list. Projects

will be funded from the primary list first, with additional projects funded based on available funds.

Evaluation Process & Scoring

SHMF members will leverage their hazard mitigation knowledge and expertise during the review process to assess the degree to which each NOI entry meets the five HMPG ranking criteria project areas. Members will score each project using a standardized points system with scores determined from 1-5 points for each of the five (5) priority areas. A final score will be calculated for each NOI by averaging the scores from each Forum member. If a SHMF is affiliated with a submission, no score will be included in the final score. All SHMF members must declare conflicts of interest and abstain from ranking projects they are affiliated with. The HI-EMA leadership team will review all SHMF final scores and determine project priorities based on those recommendations, as well as any additional information
Project criteria is ranked from 1 to 5, with 1 representing the lowest score and 5 the highest.

Table 1: To what degree does the NOI meet the criterion?

Scoring Option	Description
1 = Not at all	The NOI does not address the criterion at all, or references to the criterion are made that include no substantive information.
2 = Minimally	The NOI addresses the criterion, but information in the NOI may be confusing, unclear, and/or incorrect.
3 = Partially	The NOI addresses the criterion, but the NOI may lack clarity and/or strong support, has minor inconsistencies, or does not address all components of the criterion.
4 = Mostly	Although the NOI may include a few minor inconsistencies or areas that need more clarity, there is strong support for most components of the criterion.
5 = Entirely	The NOI is clear, concise, and complete, provides examples, and is supported by data. It addresses all components of the criterion and may have a particularly compelling narrative.

Criterion 1: Risk Reduction

The NOI demonstrates that the project strengthens community resiliency by reducing the risk of loss of life and property from specific high probability or high impact hazard. The proposed project is an effective solution to a repetitive or high-risk hazard. The reasons why this solution is preferred are identified.

Criterion 2: Long-range Solution

The NOI identifies a solution that is considered permanent or long-term (10+ years). The NOI addresses maintenance needs, describes who is responsible for maintenance, and how the project will be maintained into the future. The NOI provides a solution that can easily and feasibly be maintained permanently or long-term.

Criterion 3: Cost Effectiveness

The NOI proposes a cost-effective solution when comparing total estimated cost to project outcomes (at-a-glance). The NOI identifies potential data sources for use in the benefit cost analysis. Benefits may include avoided damages, loss of function, and displacement.

Criterion 4: Technical Feasibility

The project is environmentally sound and in conformance with Floodplain Management, Historical Preservation, and Protection of Wetlands and Endangered Species laws and regulations. The NOI considers and addresses all potential EHP issues.

- For infrastructure projects, no actual construction has begun.
- For building envelope hardening and sheltering projects, the proposed project site is located outside of a special flood hazard area (SFHA), tsunami evacuation area, or high-hazard coastal zone.
- For planning and scoping projects, methods and metrics for success have been addressed and partnerships have been identified.

Criterion 5: Project Management

The project description is clear and compelling. Project methods are included, and alternative options have been considered. Minimal support is needed from the HI-EMA Hazard Mitigation grants team to develop the complete application. The 25% cost-share has been identified and is ready to be committed. If additional funds have been allocated from other sources, an explanation of how these funds will work together is provided.

PRIMARY PROJECTS

EMERGENCY POWER TRANSFER SWITCHING CAPABILITY FOR CRITICAL WATER INFRASTRUCTURE ISLANDWIDE

Agency name: Department of Water Supply

Jurisdiction: County of Hawaii

Project location: Hawaii County: Island wide

Activity: Hazard Mitigation Plan Development/Adoption

Hazards mitigated: Coastal storm; Drought; Earthquake; Fire; Flood; Hurricane; Severe storms; Tsunami; Volcano; Windstorms

SHMP or LHMP connection to state or local plan:
2020 County of Hawaii Multi-Hazard Mitigation Plan
- *Hazard Mitigation Action HC6*

Flood zone: Minimal Flood Hazard Zone

Environmental impact issues: No

Historical or cultural preservation issues: No

Issues Detailed: N/A

Estimated cost: $750,000

Support needed from HI-EMA Hazard Mitigation Team: 1
(1 = minimal, 2= minimal, 3 = a lot)

Work started: No

Project description: The hardening of the Parker #1, Lalamilo C, Honokaa, Makapala, Kahaluu, and Queen Liliuokalani Trust (QLT) potable water producing facilities through the purchase and installation of transfer switches and supporting infrastructure (generator tap boxes, junction boxes, conduit, wire, supports, etc.) will allow the County of Hawai‘i Department of Water Supply (DWS) to better protect the health and welfare of the public.

Cost share contribution: Yes.

Additional funding allocated: No.

HAWAI'I COUNTY FIRE STATIONS: STRUCTURAL HARDENING & POWER REDUNDANCY

Agency name: County of Hawai'i Fire Department

Jurisdiction: Hawaii County

Project location: County-wide

Activity: Post-Disaster Retrofits (structural, utilities)

Hazards mitigated: Coastal storm; Dam/Levee break; Drought; Earthquake; Fire; Flood; Hurricane; Mud/Landslide; Severe storms; Terrorism; Tsunami; Volcano; Windstorms

SHMP or LHMP connection to state or local plan:
The County of Hawai'i MHMP identifies the need to ""retrofit critical facilities to reduce future wind damage"" (pg. 22-8), ""armor/retrofit critical infrastructure against the impact of landslides"" (pg. 22-8), ""build redundancy for critical facilities and functions"" (pgs. 22-5, 22-6, 22-9).

The 2018 State Hazard Mitigation Plan, makes several references to the need for emergency power prioritization at critical service facilities such as fire stations, as identified in the Makani Pahili 2017 Temporary

Emergency Power County Workshop Report. In addition, top priorities in the State plan include projects aimed at Hardening of Critical Facilities (Honolulu-004, Hawai'i 002-005). While proposed projects sites are not solely limited to inundation zones, 2018 State Hazard Mitigation Plan, G-19: 2013-122 points out the need to evaluate vulnerability of critical infrastructure systems (in inundation zones) and implement protective measures or back-up resources. Though none of these at this time direct attention to the hardening and provision of back-up power at fire stations in Hawai'i County, the need for such efforts is recognized throughout the State Hazard Mitigation Plan narrative.

Flood zone: Minimal Flood Hazard Zone

Environmental impact issues: No

Historical or cultural preservation issues: No

Issues Detailed: N/A - No groundbreaking or potential disturbance. Any required permits shall be obtained.

Estimated cost: $3,020,000

Support needed from HI-EMA Hazard Mitigation Team: 1
(1 = minimal, 2= minimal, 3 = a lot)

Work started: No

Project description: Hawai'i County Fire Stations: Structural Hardening & Power Redundancy This project will purchase and install manual transfer switches at 12 fire stations (Kailua, Waimea, Waikoloa, Ocean View, Pahala, Waiakea, Kea'au, Honoka'a, Heahou, South Kohala, North Kohala, and Paradise Park), purchase back-up generators for 5 stations (Kailua, Waimea, Waikoloa, Ocean View and Pahala), and purchase three additional mobile generators to be utilized where the need arises to establish power redundancy for these critical facilities. In addition, it will provide for structural retrofit at four stations to replace and harden station roofs to withstand high winds (Pahala, Waiakea, Kaumana, and Kailua) Total estimated costs for emergency power supply / power redundancy: $1,670,000. Total estimated costs for structural retrofits: $1,350,000. TOTAL ESTIMATED PROJECT COST: $3,020,000

Cost share contribution: County of Hawai'i Finance agreed 2/15/22 to cover the 25% non-federal cost share for these projects.

Additional funding allocated: No, only those for the cost share from the County as identified above.

HISAOKA GYM HIGH WIND RETROFIT PROJECT

Agency name: Hawaii County Civil Defense Agency

Jurisdiction: Hawaii County

Project location: 54-382 Kamehameha Park Rd, Kapaau, HI 96755

Activity: Hazard Mitigation Plan Development/Adoption

Hazards mitigated: Hurricane; Windstorms

SHMP or LHMP connection to state or local plan:

County of Hawaii Multi-Hazard Mitigation Plan

- *Action HC27*

Flood zone: Minimal Flood Hazard Zone

Environmental impact issues: No

Historical or cultural preservation issues: No

Issues Detailed: N/A

Estimated cost: $3,500,000.00

Support needed from HI-EMA Hazard Mitigation Team: 3

(1 = minimal, 2= minimal, 3 = a lot)

Work started: No

Project description: This mitigation is a structural project. The intent of this project is to provide the District of North Kohala with a high wind shelter. The North Kohala District is located in an ASCE 7-05 Hurricane-Prone Region and falls in category B, urban, suburban, wooded. North Kohala is home to approximately 6,000 individuals with a median age of 45.1. Kapaau and Hawi, the two major communities in North Kohala, are old communities which consist of many plantation era single wall post and pier homes which were built prior to 2000. These homes are not likely to withstand the high winds associated with a hurricane. Through this project we intend to perform a comprehensive wind vulnerability assessment, determine retrofit actions needed for the gym to withstand 120mph winds, decide between an incremental or full retrofit, and implement wind retrofit best practices to elevate the Hisaoka Gym from a best available refuge area to an actual high wind shelter. Without this action the Hisaoka Gym remains the best available refuge area in North Kohala. Residents seeking a true high wind shelter would have driven more than an hour to reach one of three facilities available in Hawaii County.

Cost share contribution: Civil Defense does maintain a grant cost share account and will request additional funding for this account to meet grant match requirements.

Additional funding allocated: No additional funding has been allocated to this project.

IMPROVEMENT OF ADVENTIST HEALTH CASTLE'S ELECTRICAL SYSTEM RESILIENCY AND HARDENING OF BUILDING ENVELOPE TO BENEFIT KAILUA AND OTHER WINDWARD OAHU COMMUNITIES

Agency name: Castle Medical Center, dba Adventist Health Castle

Jurisdiction: City and County of Honolulu

Project location: Kailua, Honolulu County, Hawaii

Activity: Hazard Mitigation Plan Development/Adoption

Hazards mitigated: Hurricane

SHMP or LHMP connection to state or local plan:

The proposed project aligns with the 2018 State of Hawaii Hazard Mitigation Plan goal of reducing the long-term vulnerability of Hawaii's people, property and jurisdictions to natural hazards, including critical facilities such as hospitals, through the development and implementation of a plan to harden/retrofit our existing facility

Flood zone: Minimal Flood Hazard Zone

Environmental impact issues: No

Historical or cultural preservation issues: No

Issues Detailed: N/A

Estimated cost: $2,500,000.00

Support needed from HI-EMA Hazard Mitigation Team: 2
(1 = minimal, 2= minimal, 3 = a lot)

Work started: Yes

Project description: Adventist Health Castle has completed an insurance company assessment of our hospital's roof envelope, as well as a facility condition assessment of our facility's electrical power system. The proposed scope of work will include upgrading Adventist Health Castle's back-up power system to mitigate the impact of power outages on hospital operations, through the acquisition and installation of a new facility-wide emergency generator, automatic transfer switches, fuel tanks, and electrical switchboards. The benefits of these improvements will be improved cohesiveness of our existing electrical system, which currently relies on a four-generator configuration, as well as

enhanced redundancy/reliability of power to critical areas of the hospital, such as our surgery bays, emergency department, intensive care unit, diagnostic lab, facilities department, patient care department, and air conditioning equipment.

For the building envelope hardening component of our project, the recently completed insurance company assessment includes the following recommendations:

- *Mechanically securing our penthouse steel roof deck with steel joists throughout the structure.*
- *Install and seal over mechanical fasteners, driven through the roof membrane into the deck's concrete layer.*
- *Further secure the roof's flashing for most areas/parapets with additional fasteners.*
- *Install rooftop equipment security solutions with cable tie-downs.*

Cost share contribution: Adventist Health Castle commits to covering the 25% non-federal matching requirement with cash generated from patient services.

Additional funding allocated: Adventist Health Castle will allocate a portion of its operating revenue to cover the balance of funding needed to complete the project.

MODELING AND ASSESSMENT OF RETURN PERIODS OF HURRICANE INTENSITIES IN THE VICINITY OF HAWAII UNDER CLIMATE CHANGE

Agency name: Hawaii State Climate Office, University of Hawaii

Jurisdiction: State of Hawaii

Project location: Honolulu

Activity: Hazard Mitigation Plan Development/Adoption

Hazards mitigated: Coastal storm; Dam/Levee break; Drought; Fire; Flood; Hurricane; Mud/Landslide; Severe storms; Windstorms

SHMP or LHMP connection to state or local plan:

> Plan: Risk Assessment, Mitigation Strategy: all six goals and four action types in the HI-EMA's 2018 State hazard Mitigation Plan; Priority: High-resolution Analysis of Extreme Weather Events

Flood zone: Moderate Flood Hazard Zone

Environmental impact issues: No

Historical or cultural preservation issues: No

Issues Detailed: N/A

Estimated cost: $498,834

Support needed from HI-EMA Hazard Mitigation Team: 1
(1 = minimal, 2= minimal, 3 = a lot)

Work started: No

Project description:

1. Identification of the problem (Risk Reduction/Resiliency Effectiveness, Climate Change)

Tropical cyclones (TCs) are extreme weather events and one of the most destructive natural disasters that annually cause loss of lives and enormous property damage in the U.S. Climate information about TCs would be very useful for decision makers facing extreme events (e.g., coastal zone management, state/county emergency management agency, insurance, power and water utilities). For this information to be useful, however, an analysis of hurricane risks in terms of return periods, which involves extreme wind events, is needed (State of Hawaii Hazard Mitigation Plan, 2018). The return period of maximum wind speeds associated with TCs refers to the average period in which an event is expected to recur once. For example, for a 100-yr return period, there is 1% chance that the extreme event would occur in any given year. This information is often used for risk reduction in the building design, disaster preparedness, and environmental policy, and should be updated every ten years in the context of climate change. Building codes in the U.S. mainland are often set to accommodate the 100-yr extreme events.

Various methods for estimating return periods have been proposed. The Gumbel distribution is widely used because of its simplicity and wide applicability. The computer simulation method for assessing long-term risk levels associated with TCs has emerged as a powerful tool (Chu and Wang, 1998). The Gumbel distribution is selected and fit to central pressure or maximum wind speeds of TCs coming close to a region. Then a sequence of TCs is simulated from this distribution using the Monte Carlo technique. The probability of the annual

occurrences for a given maximum wind speed associated with TCs is obtained and used to estimate return periods or return levels (e.g., Neumann, 1987; Rupp and Lander, 1996; Chu and Wang, 1998). Using data from 1949-1995 and a scan radius of 250 n mi from Honolulu (Fig. 1), Chu and Wang (1998) first defined a dimensionless quantity called “relative intensity” by combining all available meteorological information about TC characteristics at different places and times. A large number of relative intensities is simulated based on the Gumbel distribution. The return periods of relative intensity and the corresponding maximum wind speeds associated with TCs are then estimated. Results show that, for example, the return period of maximum wind speed equal to or greater than 125 (100) kts are 137 (33) years in the vicinity of Hawaii. For example, Hurricane Iniki, which ravaged Kauai in September 1992, had wind speeds of 125 kts. Estimates of damage were about $2 billion for Iniki. The Monte Carlo method is also used to estimate the confidence intervals of the return periods of TC intensities.

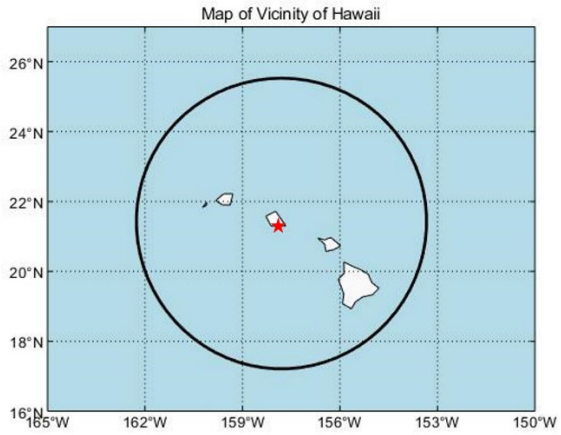

Fig. 1. A circle defines the vicinity of Hawai’i. The red star denotes the location of Honolulu.

Historically, Hawaii is not known as a hurricane-prone region. Based on the period from 1966-1997, the annual mean number of TCs (tropical storms and hurricanes) over the Central North Pacific (CNP) is approximately lower than three, where the CNP is defined as a region between 140°W-180° and northward of the equator by the National Weather Service (NWS). However, the hurricane frequency over the CNP seems to be on the rise over the last decade.

