



PROTECT OUR WATER

- MĀLAMA I KĀ WAI -

HDOT Highways Division - Maui District

Lahaina Wildfire Stormwater Mitigation Response

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Engineering Department Manager



Agenda

- Background
- Scope and Challenges
- Approach and Goals
- Execution
- Outcomes



Small Municipal Separate Storm Sewer System – Central Maui