If only tropical storms and hurricanes are counted, five TCs occurred in 2013, five in 2014, and 14 TCs in 2015 with three category 4 hurricanes occurring simultaneously, six in 2016, one in 2017, and six hurricanes in 2018 with four out of six becoming major hurricanes (category 3 or above with maximum sustained wind speed at least 111 mi/h). The 2015 season marks the first occurrence since records began (1966) with a record high of five major hurricanes (category 3 or above) and three category 4 hurricanes (sustained wind speed at least 131 mi/h) concurrently being observed over the CNP. The 2018 season ranks second in major hurricane frequency with four major hurricanes since 1966. Therefore, although a rather rare event, the frequency of major hurricanes over the CNP is also increasing in recent years and poses a great threat to Hawaii.

In August 2018, Hurricane Lane, a category 5 storm (sustained wind speed at least 155 mi/h), was within a short distance from Hawaii. Because of its furious wind intensity, torrential rainfall, and close proximity to the Hawaiian Islands, the NWS Forecast Office in Honolulu issued hurricane warnings. The consistent warnings over several days caused a large degree of anxiety as Hawaii residents had to prepare food and water supplies for a long period of time because of the isolated geographic position of the Islands in the central Pacific. Adding to the anxiety is the possibility of power and phone outages, the threat to property damage and lives, and insufficient shelters. Heavy rain is commonly found near the eyewall of hurricanes; however, descending air also occurs near the periphery of the storm's center, producing warm and dry air, and creating conditions favorable for fire occurrence. The lesson learned from Hurricane Lane is that hurricanes not only bring torrential rainfall (57 in. within a 4-day period) and extensive flooding to the east side of the Big Island but also lead to strong winds and wildfires to Maui and Oahu. Indeed, the simultaneous occurrence of multiple hazards such as flooding, landslides, powerful and sometimes destructive winds, and fires strained the capacity of state/county emergency response.

Following Lane, tropical storm Olivia made a double landfall on Maui in September 2018, with heavy rainfall and flash flooding over Hawaii, Maui, Molokai, and Oahu. It was the third direct landfall in the Hawaiian Islands in last five years. In July 2020, Hurricane Douglas passed dangerously close to Oahu and Kauai, triggering fears of local residents and emergency management agencies. Looking back at a longer time scale, Iniki in 1992 made landfall on

Kauai as a category 4 hurricane with 125 kt (144 mi/hr) winds. Iwa, a category 1 hurricane in 1982, also ravaged Kauai with maximum sustained wind speeds of 80 kt (92 mi/hr). What happens if a category 4 or 5 hurricane like Lane roars through the Hawaiian Islands for several hours or one day? The consequences would be devastating because a large percentage of homes in Hawaii were built using single-wall construction, which is unsafe during intense hurricanes, not to mention the shortages of food and medicine because of our isolated location in the Pacific, road closures, coastal erosion, storm surge, loss of electricity and water, and inadequate number and capacity in shelters.

Tropical cyclone activity over the CNP and near Hawaii are related to El Niño events and other environmental factors such as local sea surface temperatures, vertical wind shear, low-level relative vorticity, and mid-tropospheric moisture (Chu and Wang, 1997; Clark and Chu, 2002; Chu 2002). Chu and Wang (1997) demonstrated that the mean number of TCs in the vicinity of Hawaii (Fig. 1) during an El Niño year is higher than that during a non-El Niño year and the difference is statistically significant at the 5% level. A change in large-scale dynamic and thermodynamic environments is conducive to the increased cyclone incidence near Hawaii during an El Niño year (Clark and Chu, 2002). TCs generally move around the periphery of the subtropical high-pressure ridge in the eastern North Pacific. With a quasi-stationary high-pressure area situated to the north of Hawaii in summertime, a cluster of east-to-west TC tracks to the south of Hawaii is evident. This westward movement of the TCs is reflected by the surrounding easterly trade flows in the tropics.

Besides natural climate variability, anthropogenic climate change expands the tropical belt and causes TCs to track more northward, making the Hawaiian Islands more vulnerable to TC strikes. Because our previous study (Chu and Wang, 1998) was based on older records up to 1995, the return period of very strong TC winds like those that occurred during Iniki was 137 years. Given the greater number of stronger hurricanes that occurred in the past 10 years and the effect of global warming, a new analysis using longer and more recent records, together with modern statistical methods, is expected to yield shorter TC return periods. Based on historical TC records from 1954 to June 2018, the State experienced a hurricane event, which led to a FEMA disaster declaration, every 16 years (State of Hawaii Hazard Mitigation Plan, 2018). It is interesting to note that a recent Hawaii 2050 Sustainability Plan (2020) also indicated, “climate

change is expected to increase this occurrence by causing stronger and more frequent hurricanes, and climate change will also exacerbate vulnerability to other natural disasters such as flooding, wildfires, and tsunamis." While the two State reports are interesting and alarming, a more rigorous study is needed for estimating return periods for various kinds of TC intensities (e.g., tropical storms, cat 1, 2, 3, 4, and 5), not just based on FEMA disaster declarations.

We propose to update and quantify return periods of various TC intensities for Hawaii by taking advantages of more recent data and modern modeling technologies. By analyzing long TC records (1966-2021), this study also incorporates climate change into the analysis. The ability to prepare for and recover from significant hurricane impacts is known as "resiliency". Having an updated knowledge of hurricane risks in the context of return periods provides local communities with a means to better prepare for future disasters so they may better adapt to these impacts. This project is thus critical for proactive disaster mitigation efforts.

2. Scope of work

2.1 Objectives and Population Impacted

Our working hypothesis is that climate will change in the future from present conditions and that change will inevitably result in large fluctuations in extreme hurricane events near Hawaii. Extreme events are naturally defined through the statistical analysis of extreme value distributions for a specific return period of a given wind intensity (e.g., how strong cat-3 hurricane winds would be for return periods of 100-yr or the annual probability of a category 3 hurricane striking the islands). To estimate the statistics of return periods for the Hawaiian Islands, the generalized Pareto distribution (GPD) and generalized extreme value distribution (GEV) will be fit to the extreme TC wind speeds. Hurricane data are available from the International Best Track Archive for Climate Stewardship (Knapp et al., 2010) and the Central Pacific Hurricane Center, an entity of the NWS in Honolulu. Taking all the islands together, we will also estimate recurrence intervals for the entire island chain. Therefore, the entire population of Hawaii will be impacted by this study.

Because the Hawaiian Islands are spread apart and a hurricane may impact one or two islands, but not the entire island chain, it is better to have an island wide

focus. Therefore, we will estimate regional (i.e., higher resolution) return periods of hurricane intensities for each of four counties: Kauai, Honolulu, Maui, and Hawaii separately. The regional study will be particularly important because, for example, the population below the poverty level for the County of Hawaii is 18.7%, which is two times higher than other three counties in Hawaii. In Hawaii County, the Puna and Kau districts have lower household or family income and are more vulnerable to hurricane risks. Most TCs travel from the eastern North Pacific to CNP just to the south of the Hawaiian Islands. Using data from 1966 to 2003, the mean number of TC passage days in a year is five near Puna but only two on Oahu (Chu and Wu, 2008) (Fig. 2). Therefore, the existing social inequities will have a greater impact on people in Puna and Kau in light of an increased threat of storms supercharged by climate change in the future.

Return periods can be estimated from the Pareto or GEV model via computer simulation. The return level will be defined later in Section 2.2. Given the more appropriate extreme value distribution such as GEV or GPD distribution for representing extreme hurricane intensity, 26 years of additional hurricane data since the study by Chu and Wang (1998), more hurricanes striking the Hawaiian Islands, and more stronger hurricanes observed, it is time to use modern methods and longer data to better estimate the return period of storms with different intensities in the vicinity of Hawaii and determine how it might be different from our early analysis. The overarching goal is to provide an updated and quantitative high-resolution information of TC return periods to the relevant communities so that they can better plan accordingly to reduce risks resulting from hurricanes and better prepare for hurricane consequences. This is also important for disadvantaged communities in Hawaii such as Puna and Kau on the Big Island, because of the lack of local resources and their closeness to the prevailing TC tracks.

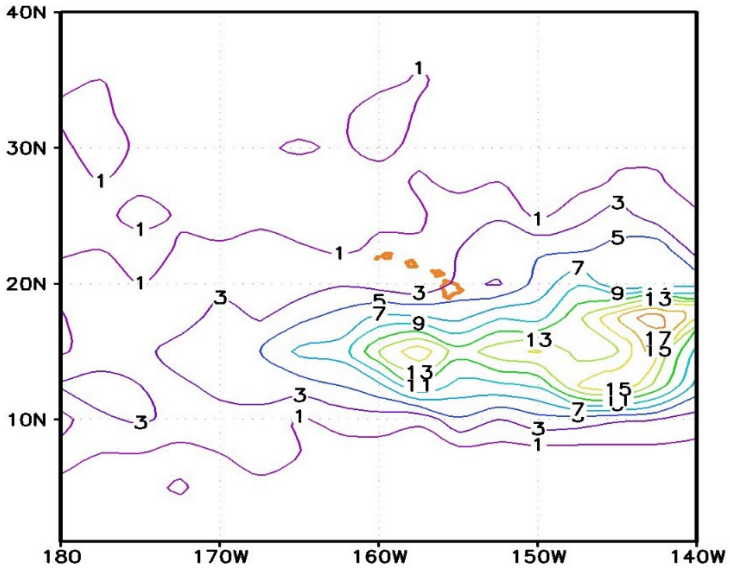

Fig. 2. Mean TC passage days during 1966-2003 over the central North Pacific (Chu and Wu, 2008).

2.2. Proposed methods

Although the Gumbel distribution has often been used to represent the statistics of extremes, this distribution also underestimates large, infrequent events, which are of interest to many fields. To overcome this deficiency, Parisi and Lund (2008) used an extreme value theory to estimate return periods of hurricanes striking the continental U.S. from 1900-2006. It is based on the peaks over threshold extreme value techniques. Specifically, the wind speed data associated with the landfall hurricanes are modeled with a generalized Pareto distribution (GPD) for excess. The second distribution to represent the statistics of the maxima of random variables is the generalized extreme value distribution (GEV) (Coles, 2001). The GEV distribution is characterized by three parameters – location, scale, and shape.

The number of storms occurring in year t is modeled using a Poisson process with mean λt. Indeed, the annual occurrences of TCs in the vicinity of Hawaii are well represented by a Poisson distribution, where the Poisson intensity λ is the only parameter (Chu and Wang, 1998). In building a nonlinear regression model, the Poisson intensity is treated as a random variable that is conditional on the external environmental factors (Chu and Zhao, 2007; Parisi and Lund, 2008). Because these factors vary from year to year, the Poisson intensity varies as well

and the corresponding probability of hurricane occurrence in each year will be different. We will use the extreme value theory for analyzing extreme data. Extreme weather events are known to be better represented by the extreme value distribution (Coles, 2001). For the sampling strategy, we will first use the peaks-over-threshold (POT) approach to sample the data. Under this approach, any values larger than a threshold are chosen, regardless of their year of occurrence. The threshold may be chosen to be at least 64 kt (34 kt) as the lower bound of hurricanes (tropical storms). The advantage is that sample size can become relatively large in fitting an extreme value model. When data are sampled from the POT, the GPD is recommended (Hosking and Wallis, 1987; Coles, 2001). The probability that the maximum wind intensity exceeds some value v given that it exceeds the threshold u follows a GPD, which has two parameters, scale and shape. Here the threshold u can be set to be 34 or 64 kts, and v is the wind intensity (e.g., 85 kt). For each storm, wind speeds are modeled with a GPD distribution for excesses.

The GEV is also found to be a good fit to extreme data sets. The probability density function (PDF) of GEV can be integrated analytically to yield the cumulative distribution function (CDF), which can then be inverted to yield an explicit formula for the quantile function. This makes GEV very appealing because once the distribution parameters are known, its extreme value (e.g., 125 mph) corresponding to any desired return period (e.g., 100-yr) can be immediately determined. This extreme value is known as the return level. A similar analysis was performed for extreme rainfall in Hawaii (Chen and Chu, 2014). It is also of interest to know the frequency of storms at a particular intensity. By combining the nonlinear Poisson regression model with the GPD (GEV), we can determine the number of storms per year with winds exceeding v (the number of storms striking Hawaii). For each county, the return levels will be computed for various return periods (e.g., 2-yr, 20-yr, 100-yr, and 200-yr). Because the return level estimated from the theoretical extreme value distribution is a fixed constant and this estimate is subject to uncertainty due to sampling variability, we will use a nonparametric bootstrap approach to provide a 95% confidence interval of the estimated return period for a range of storm intensity (Chu et al., 2009).

The quantile of a return period, T, denoted as QT, is an event magnitude so extreme that it has probability 1/T of being exceeded by any single event. That

is, for a given quantile value QT, which is known as the “return level”, the associated return period is T = 1/[1-F(QT)], where F(•) is the cumulative distribution function of the GPD or GEV. Note that the return level has the same unit as hurricane wind speeds (kts). We will use a quantile-quantile plot to determine whether the GEV or GPD distribution is more appropriate for extreme hurricane wind intensity.

3. Implementation measures

The PI is on a 9-month appointment with the University of Hawaii. Some salary support is requested for the PI who will manage the entire project, recruit and supervise graduate students, develop computer codes for the methodology proposed, present the research result at relevant professional meetings, and author scientific papers for publications. Salary support for one graduate student and half-time support for a post-doctoral follow is requested because of the complexity of statistical models and computer simulations. We anticipate one publication per year using American Meteorological Society (AMS) journal page rates with some color prints. We also include the UH computer network service charge and one trip to present our results to a relevant professional meeting. Approximate costs are based on a 5-day trip from Honolulu to Washington, DC.

4. Leveraging partners and outreach activities

The results of this study will benefit many local, state, and federal partners (e.g., each county in Hawaii, HI-EMA, NOAA, NWS, State Office of Planning, Department of Land and Natural Resources, Department of Health, Department of Transportation, Department of Business, Economic Development, and Tourism; Honolulu Board of Water Supply) who are concerned with hazard mitigation and relevant policymaking when natural hazards and climate change are considered. April Surprenant,, manager of long-range planning of Hawaii County, expressed an interest in knowing the progress of this potential project. Destructive winds, flooding, storm surges, and wildfires associated with hurricanes are likely to become a common multiple hazard in Hawaii and result in significant property, road, and state critical facility (e.g., airports, harbors, buildings) damage, and a number of environmental problems such as coastal erosion, shrinking wetland areas, and increased pollution through stormwater runoff. Given that the climate will change in the future, results from this study will be very important for decision makers in long-range planning for regions where

hurricanes are expected to increase in frequency and intensity. The PI and the team will present research results from this study to promote public awareness of hurricane risks at the HI-EMA Forum meetings, the annual Pacific Risk Management ‘Ohana (PRiMO) conferences, which aim to protect Pacific island communities from natural hazards, and others.

5. Expected Outcomes

The expected outcome of this study is a scientifically based and updated estimate of return periods of various tropical cyclone wind intensities for each county in Hawaii and the island chain as a whole. Note that property values in Hawaii are very high so there is a need for an updated best estimate of the annual probability of damaging hurricane-related destructive wind events using the most comprehensive data sets that can be assembled and state-of-the-art statistical models and analysis techniques. We expect return periods will decrease substantially compared to our previous study (Chu and Wang, 1998) and be related to the global warming signal. The return periods for various hurricane intensities may be slightly different between Oahu and Kauai but larger between the easternmost and westernmost counties (Kauai versus Hawaii) because of their large separation distance and different storm track and intensity patterns.

As stated in the 2018 State Hazard Mitigation Plan (HMP), “the mitigation strategy is composed of goals and actions that directly address the risks and vulnerabilities”. The proposed project is closely aligned with the 2018 HMP. For example, there are six goals and four action types in the 2018 HMP. Goal 1 is to reduce the long-term vulnerability of Hawaii’s people, property and jurisdictions, to natural hazards. Goal 2 is to promote actions designed to ensure long-term resiliency. Goal 3 is to strengthen partnerships and leverage existing resources. Goal 4 is to utilize state-of-the-art methods and technology and local knowledge to identify and analyze natural hazards. Goal 5 is to promote public awareness of natural hazard risks and public action, and Goal 6 is to provide a framework for robust local hazard mitigation planning. This study not only addresses these six goals but also four action types (State & Local Plans, Structure & Infrastructure Project, Natural Systems Protection, and Education & Awareness Programs). In fact, the proposed project (2018-037) met all six mitigation goals and four action types and was ranked “high” priority in the 2018

HMP Update but was not funded due to the funding constraints and other competing priorities.

Cost share contribution: Yes

Additional funding allocated: No

PALI MOMI MEDICAL CENTER EMERGENCY GENERATOR SYSTEM IMPROVEMENTS

Agency name: Pali Momi Medical Center

Jurisdiction: City and County of Honolulu

Project location: 98-1079 Moanalua Rd, Aiea, HI 96701

Activity: Hazard Mitigation Plan Development/Adoption

Hazards mitigated: Coastal storm; Earthquake; Hurricane; Severe storms

SHMP or LHMP connection to state or local plan:

The Hawaii 2018 Hazard Mitigation Plan, Goal 1 is to "Reduce the long-term vulnerability of Hawaii's people, property and jurisdictions, including state-owned or operated buildings, infrastructure and critical facilities, to natural hazards while conserving the State's natural, historical, and cultural assets.

Flood zone: Minimal Flood Hazard Zone

Environmental impact issues: No

Historical or cultural preservation issues: No

Issues Detailed: N/A

Estimated cost: $7,400,000.00

Support needed from HI-EMA Hazard Mitigation Team: 1
(1 = minimal, 2= minimal, 3 = a lot)

Work started: Yes

Project description: All costs to date are for professional design fees architectural and engineering:

- Feb 2017: $13k
- Feb 2020: $78k
- Oct 2020: $55k

Pali Momi Medical Center is seeking funding to undertake much needed improvements to its aging emergency generator system to ensure reliability and redundancy to this critical facility. It is crucial that a hospital provide a high-quality source of electrical power that is backed up with a highly reliable emergency generator system. The critical nature of patient care demands an uninterrupted supply of electricity particularly during a crisis or natural disaster. The generator system supports critical hospital operations and is essential to providing medical care during power outages. Pali Momi Medical Center is the only comprehensive hospital site with just one generator.

The current emergency generator system at Pali Momi is original, nearly 33 years old, well beyond the life expectancy FEMA indicates for generators of 19 years. The system consists of one 1617 kW emergency generator, emergency switchgear and automatic transfer switches. Having only one generator as the sole backup power source provides no redundancy. Should the generator fail for any reason during a utility outage, the hospital will be left without any electricity. In fact, that has happened during a recent power outage, where the generator failed to turn on, leaving the facility with no electricity and literally “in the dark” for nearly one hour and without backup power for over nearly 24 hours.

The proposed project will result in the addition of a 2000 kW, UL2200 listed, emergency engine generator to supplement the existing 1617 kW generator. The new generator will essentially become the primary generator while the existing generator will be secondary, providing the needed system redundancy. A new 480V emergency paralleling switchgear will also be provided. This will allow for paralleling of the new and existing generator, providing increased redundancy and reliability. The new switchgear will be UL1558 listed. A new 1000 kW permanent load bank will be interfaced with the 480V emergency switchgear to allow for monthly load testing of each generator to comply with the requirements of NFPA 110. The new generator and switchgear will be designed to meet current IBC and NFPA codes, in particular both shall be IBC seismically certified.

The new generator and paralleling switchgear will be housed in a newly constructed CMU building enclosure within the footprint of the parking garage structure. Located at the southwest corner of the facility, near the entrance to the parking structure, this new generator enclosure will be an improvement over the

location of the existing generator from an accessibility perspective, making maintenance of the equipment easier. Immediately adjacent, a new 10,000 gallon, double-walled underground fuel storage tank, with leak detection and monitoring will be provided.

Pali Momi Medical Center serves the Aiea population and supports patients from the Leeward Coast to the North Shore. The addition of a new generator will provide the redundancy needed to safely replace the existing generator in the future, ensuring Pali Momi continues to provide quality health care with a full range of services available to the community.

Cost share contribution: Yes, sub-applicant organization has identified and will contribute 25% of project costs. Pali Momi Medical Center's contribution will be funded in cash, allocated from the Hawai'i Pacific Health Capital Budget distribution.

The medical office building in which Pali Momi Medical Center is located will also benefit from this project. The owner of the building is HRT Realty Trust and, in accordance with a cost sharing agreement with Pali Momi Medical Center, HRT Realty Trust will reimburse 37.1% of Pali Momi Medical Center's 25% matching contribution for this project.

Additional funding allocated: No additional funding has been allocated to this project.

LANA'I HIGH AND ELEMENTARY SCHOOL GYMNASIUM

Agency name: County of Maui

Jurisdiction: County of Maui

Project location: 555 Fraser Avenue, Lana'i City Hawaii, 96763

Activity:

- Acquisition
- Elevation
- Hazard mitigation plan development
- Post-disaster retrofits (structural/utilities)
- Post-disaster code enforcement

Hazards mitigated: Biological; Chemical; Coastal storm; Crop losses; Dam/levee break; Drought; Earthquake; Fire; Fishing losses; Flood Hurricane; Mud/landslide; Severe storms; Terrorism; Tsunami; Volcano; Windstorms.

SHMP or LHMP connection to state or local plan:

Flood zone: Minimal Flood Hazard Zone

Environmental impact issues: No.

Historical or cultural preservation issues: No.

Issues Detailed: N/A

Estimated cost: $3,000,000

Support needed from HI-EMA Hazard Mitigation Team: 3
(1 = minimal, 2= minimal, 3 = a lot)

Work started: No.

Project description: Retrofitting and maintenance of structure to update it to current hurricane/ emergency shelter standards.

Cost share contribution: None at this time.

Additional funding allocated: Funding is pending on Engineering assessment. There was mention that money was allocated for FY21-22 from the State, but no mention of this funding has come up during recent conversation.

REAL-TIME FLOOD FOREST SYSTEM FOR HAWAII TO IMPROVE READINESS, PUBLIC SAFETY AND RISK MITIGATION

Agency name: University of Hawaii

Jurisdiction: State of Hawaii

Project location: Statewide

Activity: Hazard Mitigation Plan Development/Adoption

Hazards mitigated: Flood

SHMP or LHMP connection to state or local plan:

Relevance to the State Hazard Mitigation Plan 2018 (SHMP 2018):

The proposed real-time flood forecast system in Hawaii reduces the long-term vulnerability of Hawaii's people, property and jurisdiction, including state-owned or operated buildings, infrastructure and critical facilities, to flood while conserving the State's natural, historical, and cultural assets (which addresses

Goal 1 of the SHMP 2018). This deliverables from this project “flood susceptibility map” and “flood forecast system” will provide insight into areas subject to frequent flood risks with both historical and recent events. This insight could assist future regulations that control development or activities in areas subject to flooding and promote actions to ensure long-term resiliency (i.e., Goal 2 of the SHMP 2018). In this project, we will collaborate with HI-EMA and leverage the existing flood data (e.g., historical storm events, and the current Flood Hazard Assessment Tool). Through developing a flood susceptibility map, forecasting flood system, and issuing an alert via mobile application, we will reduce the impact of flood on our community (i.e., Goal 3 of SHMP 2018). We will use state-of-the-art, novel, and robust machine learning approaches to generate the aforementioned deliverables (i.e., Goal 4 of SHMP 2018). The publicly available flood susceptibility map and especially real-time flood warning system will promote public awareness of flood risks and urge public actions to reduce long-term risks (i.e., Goal 5 of the SHMP 2018). By creating the flood susceptibility map as well as the flood forecasting and alert system for the State of Hawaii, the proposed project will effectively assist local flood mitigation planning (i.e., Goal 6 of SHMP 2018). On the other hand, according to the SHMP 2018, 1) flood control and floodplain management to include the reduction of repetitive and severe repetitive loss properties, and 2) development and/or improvement of warning systems have been determined high priority for the State of Hawaii.

Relevance to the City & County of Honolulu Hazard Mitigation Plan 2020 (C&CHMP 2020):

The proposed real-time flood forecast system in Hawaii improves state-of-the-art for the identification of flood hazard areas, risk assessment capabilities, flood warning system, and effective response (which addresses Goal 1 of C&CHMP 2020). By forecasting flood, a high level of awareness will be developed among the general public and business, particularly visitor industry, that results in calm and efficient evacuations, self-efficient survival skills, and willingness to abide by preventive or property protection requirements (which addresses Goal 6 of C&CHMP 2020).

Relevance to the County of Hawaii Hazard Mitigation Plan 2020 (CHMP 2020):

The proposed real-time flood forecast system utilizes state-of-the-art methods and technologies as well as local knowledge to forecast flood in Hawaii and

mitigate its impact on people, critical facilities and infrastructure, natural and cultural resources (which addresses Goals 1-3 of CHMP 2020). It also promotes community risk reduction and preparedness through awareness via an alert system for the State of Hawaii (which addresses Goals 5 of CHMP 2020).

Relevance to the Kauai Hazard Mitigation Plan 2020 (KHMP 2020):

The proposed real-time flood forecast system reduces the long-term vulnerability of the County of Kauai's people, communities and property (which addresses Goal 1 of KHMP 2020). It utilizes knowledge and state-of-the-art methods and technology to identify the flood hazard and assesses the County's capability to reduce the impact of flood hazard and increases resilience (which addresses Goal 4 of KHMP 2020). Such a flood alert system promotes public awareness of hazard risks and public actions than can reduce the long-term risks and increase resilience (which addresses Goal 5 of KHMP 2020).

Flood zone: Special Flood Hazard Area

Environmental impact issues: No

Historical or cultural preservation issues: No

Issues Detailed: N/A

Estimated cost: $950,000

Support needed from HI-EMA Hazard Mitigation Team: 2
(1 = minimal, 2= minimal, 3 = a lot)

Work started: Yes

Project description: Our Wildfire team already generated historical and real-time high-resolution (250 m) daily rainfall data over the State of Hawaii, which are essential for the proposed flood forecast system. We also compared streamflow predictions from the National Water Model (NWM) with measurements in several streams/rivers of Hawaii. The results showed that the NWM performs poorly in Hawaii. Floods are one of the deadliest disasters in the world and also one of the most common natural hazards to life, property, the economy, and the environment of Hawaii.

Flood damage has become a growing concern in Hawaii due to the increasing population density close to streams, climate change, more intense rainfall, and sea level rise. Many communities in Hawaii have been affected by flooding, causing significant economic loss and infrastructure damages. The damage

caused by flood-related impacts in Hawaii is estimated to be at least $160 million over the last two decades. According to the 2022 NOAA technical report on the sea level rise (https://oceanservice.noaa.gov/hazards/sealevelrise/sealevelrise-tech-report.html#step2), “flooding is expected to occur, on average, more than 10 times as often as it does today and can be intensified by local factors.

Early detection of floods via developing a reliable flood forecasting system is the major part of flood management and can greatly assist humans in reducing the extent of the damage caused by such events. It can also directly affect the planning of the operation of reservoirs, generation of hydroelectric energy, irrigation, and human consumption. Moreover, it allows adaptation, planning, hazard mitigation, and resilience to the growing floods associated with climate change. An accurate flood forecasting system can deliver precise forecasts with appropriate lead time for both acute extreme weather events and chronic stressors. Hence, it increases public safety and resilience, and reduces injuries and loss of life, damage and destruction to property, critical services, facilities, and infrastructure. Such a system enhances the knowledge, skills, and expertise of the current workforce to improve the administration of flood hazard mitigation activities.

No study has been conducted to forecast floods in streams of Hawaii so that the State can respond promptly in the event of a potential flood. Hence, there is a vital need for a real-time flood forecast system in Hawaii to improve public safety and minimize future flood damage and related expenses. In this project, Convolutional Neural Network (CNN) and Long Short-Term Memory (LSTM) machine learning (ML) approaches will be used to simulate the daily streamflow in all the 73 gauged streams/rivers in the State of Hawaii (e.g., Waikele, Makiki, Manoa, Palolo, Kahana, Heeia, Makawao, Waimanalo, Kaneohe, Waimea, and Kaukonahua streams on Oahu; Iao, Honomanu, Honokohau and Palikea streams on Maui; Wailoa, Honolii, Kawainui, Alakahi, Kolekole, and Wailuku streams on Hawaii Island; Hanalei, Wailua, Wainiha, Waialae, Kalihiwai, Kawaikoi, Huleia and Makaweli rivers on Kauai; Halawa stream on Molokai) for forecast range of 1-5 days ahead. Unlike physical-based models that have a large number of regionally dependent parameters and require calibration, the proposed methods work based on the statistical relationship between input and output data. They are able to capture patterns in extensive data sets based on purely numerical

input-output relationships. These methods are able to accurately forecast floods and can be used readily in operational flood forecasting.

USGS Pacific Island Water Science Center and Commission on Water Resource Management have measured daily discharge data for 73 streams/rivers in Hawaii (including the above-mentioned ones) during the last several decades. Our Wildfire group also generated real-time high-resolution (250 m) daily rainfall maps over Hawaii from 1990 to present. Daily rainfall and streamflow data from 1990 to 2021 will be used to train the CNN and LSTM approaches. Thereafter, the trained ML models will be used to forecast streamflow in the 73 gauged streams/rivers in the State of Hawaii. Finally, the operational flood forecast system will be presented to HI-EMA, USACE, and NOAA for their use to mitigate the impacts of floods on the lives of people in the current phase of extreme weather events.

Cost share contribution: Yes

Additional funding allocated: No

STATE OF HAWAII SHELTER RETROFIT PROJECT

Agency name: State Sheltering Program

Jurisdiction: State of Hawaii

Project location: Kauai, Honolulu, Maui, Hawaii Counties

Activity: Post-Disaster Retrofits (structural, utilities)

Hazards mitigated: Hurricane; Severe storms; Windstorms.

SHMP or LHMP connection to state or local plan:

State of Hawaii 2018 Hazard Mitigation Plan Page 4-222:

> After high winds events, residents may be displaced or require temporary to long-term sheltering. Vulnerable populations, such as the elderly, low-income and linguistically isolated populations, are most susceptible to high windstorms.

Flood zone: Minimal Flood Hazard Zone

Environmental impact issues: No

Historical or cultural preservation issues: No

Issues Detailed: N/A

Estimated cost: $12,000,000

Support needed from HI-EMA Hazard Mitigation Team: 1
(1 = minimal, 2= minimal, 3 = a lot)

Work started:

Project description: The intent is to complete structural assessments on State Owned buildings. Harden the Building Envelope 1. Hardening the Building Envelope the strongest engineeringly feasible level as a result of the Structural Assessment and engineering study

a. *Replace the entire flat covering with a fully adhered roof covering such as a modified bitumen membrane roof. Wind Risk Category III-IV, IBC*
b. *Adding additional anchoring system from roofline to foundation*
c. *Adding additional anchoring systems to any roof mounted equipment to secure continuous load path*
d. *Strengthen the high-wind pressure areas*
e. *Strengthen roof openings*

Replace exterior, roof components with Miami-Dade rated

a. *assemblies and components that are saltwater corrosion-resistant*
b. *Reinforced glass fiver thermal installation bar with high loading capacity*
c. *Pressure extrusion for higher strength level*
d. *Truss structure design*
e. *Multi-point hardware lock system*
f. *Additional anchoring system assemblies*

Increase strength of in-place ventilation system

a. *Air Quality Control diluting internally generated air contaminants with cleaner outdoor air*
b. *Direct Advective Cooling directly cool building interiors by replacing or diluting warm indoor air with favorable outdoor air*

c. *Indirect Night Cooling indirectly cooling building interior by pre-cooling thermally massive components of the building fabric or a thermal storage system*
d. *Wind-Driven Cross ventilation, Buoyancy-Driven Stack Ventilation*
e. *Increase HVAC System by reducing air system friction losses*

Upgrade roof drainage/plumbing to increase capacity to include siphonics drainage system

a. *Reduce air ingress in drainage pipes*
b. *Increase velocity to promote self-cleaning*
c. *Dome strainer, air baffle, Flashing or clamp ring to drainage ingress*
d. *Raingarden and bioretention to reduce stress on public drainage/sewer*

Cost share contribution: Yes, State CIP funds

Additional funding allocated: none

WAILUKU WASTEWATER PUMP STATION MODIFICATIONS, TSUNAMI PROTECTION AND CLIMATE RESILIENCE PROJECT

Agency name: Department of Environmental Management, Wastewater Reclamation Division

Jurisdiction: Maui County

Project location: Wailuku, Hawaii

Activity: Hazard Mitigation Plan Development/Adoption

Hazards mitigated: Biological; Coastal storm; Earthquake; Flood; Hurricane; Severe storms; Tsunami

SHMP or LHMP connection to state or local plan:
(20) Flood proof water and wastewater treatment facilities located in flood hazard areas and identified as vulnerable to future damage or disruption

Flood zone: Special Flood Hazard Area

Environmental impact issues: Yes

Historical or cultural preservation issues: No

Issues Detailed: Loss of service will result in major raw sewage spills into Kahului Bay.

Estimated cost: $8,000,000.00

Support needed from HI-EMA Hazard Mitigation Team: 2
(1 = minimal, 2= minimal, 3 = a lot)

Work started: No

Project description: Modifications to the Wailuku Wastewater Pump Station, including but not limited to, structural reinforcement against and replacement/relocation of existing major sewer lines along a vulnerable stretch of shoreline (approximately 700 ft)

Cost share contribution: No. But the County should be able to budget the 25% share via budget amendment.

Additional funding allocated: No

SECONDARY PROJECTS

ALOHA SAFE HOMES PROJECT

Agency name: Hawaii Emergency Management Agency

Jurisdiction: State of Hawaii

Project location: Kauai, Honolulu, Maui, Hawaii Counties

Activity: Post-Disaster Retrofits (structural, utilities)

Hazards mitigated: Windstorms; Severe storms; Hurricane

SHMP or LHMP connection to state or local plan:

State of Hawaii 2018 Hazard Mitigation Plan

- *Page 4-222 After high winds events, residents may be displaced or require temporary to long-term sheltering. Vulnerable populations, such as the elderly, low-income and linguistically isolated populations, are most susceptible to high windstorms.*

Flood zone: Moderate Flood Hazard Zone

Environmental impact issues: No

Historical or cultural preservation issues: No

Issues Detailed: N/A

Estimated cost: $500,0000

Support needed from HI-EMA Hazard Mitigation Team: 1
(1 = minimal, 2= minimal, 3 = a lot)

Work started: No

Project description: Project is to address residential homes with medium to low economic status in order to complete structural assessments and to add envelope hardening measures.

Strengthen the roof systems

a. *Strengthen or replace roof to meet Wind Risk Category III-IV, IBC*
b. *Adding additional anchoring system from roofline to foundation*
c. *Adding additional anchoring systems to any roof mounted equipment to secure continuous load path*
d. *Strengthen the high-wind pressure areas*
e. *Strengthen roof openings*

Upgrade exterior components to Miami-Dade rated

a. *assemblies and components that are saltwater corrosion-resistant*
b. *ii. Reinforced glass fiver thermal installation bar with high loading capacity*
c. *iii. Pressure extrusion for higher strength level*
d. *iv. Truss structure design*
e. *v. Multi-point hardware lock system*
f. *vi. Additional anchoring system assemblies*

Increase strength of in-place ventilation system

a. *Air Quality Control diluting internally generated air contaminants with cleaner outdoor air*
b. *Direct Advective Cooling directly cool building interiors by replacing or diluting warm indoor air with favorable outdoor air*
c. *Indirect Night Cooling indirectly cooling building interior by pre-cooling thermally massive components of the building fabric or a thermal storage system*

d. *Wind-Driven Cross ventilation, Buoyancy-Driven Stack Ventilation*
e. *Increase HVAC System by reducing air system friction losses*

b. *Upgrade roof drainage/plumbing to increase capacity to include siphonics drainage system*
   a. *Reduce air ingress in drainage pipes*

Cost share contribution: Yes, Cash. Due to the communities' low economic status the state will be asking for a 10% to 90% cost share.

Additional funding allocated: No

ALOHA SAFE HOMES EDUCATION AND OUTREACH

Agency name: University of Hawaii Sea Grant Program

Jurisdiction: State of Hawaii

Project location: Kauai, Honolulu, Maui, Hawaii Counties

Activity: Post-Disaster Code Enforcement

Hazards mitigated: Windstorms; Severe storms; Hurricane

SHMP or LHMP connection to state or local plan:

State of Hawaii 2018 Hazard Mitigation Plan

- *Page 4-222: After high winds events, residents may be displaced or require temporary to long-term sheltering. Vulnerable populations, such as the elderly, low-income and linguistically isolated populations, are most susceptible to high windstorms.*

Flood zone: Moderate Flood Hazard Zone

Environmental impact issues: No

Historical or cultural preservation issues: Yes

Issues Detailed: This may include historical homes. approximate 50 years.

Estimated cost: $300,000

Support needed from HI-EMA Hazard Mitigation Team: 1
(1 = minimal, 2= minimal, 3 = a lot)

Work started: No

Project description:

This is an education and outreach project that was now retired. This project is to reinstate it. Aloha Safe Homes Education and Outreach

1) *Hurricane and Earthquake Retrofit Demonstration for Hawaii County. The post and pier retrofit was first proposed as a Hazard Mitigation Grant Project supported by FEMA and HIEMA in 2009 (Right). In 2020, Hawaii Sea Grant conducted a demonstration project for Oahu, necessitated by new connectors made by Simpson Strong- Tie which facilitated the retrofit (Left) This Demonstration Project for Oahu is in the Homeowner's Handbook – 4th Edition. Hawaii County, however, is in a much higher seismic zone (Bottom Right) and the retrofit for this island may require additional work on footings and the creation of shear walls. This Proposed Project helps lay the framework and foundation from a technical point of view for a future wind retrofit program for the state. It should be noted that a continuous load path connection is important for both hurricane and earthquake protection. This project will ensure that the guidance for the continuous load path connection will be suitable no matter what the island. This involves working with two structural engineers with experience in post and pier retrofits and some support by Simpson Strong Tie (who will donate some time and materials to provide a cost share match). The demonstration will be for two houses and screening will be required. Therefore, an application process will be part of the initial project as parameters like vintage of housing, construction type, seismic zone, other hazard threats such as lava, level of cooperation by the applicant will need to be considered in the first six months of this project. A contractor will need to be hired to perform the work based on the guidance. This is a three-year project, but initial guidance can be developed earlier to inform development of guidance for the wind retrofit program. Construction methods and costs will be kept track so that the feasibility of post and pier retrofits on different islands can be analyzed and provided to the homeowner's once the most cost-efficient methods are determined. On Oahu the costs is typically*

around $10,000 per house. For Hawaii County, a construction budget of $50,000 per demonstration house is proposed. Budget estimate is $205,000 for two houses in different seismic zones, construction costs, design work, analysis and write up.

2) *Traditional Education and Outreach – Using the Homeowner's Handbook to Prepare for Natural Hazards. Through distributing almost 100,000 books (Right), and conducting over 300 education and outreach events since 2007 with our partners, approximately 7,000 houses have been retrofitted with hurricane clips and/or window protection. This has a multiplier effect as the homeowners of many strengthened homes plan to shelter relatives or friends, relieving the demand on shelter space. This project continues the education and outreach over the last 13 years emphasizing hurricane risk, creating emergency/evacuation plans and methods to retrofit. Creating evacuation plans that are scientifically based is vital as many in the community do not know how to use the Shelter in Place Guidance in the Handbook (bottom) and thus are very likely to shelter in a house that is not sufficiently strong.*

This Project supports continued education and outreach that in the past included Church Groups, AARP, Catholic Charities, Neighborhood Boards, Rotary Clubs, the Cross Island Resilience Network of over 20 communities on Oahu, the Public Library System with 51 Libraries on every island, Chambers of Commerce, Businesses, the Insurance and Realtor Industry and individual homeowner's who only need to ask to receive free information.

After the current version of the handbook is distributed, the book will be updated with:

i) *New Covid information (2019 pandemic information is currently in the Climate Section of the book),*
ii) *relevant information available from Project 1, the Hurricane and Earthquake retrofit project*
iii) *New information on mitigation measures (see, e.g., Report)*

Cost share contribution: In-kind, volunteer hours and cash.

Additional funding allocated: This education and outreach project is a campaign project with Aloha Safe Homes Project

COASTAL AND SHORELINE RISK AND VULNERABILITY ASSESSMENT AND ADAPTATION

Agency name: Department of Land and Natural Resources

Jurisdiction: City and County of Honolulu

Project location: North Shore, Oahu (Sunset Beach)

Activity: Hazard Mitigation Plan Development/Adoption

Hazards mitigated: Coastal storm; Flood; Hurricane; Tsunami; Severe storms

SHMP or LHMP connection to state or local plan:

City and County of Honolulu Hazard Mitigation Plan (2021 Amendment)

- *Action 56*

Flood zone: Special Flood Hazard Area

Environmental impact issues: No

Historical or cultural preservation issues: No

Issues Detailed: N/A

Estimated cost: $250,000.00

Support needed from HI-EMA Hazard Mitigation Team: 1
(1 = minimal, 2= minimal, 3 = a lot)

Work started: Yes

Project description: Various hazard data layers exist for sea level, tsunami and flood hazards that would be included in a risk and vulnerability assessment Proposal is for a Study and feasibility assessment no direct mitigation planned. The project is a partnership between the Department of Land and Natural Resources and the University of Hawaii Sea Grant Program and will utilize and refine high resolution coastal hazard exposure and vulnerability map data, including high tide flooding, annual high wave flooding, and coastal erosion projections with sea level rise from a 2017 Hawai‘i Sea Level Rise Vulnerability and Adaptation Report and companion Hawai‘i Sea Level Rise Viewer in

assessing future vulnerabilities and adaptation strategies. State and County owned assets at risk will be evaluated in terms of potential adaption options in stakeholder- identified priority pilot sites on the North Shore. In addition, the project will build on a 2019 report by the State Office of Planning (OP) - Coastal Zone Management Program Assessing feasibility and implications of managed retreat strategies in Hawai‘i, the City & County of Honolulu’s (City) O‘ahu Resilience Strategy, the City’s current processes to develop a climate adaptation strategy, and ongoing update to the City’s North Shore Sustainable Communities Plan. The project will build upon and integrate the efforts and results of the ongoing (2021-22) North Shore Coastal Resilience Working Group which is developing stakeholder driven recommendations for adaption solutions for high-impact coastal areas on the North Shore of O’ahu. Hawai‘i Sea Grant, through its in-house expertise and existing university and state networks, will bring together an interdisciplinary research team of coastal management and resilience specialists, coastal geologists, planners, and economists at the University of Hawai‘i to:

- *Quantify the vulnerability of the Sunset Beach area of the North Shore coastal community, infrastructure, and ecosystems due to coastal hazard related impacts.*
- *Quantify the ecosystem and community resilience benefits of alternative coastal adaptation options.*
- *Model and project benefits and drawbacks of varying adaptation strategies including but not limited to sand management, armoring, retreat, and no action; and*
- *Conduct a feasibility assessment of prioritized coastal adaption options for final evaluation and ranking for implementation.*
- *Develop methods and produce findings along with implementation strategies that will be informative and transferrable to other coastal communities in Hawai‘i and beyond.*

Transitioning results to management application: The project fits squarely into the State Climate Commission’s Climate Ready Hawai‘i Initiative, which provides a framework for supporting community resilience to impacts of climate change. Outputs will include a summary report detailing project methods and findings along with technical and policy papers on community-based adaption frameworks. The results of this study will be applied directly to coastal

management that develops and implements innovative shoreline management techniques through a long-standing cooperative relationship with Hawai‘i Sea Grant. Commitments and partnerships with county government will be further developed and detailed in a full proposal.

Cost share contribution: None yet. If this proposal is advanced a detailed project budget with matching sources will be developed. As mentioned above a potential match may include a proposed impact assessment as described in HB2229 (2022 Hawaii State Legislature).

Additional funding allocated: No but HB2229 (2022) in the Hawaii State legislature calls for conducting a similar impact assessment for a similar shoreline project reach. These efforts are complimentary and would further each other.

COCO PALMS RESORT ACQUISITION

Agency name: Kauai Emergency Management Agency

Jurisdiction: Kauai County

Project location: Kauai County

Activity: Acquisition

Hazards mitigated: Coastal storm; Flood; Hurricane; Severe storms; Tsunami.

SHMP or LHMP connection to state or local plan:

The Coco Palms Resort Acquisition project meets the first three goals of the State Mitigation Plan:

Goal 1— Reduce the long-term vulnerability of Hawaii’s people, property and jurisdictions,
Goal 2—Promote actions designed to ensure long-term resiliency
Goal 3—Strengthen partnerships and leverage existing resources and capabilities

The project also is consistent with Kauai’s Multi-Hazard Mitigation and Resilience Plan, approved April 30, 2021. The project meets Goals 1 & 2:

2. *Reduce long-term vulnerability of the County’s people, communities, and property— including government-owned or*

operated buildings, lifelines, and infrastructure—to hazards, while conserving the County's natural, historical, and cultural assets.

3. *Promote long-term resilience, the capacity to adapt to and thrive with changing conditions and acute shocks.*

The project is also consistent with the Plan's Objectives 1, 2, 3, 4 & 7:

1. *Engage the whole community, including visitors, to develop a shared science-based understanding of hazards and climate change risks and vulnerabilities to inform risk-reduction measures and adaptation strategies.*
2. *Reduce repetitive property losses due to floods, erosion, high winds, tsunamis, fire and sea level rise through acquisition, retrofitting, design, and updated construction and land use regulations.*
3. *Incorporate mitigation measures into repairs, major alterations, new development, and redevelopment, especially in areas with substantial hazard risk and those known to have repetitive loss.*
4. *Consider climate change impacts—including greenhouse gas emissions—in all repairs, major alterations, new development, and redevelopment.*
5. *Reduce risk to and increase the resilience of vulnerable infrastructure and community lifelines.*

Flood zone: Special Flood Hazard Area

Environmental impact issues: Unknown

Historical or cultural preservation issues: Yes

Issues Detailed: The Coco Palms Resort is located on Kauai's eastern shore, just north of the Wailua River. The area has enormous cultural significance both pre-European contact and post- as one of the iconic Hawaiian resorts during the 1950s-1980's. The Phase 1 activities include updating the historical & cultural preservation documentation and developing a plan for recreational & cultural activities consistent with open space.

Estimated cost: $23,600,000.00

Support needed from HI-EMA Hazard Mitigation Team: 2
(1 = minimal, 2= minimal, 3 = a lot)

Work started: No

Project description: The Phase 1 activities include determining the environmental impacts from acquiring and demolishing the buildings and restoring the area to open space. The County proposes to acquire the Coco Palms Resort (CPR), specifically three privately owned parcels, and demolish the remaining, Hurricane Iniki-damaged structures (located primarily on one parcel) to create open space with compatible general recreational activities and culturally appropriate uses. The CPR buildings were severely damaged during Hurricane Iniki in September 1992. Since then, various combinations of owners and investors have unsuccessfully investigated redeveloping the resort. The most recent action occurred on July 26, 2021, when the properties were auctioned off and sold to the Private Capital Group (PCG) for $22 million. The PCG had foreclosed on the previous owners, Coco Palms Hui, LLC, who had defaulted on a loan from Stillwater Equity Partners and Reef PCG. The acquisition of the CPR and demolition of its remaining structures together with the creation of open space will mitigate the flooding, hurricane, and tsunami risk to the site and the residents of Kauai. The project fits well with the County's Multi-Hazard Mitigation and Resilience Plan. Because the County lacks detailed knowledge of the condition of the CPR structures, utilities and underground improvements, the County intends to implement the project in two phases. In Phase 1, project scoping and design, the County will hire an engineering/design consultant to supplement the County's planning and public works staff to:

- *analyze the condition of the remaining hurricane-damaged structures and develop the plans for demolishing and removing those structures and any utilities or underground improvements,*
- *prepare the National and State environmental and historic preservation review documentation,*
- *develop a public participation process to gather broad-based, whole community input to the open space design,*
- *develop partnerships with community and private organizations that can contribute to funding the cost match, and to managing and maintaining the open space,*
- *refine the project cost estimate, including the cost of managing and maintaining the open space,*
- *determine how the County and non-governmental organizations can share the responsibility for managing and maintaining the open space.*

- *re-evaluate the Benefit Cost Analysis to include the updated project cost estimate.*
- *develop the voluntary sale agreement, the deed restriction document, and a memorandum of agreement that lays out the shared responsibilities and costs of managing and maintaining the open space.*
- *The County will submit the Phase 1 results to HI-EMA and FEMA for review and approval. Upon that approval the County will initiate Phase 2 to implement the phase 1 steps. The County will*
- *complete the acquisition/voluntary sale of the property/parcels,*
- *complete the EHP documentation and acquire the necessary permits*
- *hire a construction firm to demolish and remove the structures, utilities, and underground improvements, and then complete the grading and site preparation for the open space.*

The County anticipates taking 36 months to complete the acquisition/demolition project. The CPR site is of enormous Pre- and Post-European contact cultural importance. The area around the mouth of the Wailua River contains numerous cultural sites, including heiaus, fishponds, burial sites, and habitation sites. After the construction of the resort, it became one of the iconic Hawaiian resorts, hosting numerous dignitaries, Hollywood stars and was the locale for several Hollywood films. Because of the community interest in preserving these cultural sites, the County anticipates undertaking a memorandum of agreement with non-governmental organizations to develop culturally appropriate uses consistent with open space, and to share responsibility for the long-term management and maintenance of the site.

Cost share contribution: The County has several options for the Phase 1 match ($100,000), including the Act 35/Act 9 Disaster Recovery and Mitigation funding and the County's Open Space Preservation fund. Final determination, and potential County Council approval, will made upon the Phase 1 award. The Phase 2 match ($5.8 million) will also come from a combination of sources, including Act 35/Act 9 funds, Open Space Preservation funds, donations from private, non-profit community organizations and the general public. The determination of the Phase 2 match is one of the Phase 1 contractor tasks and will be part of the package the County submits to HI-EMA and FEMA for review and approval.

Additional funding allocated: No

CONTRACTUAL SUPPORT FOR KAUAI DEPARTMENT OF PUBLIC WORKS NFIP COMMUNITY RATING SYSTEM APPLICATION

Agency name: Kauai Department of Public Works

Jurisdiction: Kauai County

Project location: Kauai County

Activity: Post-Disaster Code Enforcement

Hazards mitigated: Coastal storm; Dam/Levee break; Flood; Hurricane; Mud/Landslide; Severe storms; Tsunami

SHMP or LHMP connection to state or local plan:

This project to bring on contractor support to complete Kauai's CRS application is consistent with the 2018 State Hazard Mitigation Goals 1, 2 & 3

Goal 1— Reduce the long-term vulnerability of Hawaii's people, property and jurisdictions, . . . including high risk properties such as repetitive loss (RL) and severe repetitive loss (SRL) properties.

Goal 2—Promote actions designed to ensure long-term resiliency.

Goal 3—Strengthen partnerships and leverage existing resources and capabilities to identify, assess and reduce the impact of natural hazards.

It is consistent with the 2021 Kauai Multi-Hazard Mitigation and Resilience Plan (Plan) Goals 1, 2 & 7; and Plan Objectives 2, 4, 5, 10

Goal 1 – Reduce the long-term vulnerability of the County of Kauai's people, communities and property, including high risk properties such as repetitive loss and severe repetitive loss properties.

Goal 2 – Promote the County of Kauai's long-term resilience, the capacity to adapt to and thrive with changing conditions and acute shocks.

Goal 7 – Increase the County of Kauai's capabilities and capacity to prepare for, respond to, recover from, and mitigate the impacts of hazards that can impact the County.

Objective 2 – Reduce repetitive property losses due to floods, erosion, high winds, tsunamis, fire and sea level rise through acquisition, retrofitting, design, and updated construction and land use regulations.

Objective 4 – Consider climate change impacts [primarily Sea Level Rise] in all repairs, major alterations, new development, and redevelopment.

Objective 5 – Enhance community capacity to develop community-based disaster resilience plans that incorporate education & risk-reduction measures and integrate them into county planning documents.

Objective 10 – Create financial and regulatory incentives for development and land use techniques to motivate homeowners, businesses & non-profit community organizations to mitigate hazards/risk.

Flood zone: Special Flood Hazard Area

Environmental impact issues: No

Cultural preservation issues: No

Historical or cultural preservation issues: N/A

Estimated cost: $100,000

Support needed from HI-EMA Hazard Mitigation Team: 2
(1 = minimal, 2= minimal, 3 = a lot)

Work started: No

Project description: The County of Kauai intends to take advantage of the benefits available under the NFIP's CRS (Community Rating System) program. Unfortunately, staffing shortages and multiple taskings to the limited staff in the County's Department of Public Works, Engineering Division, which houses the County's Floodplain Manager (FPM), have hampered the County's progress in applying to the CRS. Last summer the County teamed up with the University of Hawaii's Sea Grant Program to fund a Rappa Fellow to lay out the steps the County needs to take to complete the CRS application and to calculate the

County's probably rating level. The County intends to hire a consultant with significant CRS experience to support the County's FPM in implementing the recommendations from Gabriel Leggott's Sea Grant CRS report, completing the CRS application and submitting it to FEMA and the ISO for review and approval.

Cost share contribution: The County's Department of Public Works intends to use in-kind services for the 25% Non-Federal share ($25,000) from its non-federal staff time, funded by the County. In-kind services will be employee hours, working with contractor support, to implement the Sea Grant CRS report recommendations, complete the CRS application and submit it to FEMA and the ISO for review and approval.

Additional funding allocated: No

DWS WATER CONSERVATION AND REUSE GRANTS PROGRAM

Agency name: Department of Water Supply Water Resources & Planning Division

Jurisdiction: Maui County

Project location: Countywide

Activity: Hazard Mitigation Plan Development/Adoption

Hazards mitigated: Biological; Chemical; Drought

SHMP or LHMP connection to state or local plan:
Drought, Sec 4.5; Limitations, Sec 4.23; Hazardous Materials, Sec 4.8; Health Risks, Sec 4.9

Flood zone: Special Flood Hazard Area

Environmental impact issues: Yes

Historical or cultural preservation issues: Yes

Issues Detailed: Graywater systems can involve design and construction work that may disturb the ground. However, reuse systems are "sustainable" project in which certain designs can greatly minimize this impact greatly, and even improve the site's environmental qualities and resilience.

A great number of Hawaiian burial sites have been identified throughout Maui County. These sites are often discovered under previously disturbed building sites. Graywater system designers and builders should be aware to in order to avoid disturbing historical and cultural resources.

Estimated cost: $2,000,000.00

Support needed from HI-EMA Hazard Mitigation Team: 1
(1 = minimal, 2= minimal, 3 = a lot)

Work started: Yes

Project description: Graywater systems can help conserve potable water by repurposing used ""gray"" water for secondary use purposes after being intercepted from being directly released into the environment and treated. The treated water is not only cleaner but will go to high water demand applications such as irrigation, reduce erosion hazards and chemicals and bacteria levels being released into the environment and waters in its vicinity. Therefore, graywater systems are especially helpful in coastal areas zones where effluent water is released into the environment after high potable water demand. DWS spearheaded the State's first mechanical graywater system currently being installed at the Launiupoko Beach Park in Lahaina (early 2022). We are very familiar with regulations and permitting process at the County, State and Federal level. The current system captures and treats water from showers and sinks for irrigation reuse and utilizes bioswales to capture water run-off from the park's parking lot and nearby road to reduce pollution to the coastal beach area. The system can treat tens of thousands of gallons of water per day, which helps to conserve water and reduce production costs. This kind of project works well in places where recycled water from DEM may be too costly or far for distribution and hookup.

Maui is located in the most isolated island chain in the world, fresh water is our most important resource. As demand continues to rise for clean, potable, drinking water, DWS is committed to sustainable water security, reducing environmental hazards and supporting efforts to achieve it. Graywater reuse systems coupled with a robust water conservation plan may be a great solution to accomplish sustainable goals.

We seek water conservation experts to expand and promote water conservation and reuse projects throughout Maui. As freshwater demand continues to rise with increasing populations and community growth, DWS recognizes that proven, innovative, solutions can save our water resources and help alleviate water availability under persisting drought conditions. In this regard, DWS recognizes that most of the water we deliver to our customers are not used for drinking or cooking food, and that a lot of water used for other purposes wash off into the

drain. This water can be intercepted, treated and reused for non-potable secondary use purposes like irrigating your gardens and landscaping.

Cost share contribution: Cost share can be in-kind employee hours required to sustain and manage the project program

Additional funding allocated: None.

FOSTERING COMMUNITY RESILIENCE TO CLIMATE CHANGE THROUGH BEACH RESTORATION STUDIES IN KAPA`A AND POIPU, KAUA`I

Agency name: Planning Department

Jurisdiction: County of Kaua`i

Project location: Two sites in the County of Kauai: Poipu and Kapa`a

Activity: Post-Disaster Retrofits (structural, utilities)

Hazards mitigated: Coastal storm; Tsunami; Hurricane.

SHMP or LHMP connection to state or local plan:

County of Kaua`i Multi-Hazard Mitigation and Resilience Plan:

- *Action KC31— Pursue beach and dune restoration to mitigate impact from coastal hazards and sea level rise"*

Flood zone: Special Flood Hazard Area

Environmental impact issues: No

Cultural preservation issues: No

Historical or cultural preservation issues: N/A

Estimated cost: $300,000

Support needed from HI-EMA Hazard Mitigation Team: 1
(1 = minimal, 2= minimal, 3 = a lot)

Work started: Yes

Project description: Preliminary sand investigation, coastal processes studies, and conceptual designs have been completed for Kapa`a and Poipu Beach Parks. These studies identified a need to conduct more analysis before beach

restoration projects can be implemented This project proposes to hire a coastal engineering firm to complete site assessments, studies, and preliminary designs (60%) for beach restoration at Kapa`a and Poipu Beach Parks. After completion of the analysis the County intends to proceed with the stakeholder process and the Environmental Impact Statements (EIS) for the projects to develop a plan to implement the beach restoration. More specifically, this work will include:

- *Characterization of existing beach conditions, including topographic surveys, beach sampling and laboratory analysis, and historical shoreline analysis.*
- *Offshore sand investigations using vibracore and laboratory analysis of sand samples.*
- *Investigation of sand recovery and transport methodology.*
- *Refinement of oceanographic design parameters, including wind, waves, water levels, currents, sea-level rise and*
- *wave, current, and geomorphology modeling.*
- *Development of conceptual nourishment and erosion mitigation alternatives for stakeholder review.*
- *Development of 60% design for selected alternative and a design report.*

Background: Kapa‘a Beach provides the first line of defense between the ocean and this residential town. Chronic erosion and sea level rise threatens homes, infrastructure, recreation, and habitat for native flora and fauna. Po‘ipu Beach is Kaua‘i’s premier visitor destination area, due in part to guaranteed viewing of basking green sea turtles and monk seals. Chronic beach erosion and sea level rise threatens public safety, park facilities, hotels, and infrastructure as well as habitats for these threatened and endangered species. These sites are identified priorities in the County of Kaua‘i General Plan and the Kaua`i Multi-Hazard Mitigation and Resilience Plan. Previous studies by Sea Engineering in 2012-2013 identified offshore sand resources in each area, but additional analysis is needed to design the projects.

Cost share contribution: We intend to apply to the Department of Land and Natural Resources (DLNR) Office of Conservation and Coastal Lands (OCCL) Beach Fund for a cash match of $75,000 (25%). Preliminary conversations with DLNR about this project have occurred. In addition, in-kind services from non-federally funded County of Kaua`i staff will be provided. This will be in the form of employee hours working on managing the grant, assisting with the studies, and conducting initial outreach to stakeholders.

Additional funding allocated: No

GAT TSUNAMI EVACUATION ZONE

Agency name: Hawaii County Civil Defense Agency

Jurisdiction: Hawaii County

Project location: County wide revised tsunami evacuation zones

Activity: Hazard Mitigation Plan Development/Adoption

Hazards mitigated: Tsunami.

SHMP or LHMP connection to state or local plan:
County of Hawaii Multi-Hazard Mitigation Plan, September 2020
- *Action HC27Evacuation and Sheltering Assessment and Protocol*

Flood zone: Special Flood Hazard Area

Environmental impact issues: No

Historical or cultural preservation issues: No

Issues Detailed: N/A

Estimated cost: $10.000.00

Support needed from HI-EMA Hazard Mitigation Team: 3
(1 = minimal, 2= minimal, 3 = a lot)

Work started: Yes

Project description: Great Aleutian Tsunami (GAT) study circa 2016. The County of Hawaii adopted the inundation projections of the GAT study, which far exceed previous inundation studies done for the Multi-Hazard Mitigation Plan. The Tsunami SOP is under revision to reflect this change. This project will install GAT tsunami evacuation zone signs in three locations on Hawaii Island. Haena Bay in the Puna District at 19.643721N and -154.983061W, Puako in the South Kohala District at 19.972605N and -155.830999W, and in the South Hilo District in the City of Hilo to include the Keaukaha subdivision near 19.714431N and -155.073137W.This project includes creating two separate tsunami evacuation zones; one for the most likely inundation based on previous inundation studies, and one for the GAT scenario. The County of Hawaii adopted the GAT scenario

with two distinct evacuation zones on June 3, 2021. The Tsunami SOP is currently under revision and is set to be exercised in April 2022. This project will procure and place Extreme (GAT) tsunami evacuation signs to mark the extend of the GAT evacuation zone in the three locations identified when the Tsunami SOP is finalized.

Cost share contribution: The Director of Finance has agreed to fund the 25% match for this grant.

Additional funding allocated: The EMPG grant funds half the salary and wages of the tsunami plan author.

HAWAII POST DISASTER TRANSITIONAL HOUSING

Agency name: HI-EMA

Jurisdiction: State of Hawaii

Project location: Honolulu County

Activity: Post-Disaster Retrofits (structural, utilities)

Hazards mitigated: Windstorms

SHMP or LHMP connection to state or local plan:

State of Hawaii 2018 Hazard Mitigation Plan

- *Page 4-222 After high winds events, residents may be displaced or require temporary to long-term sheltering. Vulnerable populations, such as the elderly, low-income and linguistically isolated populations, are most susceptible to high windstorms.*

Flood zone: Minimal Flood Hazard Zone

Environmental impact issues: No

Historical or cultural preservation issues: No

Issues Detailed: N/A

Estimated cost: $65,000

Support needed from HI-EMA Hazard Mitigation Team: 1
(1 = minimal, 2= minimal, 3 = a lot)

Work started: No

Project description: A technical design has been completed for this project. This Grant request is to go into construction phase. Currently State of Hawaii has no comprehensive plan to provide Transitional housing for persons displaced due to natural disaster. There are large inadequacies of the trailers issued to flood victims by the Federal Emergency Management Agency (FEMA) and this type of facility is stored on Mainland US.

In collaboration with UH a prototype for Transitional Housing Units has been created. The Prototype designs attempt to fulfill the needs of their occupants in a more permanent and humane manner, while addressing the challenges of building and protecting a home after a disaster event. The intent of this application grant request is to build a variety of prototypes for communal transitional housing and on site for families repairing/protecting their homes. The materials will be eco-friendly and easily stored on island in order to assemble and be ready to build on site for individuals and families repairing their homes. The goal is to have ready to assemble pre-packaged its, including plans and all materials needed for construction

Cost share contribution: Volunteer hours, in-kind services.

Additional funding allocated: No.

IMPLEMENTATION OF A DUNE RESTORATION PLAN TO MITIGATE FUTURE IMPACTS OF COASTAL HAZARDS AND PROTECT PUBLIC SAFETY AND CRITICAL INFRASTRUCTURE AT BALDWIN BEACH PARK, MAUI

Agency name: Department of Parks and Recreation

Jurisdiction: Maui County

Project location: Baldwin Beach Park, North Shore of the Island of Maui

Activity: Post-Disaster Retrofits (structural, utilities)

Hazards mitigated: Coastal storm; Fishing losses; Flood; Hurricane; Severe storms

SHMP or LHMP connection to state or local plan:

The project supports many of the goals and priority hazard mitigation actions incorporated in the 2018 Hawaii State and 2020 Maui County HMP updates especially those that relate to conserving natural, historical, and cultural resources and developing nature-based solutions, in particular, dune restoration. In addition, the project would promote plan integration

as multiple county departments and state agencies would need to be consulted and plans considered.

2018 Hawai‘i State HMP - Relevant Priority Hazard Mitigation Actions

2018-023: Integrated Hazard Mitigation of State Coastal Highways and Beaches from Chronic Coastal Flooding

2018-048: Infrastructure Managed Retreat and/or Nature Based Solutions Engineering Pilot Project to Protect Threatened Hawai‘i Infrastructure

2018-026: Assess, identify, and implement state nursery improvements needed to provide native plants for green breaks

2020 Maui HMP - Relevant High and Medium Priority Hazard Mitigation Actions:

2020-14: Expand Beach and Dune Restoration Projects

1. *Identify and prioritize erosion hotspots for mitigation via beach nourishment where applicable.*
2. *Pursue Federal/State/County funding for beach nourishment and restoration (including pre-positioning for post disaster financial assistance).*
3. *Work with State regulatory agencies to streamline permitting for beach restoration.*
4. *Promote living shoreline projects instead of shoreline hardening where feasible.*
5. *Protect/restore coral reefs as they provide a barrier for erosion, high surf/coastal flooding and tsunamis.*

2020-15: Update dune restoration guidance. Provide dune restoration training. Develop an outreach initiative to encourage or establish new dune restoration volunteers/stewards. Install ADA compliant dune walkovers in identified locations.

2020-17: Conduct a multivariate GIS analysis to identify and categorize open spaces for the County of Maui to purchase and preserve based on highest ROI for hydrological capacity and positive impact on flood mitigation.

2020-08: Integrate the hazard mitigation plan into other plans, ordinances and programs that dictate land use decisions in the community, including capital improvement programs, the general plan, recovery plans and strategic plans.

2020-21: Develop a strategy to mitigate risk to coastal roads.

2020-08: Plan Integration. Integrate the hazard mitigation plan into other plans, ordinances and programs that dictate land use decisions in the community, including capital improvement programs, the general plan, recovery plans and strategic plans

2020-13: Support cross-departmental collaboration and planning in resilience and climate action efforts.

2020-41: Maintain NFIP Compliance. Continue to maintain good standing and compliance under the NFIP through implementation of floodplain management programs that, at a minimum, meet the NFIP requirements: enforce the flood damage prevention ordinance, participate in floodplain identification and mapping updates, provide public assistance/information on floodplain requirements and impacts.

Flood zone: Special Flood Hazard Area

Environmental impact issues: No

Historical or cultural preservation issues: Yes

Issues Detailed: It is anticipated that this project will be exempt from requirements for an environmental assessment under Hawaii Revised Statutes Chapter 343 pertaining to Environmental Impact Statements.

Dune restoration activities may encounter cultural resources. The Department of Parks and Recreation has allocated funding to conduct a cultural resources survey of the project area. This project can be further reviewed for compliance with NEPA 106

Estimated cost: $900,000

Support needed from HI-EMA Hazard Mitigation Team: 3
(1 = minimal, 2= minimal, 3 = a lot)

Work started: Yes

Project description: In 2020, the County of Maui Department of Parks and Recreation (DPR) initiated a project to assess the vulnerability of its beach parks to a variety of coastal threats and to prepare adaptation strategies. The study was funded by the county council and was conducted with planning and technical assistance by Tetra Tech, Inc. A detailed vulnerability and adaptation study has been conducted for 65 beach parks throughout Maui County.

An interim Master Plan was developed for Baldwin Beach Park was prepared 2020 identifying dune restoration as a primary coastal flooding and erosion mitigation strategy.

In 2021, the Hawai‘i Sea Grant Program and DPR completed a detailed engineering plans and specifications, an implementation plan, and draft permit applications for a dune restoration project at Baldwin Beach Park (Kapukaulua). An overview of the project and stakeholder engagement process can be found here:
https://experience.arcgis.com/experience/7417e375f63a4eae9391cb257dbfe245

Implementation of a dune restoration plan to mitigate future impacts of coastal hazards and protect public safety and critical infrastructure at Baldwin Beach Park, Maui "This “shovel-ready” project will restore dunes impacted by coastal hazards at Baldwin Beach Park. Dune restoration will occur at the park and extend east to Lower Pā‘ia Park and west to Wawau Point. Dune restoration will be implemented based on detailed engineering designs, draft permit applications, and an implementation plan completed in 2021 by UH Sea Grant College Program and the DPR under a National Fish and Wildlife Foundation (NFWF) grant. Permit applications are ready for submission to the County of Maui Planning Department. It is anticipated that this project will be exempt from requirements for an environmental assessment under Hawaii Revised Statutes Chapter 343 pertaining to Environmental Impact Statements, and this project can be further reviewed for compliance with NEPA 106. All documentation to support this “shovel-ready” project can be provided upon request.

DPR has historically worked closely with the Hawaii Sea Grant College Program on county-wide large-scale nature-based planning efforts and the preparation of grant applications to federal and state agencies for work at specific sites. This partnership will be continued in this project.

Dune restoration will mitigate long-term impacts of flooding of park facilities, a wastewater pump station, and the Hana Highway, which provides access to the Park. The project will also protect public safety by the removal of large trees along the shoreline that will fall during the next high wave event. This activity will also support propagation and grow-out of native plants and trees to support dune restoration activities.

County beach parks are being impacted by coastal storms, high wave events, and sea level rise. Coastal hazards jeopardize public safety in the beach parks when the foundation of park facilities and roots of large trees are undermined. Emergency response actions have been undertaken at several beach parks to remove park pavilions and trees after high tide and wave events to protect public safety. The pavilion at Baldwin Beach Park was severely damaged during the last high wave event. DPR had to conduct an emergency removal of half the pavilion to protect public safety. Puamana Beach Park had to be closed due to public safety concerns and exposure of iwi kupuna (human remains) in 2021. The highest rates of historical erosion on Maui are documented at Baldwin Beach Park owing in large part to a history of extensive sand mining from the beach and dunes. Erosion is expected to persist in the future with rising seas.

Dune restoration is a nature-based solution for coastal hazard mitigation. Sand dunes and living shorelines and a key part of a “healthy” beach ecosystem. Vegetated dunes trap windblown sand, store excess sand reserves, serve as natural erosion buffers and create an elevated berm and dense root system that may protect against storm and high wave events. Coastal dunes serve as the primary buffer to wave energy and provide a critical supply of sand to the beach when seasonal and storm erosion occurs. To this end, coastal dunes act as a self-regulating mechanism to assist the sandy beach during periods of high surf and high tides by promoting recovery through release of much-needed sand to the beach. Beaches and coastal dunes also provide important habitat to many native and endangered species. Kanahā and Baldwin Beach Parks are two of a handful of beach parks with the sand deposits and surrounding land use to support dune restoration that can be maintained with rising seas.

Baldwin Beach Park provides vital recreational and subsistence fishing services to residents. During the pandemic, beach parks supported the physical and mental health and well-being of the residents of Hawaii providing outdoor open

spaces. The availability of marine sands and dunes at Baldwin Beach Park have great potential to support living shorelines through nature-based solutions such as dune restoration.

Cost share contribution: Yes. In-kind and cash contributions have been identified.

Additional funding allocated: Department of Parks and Recreation has allocated $200,000 in county funds for studies on traffic, engineering-drainage, cultural resources, and flora and fauna at the project site. These studies will support this dune restoration project.

KA‘EHU BAY STREAMS & SHORELINE MITIGATION PROJECT

Agency name: KAEHU Non-profit organization

Jurisdiction: Maui County

Project location: County of Maui in the District of Wailuku at Ka‘ehu Bay (Paukukalo Coastal Wetlands)

Activity: Hazard Mitigation Plan Development/Adoption

Hazards mitigated: Coastal storm; Flood; Hurricane; Severe storms; Tsunami.

SHMP or LHMP connection to state or local plan:

The Ka‘ehu Bay project will utilize several of the State mitigation strategies:

1. *Promote actions designed to ensure long-term resiliency,*
2. *Strengthen partnerships and leverage existing resources and capabilities to identify, assess and reduce the impact of natural hazards,*
3. *utilize state-of-the-art methods and technology and traditional knowledge to identify and analyze natural hazards and assess State capabilities to reduce the impacts of those hazards, and*
4. *Provide a framework for robust local hazard mitigation planning and mitigation strategy implementation for Ka‘ehu Bay and the surrounding communities.*

Flood zone: Special Flood Hazard Area

Environmental impact issues: Yes

Cultural preservation issues: Yes

Historical or cultural preservation issues: Ka‘ehu Bay is 64-acre coastal wetlands that is directly impacted by

a) *climate change and sea level rising,*
b) *Chronic Coastal Flooding,*
c) *Event-Based Flooding,*
d) *hurricanes,*
e) *Tsunami's.*

There are over 40+ archaeological sites on the 64-acre parcel including a sacred healing spring, a recently partially uncovered ancient 12-acre fishpond wall, and many artifacts throughout the property.

Estimated cost: $1,120,000.00

Support needed from HI-EMA Hazard Mitigation Team: 1
(1 = minimal, 2= minimal, 3 = a lot)

Work started: Yes

Project description: KA'EHU has been coordinating planning workshops since 2017 and recently held long-term resiliency planning workshops from June to November 2021. Currently, the architect and planner is working with community leaders and experts/specialists to help design a draft to help restore the area. Last summer we had a consultant do a botanical survey and are working with the UH Institute of Marine Biology PhD Candidate Nakoa Goo to do marine surveys and research best practices for future restoration of the shoreline and mitigation to slow down erosion and rising sea levels. We are currently working with Oceanographer Andrea Kealoha PhD, director of the Water Quality Department at the University of Hawaii, Maui College. KA'EHU has over 4 years of experience training youth and community members in natural resource management, which fits well with the next approach of selecting and implementing mitigation strategies. Ka'ehu Bay Streams & Shoreline Mitigation Project. Ka'ehu Bay is located on the island of Maui, in the district of Wailuku and is located 1.3 miles from Kahului Harbor. We are located in a Special Flood Zone area.

The main areas of mitigation being addressed include stream bank erosion, shoreline erosion, sedimentation, coastal flooding, rising sea levels, and the preservation/mitigation of archaeological sites.""Ka'ehu Bay includes the Paukukalo Coastland Wetlands, an undeveloped parcel that is rich in natural and cultural resources, along with native flora and fauna. The offshore area is an estuary necessary for spawning fish, a place for monk seals to rest and play, and a birthing place for green sea turtles to nest and lay their eggs. The property

provides ocean access and resources for traditional and cultural practices for the community.

In ancient times, this area was once filled with taro patches, native plants and birds, native trees, productive fishponds, two streams of fresh clean water, freshwater springs throughout the property, a bountiful ocean with plenty of limu (seaweed), and fish and ocean wildlife. Unfortunately, commercial agriculture and businesses used the area to dump toxic metals and rubbish, leaving it overgrown and contaminated.

The Kaʻehu Stream and Shoreline Mitigation Project will implement a community-based, socio-ecological program that will utilize staff and community volunteers to work directly with the marine biologists, archaeologists, oceanographers, water quality and climate change specialist, shoreline managers, and cultural experts for hands-on learning in natural resource management integrating the Ahupuaʻa system values and wisdom of land stewardship. The staff and volunteers will be trained to research best practices, test, analyze and assess the data being collected from the 64-acre coastal wetlands and shoreline, which includes ocean monitoring, marine survey, water quality testing, stream monitoring, and endemic and invasive flora and fauna.

The project will be implemented in four phases: 1) Research - staff, volunteers and experts will research best practices of the mitigation strategies to address the direct impacts of climate change and sea level rising at Kaʻehu Bay 2) Hands-On Training - train staff and community youth and volunteers about climate change and sea level rising and selected mitigation strategies to be implemented and tested, 3) Data Collection - on-going data collection of the varying mitigation strategies being implemented to determine the best practices for Kaʻehu Bay in addressing climate change, rising sea levels, shoreline erosion, coastal flooding, and other high risk factors facing this coastal community, 4) Community Education - educate the neighboring communities on the findings and offer opportunities for them to come to Kaʻehu Bay to learn about natural resource management. The goal is to educate the surrounding communities and Maui residents on how climate change impacts them directly and steps they can take to mālama Hawaiʻiʻs natural resources.

Cost share contribution: KAʻEHU is able to secure a 25% Non-Federal Share Match. The various funders include the County of Maui, private foundations, and donations. Much of the match will be from the County of Maui. Volunteers will make up another significant portion of the match.

Additional funding allocated: KAEHU secured $90,000 from NDN Collective for the long-term resiliency planning project, which will wrap up at the end of 2022. The County has awarded KAEHU $150,000 for 2021-2022. We will seek additional funds in July 2022 to help with the match.

KANEHILI COMMUNITY ASSOCIATION PARL PHASE 2

Agency name: Kanehili Community Association

Jurisdiction: City and County of Honolulu

Project location: Kapolei, Hawaii

Activity: Hazard Mitigation Plan Development/Adoption

Hazards mitigated: Biological; Chemical; Civil unrest; Earthquake; Fire; Flood; Hurricane; Terrorism; Windstorms; Coastal storm; Drought; Severe storms

SHMP or LHMP connection to state or local plan:

Plan Reference: 2018 State of Hawaii Hazard Mitigation Plan Mitigation Strategy/Priorities.

1. *Honolulu 004 - Hardening of Critical Structures*
2. *Honolulu 005 - Long Term Congregate Care Shelters*
3. *Honolulu 006 - Post Disaster Staging Areas*
4. *Honolulu 090 - Micro Grids for Critical Health Structures*
5. *Honolulu 010 - Structure Hardening & Construction of Safe Rooms*

Flood zone: Minimal Flood Hazard Zone

Environmental impact issues: Unknown

Historical or cultural preservation issues: Yes

Issues Detailed:
The site was known to be the host of an endangered native plant, Ko'oloa'lua (red ilima blossom). However, the site was regraded during the subdivision development and no evidence of this plant is present on it today.

Estimated cost: $10,000,000.00

Support needed from HI-EMA Hazard Mitigation Team: 2
(1 = minimal, 2= minimal, 3 = a lot)

Work started: Yes

Project description: The planning and design for the phase 2 development is currently in progress. The Kanehili Association Community Center is planned to

perform as a resilience hub for the 403 single-family households, in Kapolei, Oahu. Kanehili is a native Hawaiian Homestead Community located on Trust Lands administered by the Department of Hawaiian Homelands. On a daily basis, this facility will serve as the administrative/operational center providing services and programs to meet the social, economic, health, cultural and recreational needs of the community. If an anticipated or unanticipated disaster (i.e. hurricane, seismic, and or another natural or human-induced event) occurs, this center should serve as a multi-hazard resilience hub and possibly a shelter to provide a high degree of protection for residents who would be prone to greater harm in their own homes. The KCA leadership also envisions this facility to be a Pu'uhonua, a safe place of refuge, prior to, during, and after a catastrophic event.

Cost share contribution: The Kanehili Community Association will seek the DHHL, other State agencies, City government, and/or non-profit organizations, and community volunteers for the 25% Non-Federal share

Additional funding allocated: In 2020, the Kanehili Community Association received a grant award of $100,000 for the Regions Priority Project from the Department of Hawaiian Homelands; and a $30,000.00 matching funds from the Kapolei Community Development Corporation.

KAUNAKAKAI HARBOR PETROLEUM PIPELINE PROTECTION AND SECONDARY CONTAINMENT PROJECT

Agency name: Maui Emergency Management Agency

Jurisdiction: Maui County

Project location: Molokai Island, Maui County

Activity: Post-Disaster Retrofits (structural, utilities)

Hazards mitigated: Coastal storm; Chemical; Severe storms; Tsunami.

SHMP or LHMP connection to state or local plan:

Protecting the Molokai Pipeline at Kaunakakai Harbor would enhance resiliency of a critical lifeline for the island of Molokai. This is consistent with the State of Hawaii Hazard Mitigation Plan's (HIHMP) high prioritization of projects that harden or retrofit essential facilities and infrastructure. Petroleum product pipelines are listed as core energy infrastructure in Table F.1-1 (HIHMP). This facility is also identified as high priority critical infrastructure in the 2020 County of Maui Hazard Mitigation Plan Update, carried over from the 2015 Plan (Index # FL-13 and discussed further on page 635 of the document).

Flood zone: Special Flood Hazard Area

Environmental impact issues: Unknown

Historical or cultural preservation issues: No

Issues Detailed: N/A

Estimated cost: 1,000,000

Support needed from HI-EMA Hazard Mitigation Team: 2
(1 = minimal, 2= minimal, 3 = a lot)

Work started: No

Project description: Island Petroleum has two 2000'x 6"" SCH 40 BLK Pipe fuel lines that run from Kaunakakai harbor to Island Petroleum Inc., Mauka storage facility located at #10 Wharf Road and Beach Place. Island Petroleum is the only petroleum and fuel distribution facility on the island of Molokai in Maui County. These pipelines are the lifeline of the island and they are vulnerable to storm impacts as well as other natural hazards. If the pipeline were to fail during a

natural disaster, a domino effect would place the entire island and community in jeopardy.

Island Petroleum Inc., stores and delivers diesel fuel to Maui Electric Company who supplies electric power to the whole island. The islands two water suppliers, Maui County Water Department and Department of Hawaiian Homelands depend on electricity to power their water well pumps in order to bring drinking water into our homes. Local grocery stores depend on electricity to keep their cold food storage at refrigerant temperature. The only hospital on island depends on this electricity for emergency operations. The local kidney dialyses center depends on electricity to take care of patients. Emergency crews (Police, Fire, Ambulance, etc.) would not be able to respond to people in need without fuel. These are just a few of the organizations, vulnerable groups, and businesses that would be impacted if something was to happen to these fuel lines, which run along the constructed harbor road.

These pipelines are regulated by the US Coast Guard, EPA, DOH, State Harbors Division, and DLNR. In order to meet these government regulations, annual pipeline maintenance and annual hydro testing is done to both pipelines in order to keep them operational. Estimated annual maintenance cost alone is $50,000 to $100,000.00 per year.

Currently about 1700 feet of two 6"" pipelines sit above ground on the eastside of the main road leading to the pier. There are no guardrails or cement barriers to protect them from damage from moving vehicles or debris that may become airborne during a strong hurricane or lifted by a tsunami or storm surge during a natural disaster. An earthquake of high magnitude could destroy the supports causing the pipelines to fall unto the beach and rupture, posing risk of significant environmental impacts should the system experience catastrophic failure.

This project would elevate and harden the pipeline in a concrete trough with access steel plate covers. This concrete trough would act as a secondary containment for the pipelines, protect it from vehicle and pedestrian traffic and protect it from any natural disasters. If the pipelines should rupture at any time, its hazardous contents would be contained, protecting the environment and making clean up easier. Annual visual inspections on the pipeline could be conducted more easily. Estimated cost to complete designs, obtain permits, and build this critical infrastructure enhancement project is $1,000,000.

Cost share contribution: In order to lessen the burden of cost from the community, Island Petroleum would be able to provide 25% of the cost.

Additional funding allocated: No

OPERATIONAL REDUNDANCY FOR COUNTY OF HAWAI'I FIRE DEPARTMENT

Agency name: County of Hawai'i Fire Department

Jurisdiction: Hawaii County

Project location: Island-wide

Activity: Post-Disaster Retrofits (structural, utilities)

Hazards mitigated: Coastal storm; Dam/Levee break; Earthquake; Fire; Flood; Hurricane; Mud/Landslide; Severe storms; Tsunami; Volcano; Windstorms

SHMP or LHMP connection to state or local plan:

> The 2020 County of Hawai'i MHMP identifies the need to "build redundancy for critical facilities and functions" (pgs. 22-5, 22-6, 22-9)

Flood zone: Minimal Flood Hazard Zone

Environmental impact issues: No

Historical or cultural preservation issues: No

Issues Detailed: N/A

Estimated cost: $1,400,000

Support needed from HI-EMA Hazard Mitigation Team: 1
(1 = minimal, 2= minimal, 3 = a lot)

Work started: No

Project description: Operational Redundancy for County of Hawai'i Fire Department: Mobile ICP/Station This project would purchase a mobile building system that would allow the County of Hawai'i Fire Department to immediately stand up a fire station or emergency operations command post. This system is a mobile trailered pop-up building and can replace a fire station should a catastrophic event damage one of our facilities beyond usage. During large scale events, the system can be brought out to establish a command post building.

Cost share contribution: County of Hawai'i Finance Department has agreed to cover the 25% non-federal cost share.

Additional funding allocated: No

PA`IA YOUTH & CULTURAL CENTER

Agency name: Pa`ia Youth Council, Non-profit organization

Jurisdiction: Maui County

Project location: Paia, Maui

Activity: Hazard Mitigation Plan Development/Adoption

Hazards mitigated: Coastal storm; Flood; Hurricane; Severe storms; Tsunami; Windstorms

SHMP or LHMP connection to state or local plan:

State of Hawaii Hazard Mitigation Plan Update 2018:

Goal 1— Reduce the long-term vulnerability of Hawaii's people, property and jurisdictions, including state-owned or operated buildings, infrastructure and critical facilities, to natural hazards while conserving the State's natural, historical, and cultural assets. This includes high risk properties such as repetitive loss (RL) and severe repetitive loss (SRL) properties.

Goal 2—Promote actions designed to ensure long-term resiliency.

Goal 3—Strengthen partnerships and leverage existing resources and capabilities to identify, assess and reduce the impact of natural hazards.

Goal 5—Promote public awareness of natural hazard risks and public action to reduce the long-term risks.

Mitigation Action 2018-048: Infrastructure Managed Retreat and/or Nature Based Solutions Engineering Pilot Project to Protect Threatened Hawai'i Infrastructure

Maui County Hazard Mitigation Plan 2020 Goals:

People. Protect the life, health, safety and welfare of Maui County residents and visitors.

Resilience. Promote the long-term resilience of the County's economic, environmental, historical and cultural resources.

Property. Protect and adapt property and infrastructure from the impacts of natural hazards and climate change.

Education. Improve awareness and mitigation of risks associated with natural hazards and climate change.

Implementation. Enhance the implementation of this Hazard Mitigation Plan through active involvement and plan integration across all County Departments.

Mitigation Action 2020-15: Update dune restoration guidance. Provide dune restoration training. Develop an outreach initiative to encourage or establish new dune restoration volunteers/stewards. Install ADA compliant dune walkovers in identified locations.

Mitigation Action 2020-08: Integrate the hazard mitigation plan into other plans, ordinances and programs that dictate land use decisions in the community, including capital improvement programs, the general plan, recovery plans and strategic plans.

Mitigation Action 2020-13: Support cross-departmental collaboration and planning in resilience and climate action efforts.

Mitigation Action 2020-31: Implement the Teen Cert Hero Project and promote the culture and resiliency of youth in Maui County.

Flood zone: Special Flood Hazard Area

Environmental impact issues: Yes

Historical or cultural preservation issues: Yes

Issues Detailed: Environmental impacts of new construction will be minimized/mitigated by siting outside of the sea level rise exposure area and through an elevated design that is compliant with the FEMA flood hazard standards. A full environmental review will be conducted during the detailed planning stage which will include County of Maui Flood Development Permits and Special Management Area permits.

A cultural resources survey is currently underway by the County of Maui for Baldwin Beach Park where this facility will be sited. Also, new development will require a full review during the permitting stage by the State Historic Preservation Division.

Estimated cost: $7,000,000

Support needed from HI-EMA Hazard Mitigation Team: 1

(1 = minimal, 2= minimal, 3 = a lot)

Work started: Yes

Project description: An Unmanned Aerial Vehicle Topographic Survey and Topographical Survey Maps including FEMA Zone limits and Orthomosaic Overlay have been done. We hired Romanchak Architecture LLC for Architectural Services.

In progress are Schematic Structural documents and a Geotechnical Investigation. We have previous experience with grant applications. We understand that a Benefit Cost Analysis will be part of the application, and we may need guidance on this topic particularly. Relocation and Elevation of the Pa`ia Youth & Cultural Center, Paia, Maui: Creating a Resilient Facility to Support the Youth of Maui "Pa'ia Youth Council, Inc. is a 501 (C)(3) nonprofit organization incorporated in 1993 that strives to provide a balance of social, educational, cultural, vocational, and recreational experiences for the youth of Pa'ia and surrounding communities through the operation of the Pa`ia Youth & Cultural Center (PYCC). Our mission is to Build Community Through Our Youth. Our target group is youth aged 9 to 18.

The current PYCC facility is located directly on the beach at Pa`ia Bay in a house that was constructed in the early 1940's. Four homes were originally constructed on this north shore coastline to house the executive managers of the Hawaiian Cane and Sugar (HC&S) plantation, a subsidiary company of A&B Properties Inc. The PYCC is the only structure that survived the tsunami in 1946. After the tsunami the house was leased to Doris Todd Elementary School, a school that still exists today in upper Pa`ia. It was used primarily as a summer boarding school and housing for teachers.

In 1992, a fire destroyed the upper floor of the building. In 1993, A&B Properties Inc. decided to condemn and demolish the building. A group of 26 Pa`ia youth, led by Brian McCafferty, lobbied to keep the building and turn it into a youth center. They won and the PYCC was born. Susun White became the Executive Director in 1993 and the rest is a history of continuous building renovation and restoration and the creation of a youth life skills program that has international recognition.

Today the PYCC averages 425 youth members (membership is renewed annually) with a daily membership averaging 85 youth. Many of the original 26 youth who lobbied for the youth center, have children who now attend the PYCC. Our greatest achievement is that we have managed to remain youth-directed and community-based. Throughout challenging economies and an increase in membership the PYCC has managed to continue to offer its quality programs and to retain high-level staff.

Even though we renovated the building including rebuilding the burnt upstairs, due to its location, right on the beach, we will not be allowed to continue renovating or expanding the existing structure. Eventually the rising ocean will take the house as it is vulnerable due to projected climate change and sea level rising to coastal hazards, and more flooding due to higher waves. We will have to build a new facility. Consultations with the Maui County Mayor's Office, the Department of Planning and the Department of Parks and Recreation have determined a suitable site mauka of the existing building that will withstand the 100-year projections for sea level rising. Since there is no emergency shelter from Kahului to Hana the new facility will be built to serve additionally as an emergency shelter. It will be constructed "green" (LEED certified) and built on 15'

poles to comply with flood zone and emergency shelter requirements. The new facility will be designed according to FEMA specifications to serve as an emergency shelter. The facility will serve primarily as a youth center; however, it will also allow for the community to use it as place Hawaiian programs and other educational purposes.

Since 1993, for the first 15 years, annually during November the existing PYCC's entire first floor was flooded due to high surf. With the guidance and assistance of the University of Hawaii, the PYCC planted and has committed stewardship of the dunes to help mitigate this annual problem. 100% success- flooding zero! Due to this success the PYCC became the lead organization in restoring all of the dunes on Pa`ia Bay. We will continue to provide leadership in restoring and maintaining all of the dunes from Pa`ia Bay to Baldwin Beach Park.

On January 25th, 2022, we were granted a 50-year lease with Maui County that extends the property to include the area to build a new facility. This new lease requires a mitigation plan by July 25, 2022 that we are currently in the process of writing.

Cost share contribution: Yes. Through volunteer hours, in-kind materials donations, capital campaign donations and grants from private foundations. We are confident to receive all the above.

Additional funding allocated: None of the additional funding is confirmed. We have applied for a State of Hawaii GIA for $850,000. We also intend to launch a capital campaign.

PLANNING AND DESIGN OF A DUNE RESTORATION PROJECT TO MITIGATE FUTURE IMPACTS OF COASTAL HAZARDS AND PROTECT CRITICAL INFRASTRUCTURE AT KANAHĀ BEACH PARK

Agency name: Department of Parks and Recreation

Jurisdiction: Maui County

Project location: Kanahā Beach Park, North Shore of the Island of Maui

Activity: Hazard Mitigation Plan Development/Adoption

Hazards mitigated: Coastal storm; Fishing losses; Flood; Hurricane; Severe storms

SHMP or LHMP connection to state or local plan:

The project supports many of the goals and priority hazard mitigation actions incorporated in the 2018 Hawaii State and 2020 Maui County HMP updates especially those that relate to conserving natural, historical, and cultural resources and developing nature-based solutions, in particular, dune restoration. In addition, the project would promote plan integration as multiple county departments and state agencies would need to be consulted and plans considered.

2018 Hawai‘i State HMP - Relevant Priority Hazard Mitigation Actions

2018-023: Integrated Hazard Mitigation of State Coastal Highways and Beaches from Chronic Coastal Flooding

2018-048: Infrastructure Managed Retreat and/or Nature Based Solutions Engineering Pilot Project to Protect Threatened Hawai‘i Infrastructure

2018-026: Assess, identify, and implement state nursery improvements needed to provide native plants for green breaks

2020 Maui HMP - Relevant High and Medium Priority Hazard Mitigation Actions:

2020-14: Expand Beach and Dune Restoration Projects

1. *Identify and prioritize erosion hotspots for mitigation via beach nourishment where applicable.*

2. *Pursue Federal/State/County funding for beach nourishment and restoration (including pre-positioning for post disaster financial assistance).*
3. *Work with State regulatory agencies to streamline permitting for beach restoration.*
4. *Promote living shoreline projects instead of shoreline hardening where feasible.*
5. *Protect/restore coral reefs as they provide a barrier for erosion, high surf/coastal flooding and tsunamis.*

2020-15: Update dune restoration guidance. Provide dune restoration training. Develop an outreach initiative to encourage or establish new dune restoration volunteers/stewards. Install ADA compliant dune walkovers in identified locations.

2020-17: Conduct a multivariate GIS analysis to identify and categorize open spaces for the County of Maui to purchase and preserve based on highest ROI for hydrological capacity and positive impact on flood mitigation.

2020-08: Integrate the hazard mitigation plan into other plans, ordinances and programs that dictate land use decisions in the community, including capital improvement programs, the general plan, recovery plans and strategic plans.

2020-21: Develop a strategy to mitigate risk to coastal roads.

2020-08: Plan Integration. Integrate the hazard mitigation plan into other plans, ordinances and programs that dictate land use decisions in the community, including capital improvement programs, the general plan, recovery plans and strategic plans

2020-13: Support cross-departmental collaboration and planning in resilience and climate action efforts.

2020-41: Maintain NFIP Compliance. Continue to maintain good standing and compliance under the NFIP through implementation of floodplain management programs that, at a minimum, meet the NFIP requirements: enforce the flood damage prevention ordinance, participate in floodplain identification and mapping updates, provide public assistance/information on floodplain requirements and impacts

Flood zone: Special Flood Hazard Area

Environmental impact issues: No

Historical or cultural preservation issues: No

Issues Detailed: N/A

Estimated cost: $225,000

Support needed from HI-EMA Hazard Mitigation Team: 3
(1 = minimal, 2= minimal, 3 = a lot)

Work started: Yes

Project description: In 2020, the County of Maui Department of Parks and Recreation (DPR) initiated a project to assess the vulnerability of its beach parks to a variety of coastal threats and to prepare adaptation strategies. The study was funded by the county council and was conducted with planning and technical assistance by Tetra Tech, Inc. A detailed vulnerability and adaptation study has been conducted for 65 beach parks throughout Maui County.

A Master Plan was prepared for Kanahā Beach Park in 2018 identifying dune restoration as a primary coastal flooding and erosion mitigation strategy. An Environmental Assessment is being conducted for the Master Plan.

In 2021, the Hawai‘i Sea Grant Program and DPR completed a detailed engineering plans and specifications, an implementation plan, and permit applications for a dune restoration project at Baldwin Beach Park (Kapukaulua). These documents can be provided upon request. The successful completion of the scope of work for this project at Baldwin Beach Park serves as the model for this project at Kanahā Beach Park. All deliverables for this project were completed within one year. An overview of the project and stakeholder engagement process that will be replicated for this project can be found here: https://experience.arcgis.com/experience/7417e375f63a4eae9391cb257dbfe245.

Planning and design of a dune restoration project to mitigate future impacts of coastal hazards and protect critical infrastructure at Kanahā Beach Park, Island of Maui. The project will produce a dune restoration plan, detailed engineering plans and specifications, an implementation plan, and draft permit applications for Kanahā Beach Park. The project will adopt the scope of work used for the successful completion of dune restoration planning and design for Baldwin Beach Park.

An outreach plan for the project will be developed to guide community outreach, stakeholder meetings, and for publication on the project's website or social media platform. Outreach materials and tools will include a web-based story map, interactive mapping tool, and surveys. An advisory group will be formed to support dune restoration planning and design. The dune restoration plan will be developed by zone as defined in the Master Plan. A LiDAR survey of the project site will be conducted to support the development of engineering plans and specifications. Conceptual site plans will be developed to support community outreach. Detailed engineering plans and specifications and a landscaping plan will be developed incorporating community input. An Implementation Plan will be prepared to describe the design plans and proposed construction activities, logistics, and costs. A monitoring framework will be developed as part of the implementation plan with monitoring strategies, metrics, and targets to assess the long-term impacts on hazard mitigation after construction. Draft permit applications will be prepared including: County of Maui SMA and SSA, County of Maui Grading & Grubbing. County of Maui Flood Development Permit (requires licensed engineer stamp/signature), DLNR OCCL Site Plan Approval (SPA), Small Scale Beach Restoration (SSBR) permit, or Conservation District Use Permit (CDUP)

DPR has historically worked closely with the Hawai'i Sea Grant College Program on county-wide large scale nature-based planning efforts and the preparation of grant applications to federal and state agencies for work at specific sites. This partnership will be continued in this project.

Kanahā Beach Park is surrounded by a county road, state airport, wastewater pump station, and wildlife sanctuary. The results of a sea level rise vulnerability assessment for Kanahā Beach Park shows that coastal flooding will jeopardize these facilities within the next 50 years or sooner with a large storm event. The project directly supports multiple State and County HMP strategies and actions including plan integration with the County Department of Department of Public Works (DPW), County Department of Environmental Management (DEM), State Department of Transportation (DOT) and State Department of Land and Natural Resources (DLNR). The DEM recently completed a vulnerability and adaptation study for Maui County wastewater facilities with adaptation options and recommendations for the Kahului Wastewater Transfer Station. This project may also support NFIP requirements under CRS activity 420, Open Space.

Kanahā Beach Park provides vital recreational and subsistence fishing services to residents. During the pandemic, beach parks supported the physical and mental health and well-being of the residents of Hawaii providing outdoor open spaces. The availability of marine sands and dunes at Kanahā Beach Park have great potential to support living shorelines through nature-based solutions such as dune restoration.

Should additional funding be available, this planning project could be expanded to include another priority beach park for dune restoration.

Cost share contribution: Yes. In-kind services and cash have been identified.

Additional funding allocated: No.

POAMOHO CAMP WAHIAWA PRESERVATION

Agency name: ASSOCIATION OF UNIT OWNERS OF POAMOHO CAMP

Jurisdiction: City & County of Honolulu

Project location: 69-601 Kikowaena St, Wahiawa, HI 96786

Activity: Hazard Mitigation Plan Development/Adoption

Hazards mitigated: Crop losses; Drought; Fire; Flood; Chemical; Biological

SHMP or LHMP connection to state or local plan:

1. *Clean Energy*
2. *Agriculture and Food Security*
3. *Infrastructure*

   These priorities pertain to sections 4.2, 4.8. and the entirety of section 6 of the Hazard Mitigation Plan.

Flood zone: Moderate Flood Hazard Zone

Environmental impact issues: Yes

Historical or cultural preservation issues: Yes

Issues Detailed: The environmental risks involve the dumping of tires, automobiles, and construction materials which are hazardous to the soil and groundwater. The 50+ acres of this fertile land is for agriculture, cattle, free range

chickens, and solar PV. All of which will ensure Hawaii's food security and help the State of Hawaii achieve the Clean Energy Initiative of 2030.

The camp was originally built in the early 1900s on the former Galbraith Lands. The original Del Monte pineapple plantation workers were able to take ownership of the 50+ acres of agricultural land. Poamoho Camp is comprised of all of the ethnic groups that came to Hawaii in search for a better life. Plantation workers of Poamoho Camp were the foundation of Hawaii's greatest export, pineapple. They want to preserve the agricultural significance and protect this precious land.

Estimated cost: $5,300,000

Support needed from HI-EMA Hazard Mitigation Team: 3
(1 = minimal, 2= minimal, 3 = a lot)

Work started: No

Project description: 1. Clean Energy - Our plan is to have 8-10 acres of photovoltaic panels, which will provide renewable energy to the farm and surrounding residents. We will also build a charging station for electric vehicles, as there are limited stations from Honolulu to the North Shore of Oahu.

2. Agriculture and Food Security - We have a master plan for an Eco-Village of Poamoho Camp. The village will produce crops, indigenous plants and herbs, free range livestock, and vertical farming. Poamoho Camp's soil is rich and fertile. There has been no farming on this fallow land for over 20 years. This village will be sustained by the solar farm and water lines owned by Poamoho Camp.

3. Infrastructure - The water lines are owned by Poamoho Camp and will need distribution lines installed. There is a green system for sewage/septic which will be integrated as part of the Eco-Village. The Eco-village will need paved roads in order to access the crops and operate the farm.

Cost share contribution: Our cost share contribution will come from minimal cash and primarily in-kind services from contractors, Poamoho Camp residents and the surrounding communities.

Additional funding allocated: No

REFUGE AREA ASSESSMENT AND HOME RETROFIT EDUCATION

Agency name: Department of Emergency Management, City and County of Honolulu

Jurisdiction: City and County of Honolulu

Project location: City and County of Honolulu

Activity: Hazard Mitigation Plan Development/Adoption

Hazards mitigated: Hurricane

SHMP or LHMP connection to state or local plan: State and County Hazard Mitigation Plans -Develop hurricane shelter capacity estimates and identify alternative hurricane evacuation/sheltering policies prioritizing the most vulnerable population areas. — Continue to retrofit public shelter buildings to increase capacity to decrease the sheltering deficit. Achieve EHPA rated hurricane shelters or alternative types of refuge buildings

Flood zone: Special Flood Hazard Area

Environmental impact issues: No

Historical or cultural preservation issues: No

Issues Detailed: N/A

Estimated cost: $800,000

Support needed from HI-EMA Hazard Mitigation Team: 1
(1 = minimal, 2= minimal, 3 = a lot)

Work started: Yes

Project description: Initial development of the BARA processes and modeling has been completed. This project will seek to refine the Best Available Refuge Area (BARA) assessment tool developed by the City and County to evaluate facilities for use as hurricane refuge areas. Currently the tool provides a score of the building which can be used by emergency managers as an indicator of its overall risk of use during a hurricane, but the assessment outcome does not include the identification of mitigation actions that would result in a higher score (meaning lower risk). This project will include work to building in that component so that these assessments can lead to meaningful mitigation projects. It will include the work to refine the current tool as well as 100 additional assessments and re-evaluation of previously assessed buildings to identify mitigation opportunities. Currently the BARA assessment tool cannot be used for home

evaluation and the public continually is challenged with understanding whether to stay home or go to a refuge area. Many fail to understand the difference home retrofits would make. Existing messaging and public communications material is often geared toward mainland homes. As part of this project, a localized simulation video will be developed, based on one produced by the Weather Channel, that shows the impact of different hurricane categories on a home. https://www.youtube.com/watch?v=lqfExHpvLRY Our proposal is to make a similar video but using a home with typical features of local construction, including a single wall versus double wall construction home, to show the impact of different levels of storm. In addition, the simulation would include how simple home retrofit measures would make a difference. The goals would be to help people understand the safety of their home versus a hurricane refuge area, and to develop a tool that will help establish a foundation for developing a home 'best available refuge area' tool and encourage home retrofits.

Cost share contribution: Cash cost share

Additional funding allocated: No

UV DISINFECTION INSTALLATION AT THE MA'ALAEA WASTEWATER RECLAMATION FACILITY

Agency name: Maui County Emergency Management Agency

Jurisdiction: Maui County

Project location: Ma'alaea Village, Maui County

Activity: Elevation

Hazards mitigated: Biological; Chemical; Coastal storm; Flood; Fishing losses; Hurricane; Severe storms

SHMP or LHMP connection to state or local plan:
Maui County Multi-Hazard Mitigation Plan, August 2020 – #19, #25, #26, #36

Flood zone: Special Flood Hazard Area

Environmental impact issues: Yes

Historical or cultural preservation issues: No

Issues Detailed: The concerns are that if the project is not approved, it will only intensify severe degradation of reef cover at an alarming rate, sea level rise is a contributor to environmental impacts, ground water inundation below the surface is harder to see and where the pathogens, and nutrients are being pumped into the injection wells. Fish, Shells, and Limu are dying more than what can be retained. The concern is that there are 11 injection wells in Ma'alaea that are not treated with UV disinfection, this project is to mitigate the risk of infected wastewater flowing into nearshore recreation areas during a global pandemic.

Estimated cost: $9,000,000.00

Support needed from HI-EMA Hazard Mitigation Team: 1
(1 = minimal, 2= minimal, 3 = a lot)

Work started: No

Project description: "There are 14 State issued Underground Injection Control Program permits for wastewater injection well systems in Maui. Three are issued to the County of Maui at Kahului, Kihei and Lahaina municipal wastewater facilities, where higher quality secondary treatment is provided. The other 11 injection wells are all in Ma'alaea, with each being 40'– 60' in depth. The individual wastewater systems servicing Ma'alaea's ten condominium properties were built in the 1970's, use 1970's technology, produce only primary wastewater

with no disinfection treatment, and pump pathogens and nutrients into injection wells located directly adjacent to the shoreline. The outdated systems, along with agricultural runoff and sedimentation from the Pohakea watershed, have contributed to the severe degradation of reef cover in nearshore ecosystems. Of grave concern is the introduction of infected wastewater into groundwater and the ocean from nearshore injection wells that are close to popular human recreation areas. The U.S. National Institutes of Health has identified over 30 harmful pathogens such as bacteria, viruses and protozoa that may infect humans via exposure to infected wastewater.

The proposed solution is to replace the ailing injection wells with an advanced wastewater treatment system located away from the shoreline and outside the tsunami zone, combined with natural and regenerative irrigation disposal methods

The clear direct and immediate public benefit of this project will be improving the nearshore water quality in Ma’alaea Bay, a 303(d) impaired body of water classified by EPA. This will help to restore for the benefit of Maui residents and visitors the native coral reef ecosystem that has been decimated along with the native limu that has all but disappeared. Infected primary wastewater will no longer flow directly into nearshore ecosystems and recreation areas because a new regional system will not discharge into groundwater. The high-quality reuse water will irrigate a native agroforest greenbelt. This project will help restore the watershed, thus reducing the excessive sedimentation and nutrient loading into Ma’alaea Bay. The 2019 Ma'alaea Community Wastewater Feasibility Study and a detailed scope of work are available upon request.

Cost share contribution: Yes

Additional funding allocated: No

WAIKOLOA RESERVOIR NO. 1 EARTHQUAKE DAMAGE REPAIRS

Agency name: Department of Water Supply

Jurisdiction: County of Hawaii

Project location : Kamuela, South Kohala, Hawaii

Activity: Post-Disaster Retrofits (structural, utilities)

Hazards mitigated: Dam/Levee break; Earthquake; Drought

SHMP or LHMP connection to state or local plan:
2020 Hawaii County Multi-Hazard Mitigation Plan
- *Mitigation Action HC7*

Flood zone: Minimal Flood Hazard Zone

Environmental impact issues: No

Historical or cultural preservation issues: Yes

Issues Detailed: Not sure of any however, any excavation of previously undisturbed ground will need to be monitored by an archaeologist per an approved plan by the State Historic Preservation Division.

Estimated cost: $10,600,000

Support needed from HI-EMA Hazard Mitigation Team: 3
(1 = minimal, 2= minimal, 3 = a lot)

Work started: Yes

Project description: Engineering Planning and Design is complete including environmental reviews. The project requires the improvements to address the stability of the embankments as well as the waterproofing of the reservoir itself. The embankments are being improved by widening the base of the embankment and increasing the overall strength supporting the reservoir walls. An underdrain at the toe of the embankment is also being installed to direct groundwater away from the embankment to minimize the chances of liquefaction. Also, waterproofing the reservoir will be accomplished by installing a synthetic liner, which eliminates the possibility of leaks through the numerous cracks in the concrete panels lining the interior of the reservoir.

Cost share contribution: Yes

Additional funding allocated: No.

WIKI HALE GROUP SITE DESIGN AND COMMUNITY FEEDBACK AT PALAMA SETTLEMENT

Agency name: HI-EMA

Jurisdiction: State of Hawaii

Project location: Kalihi/Palama, Oahu, Hawaii

Activity: Post-Disaster Retrofits (structural, utilities)

Hazards mitigated: Tsunami; Windstorms; Volcano; Severe storms; Hurricane; Earthquake

SHMP or LHMP connection to state or local plan: 1

Flood zone: Minimal Flood Hazard Zone

Environmental impact issues: No

Historical or cultural preservation issues: No

Issues Detailed: N/A

Estimated cost: $50,000

Support needed from HI-EMA Hazard Mitigation Team: 1
(1 = minimal, 2= minimal, 3 = a lot)

Work started: Yes

Project description: Phase 1 is complete: Initial prototype development. The Wiki Hale is a THU (temporary housing unit) design solution that has been created via a partnership between the Hawaii Emergency Management Agency (HI-EMA) and the University of Hawaii school of Architecture to resolve a key aspect of the post-disaster housing plan. Due to the significant risk to public health and safety the need for housing solutions following a catastrophic hurricane or tsunami event that significantly damages housing stock is needed. This project is a component of the State of Hawaii post-disaster plan creation aimed to have a cost-effective design option to house disaster survivors once congregate housing spaces transition out of emergency sheltering. Phase 1 of this project was the creation of a THU prototype (Wiki Hale), with Phase 2 involving design evaluation of the units to allow for modular attachment of multiple units in order to accommodate larger family units, weather testing, community feedback, and creation of a construction, material list, and packaging

plan. One of the key features of this THU is how cost-effective the base model is, coming in at $1,000 per unit with additional features such as water filtration, solar panels, and water catchment systems potentially available for additional cost.

Financial support for Phase 2 is needed to build 10-15 Wiki Hale units, including design modifications for family units and engagement with the community in meaningful feedback and education sessions around post-disaster housing and emergency preparedness. Project costs include the purchase of materials, delivery, and transportation as well as paint, joining and attachment modifications, creation of a foundation system, and design of the modular joining system. Additionally, one unit will be created as a "self-contained" prototype, meaning it would be fully self-sufficient with power, water, toilet, and cooking systems included. Weather testing feedback will likely result in modifications to strengthen roofs, walls, and to create additional ventilation and storage features.

Specifically, for Phase 2, the UH and HI-EMA design team is partnering with Palama Settlement in Kalihi, Oahu to install a "village" of the Wiki Hale units in order to replicate potential group or field site scenarios that would be set up post-disaster. There is a large field adjacent to the gymnasium that will be the THU site, with easy access to the community of youth, adults and kupuna that access services and activities at the location. The diverse local community has more than 15% Native Hawaiian or Pacific Islander, an average house size of 5.3 people, and 15.8% of the population living below the poverty line. During the village installation members of the community will have access to the site to give feedback and offer design solutions, while also receiving education on emergency response, hurricane and tsunami risks and vulnerabilities, and ways to create a family emergency plan for disasters.

Cost share contribution: There is currently no option for a cost-share UH School of Architecture has contributed all initial costs ($3,000 +), Palama Settlement is a non-profit and is offering in-kind support of site use

Additional funding allocated: N/A

RANKING SHEETS

Forum Member

GRANT RANKING SCORECARD

EMERGENCY POWER TRANSFER SWITCHING CAPABILITY FOR CRITICAL WATER INFRASTRUCTURE ISLANDWIDE

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

HAWAI'I COUNTY FIRE STATIONS: STRUCTURAL HARDENING & POWER REDUNDANCY

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

HISAOKA GYM HIGH WIND RETROFIT PROJECT

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

IMPROVEMENT OF ADVENTIST HEALTH CASTLE'S ELECTRICAL SYSTEM RESILIENCY AND HARDENING OF BUILDING ENVELOPE TO BENEFIT KAILUA AND OTHER WINDWARD OAHU COMMUNITIES

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

MODELING AND ASSESSMENT OF RETURN PERIODS OF HURRICANE INTENSITIES IN THE VICINITY OF HAWAII UNDER CLIMATE CHANGE

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

PALI MOMI MEDICAL CENTER EMERGENCY GENERATOR SYSTEM IMPROVEMENTS

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

LANA'I HIGH AND ELEMENTARY SCHOOL GYMNASIUM

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

REAL-TIME FLOOD FOREST SYSTEM FOR HAWAII TO IMPROVE READINESS, PUBLIC SAFETY AND RISK MITIGATION

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

STATE OF HAWAII SHELTER RETROFIT PROJECT

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

WAILUKU WASTEWATER PUMP STATION MODIFICATIONS, TSUNAMI PROTECTION AND CLIMATE RESILIENCE PROJECT

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

ALOHA SAFE HOMES PROJECT

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

ALOHA SAFE HOMES EDUCATION AND OUTREACH

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

COASTAL AND SHORELINE RISK AND VULNERABILITY ASSESSMENT AND ADAPTATION

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

COCO PALMS RESORT ACQUISITION

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

CONTRACTUAL SUPPORT FOR KAUAI DEPARTMENT OF PUBLIC WORKS NFIP COMMUNITY RATING SYSTEM APPLICATION

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

DWS WATER CONSERVATION AND REUSE GRANTS PROGRAM

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

FOSTERING COMMUNITY RESILIENCE TO CLIMATE CHANGE THROUGH BEACH RESTORATION STUDIES IN KAPA`A AND POIPU, KAUA`I

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

GAT TSUNAMI EVACUATION ZONE

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

HAWAII POST DISASTER TRANSITIONAL HOUSING

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

IMPLEMENTATION OF A DUNE RESTORATION PLAN TO MITIGATE FUTURE IMPACTS OF COASTAL HAZARDS AND PROTECT PUBLIC SAFETY AND CRITICAL INFRASTRUCTURE AT BALDWIN BEACH PARK, MAUI

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

KA‘EHU BAY STREAMS & SHORELINE MITIGATION PROJECT

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

KANEHILI COMMUNITY ASSOCIATION PARL PHASE 2

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

KAUNAKAKAI HARBOR PETROLEUM PIPELINE PROTECTION AND SECONDARY CONTAINMENT PROJECT

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

OPERATIONAL REDUNDANCY FOR COUNTY OF HAWAI'I FIRE DEPARTMENT

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

PA`IA YOUTH & CULTURAL CENTER

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

PLANNING AND DESIGN OF A DUNE RESTORATION PROJECT TO MITIGATE FUTURE IMPACTS OF COASTAL HAZARDS AND PROTECT CRITICAL INFRASTRUCTURE AT KANAHĀ BEACH PARK

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

POAMOHO CAMP WAHIAWA PRESERVATION

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

REFUGE AREA ASSESSMENT AND HOME RETROFIT EDUCATION

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

UV DISINFECTION INSTALLATION AT THE MA'ALAEA WASTEWATER RECLAMATION FACILITY

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

WAIKOLOA RESERVOIR NO. 1 EARTHQUAKE DAMAGE REPAIRS

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments

WIKI HALE GROUP SITE DESIGN AND COMMUNITY FEEDBACK AT PALAMA SETTLEMENT

Risk Reduction	Long Range Solution	Cost Effective	Technical Feasibility	Project Management
5	5	5	5	5

Comments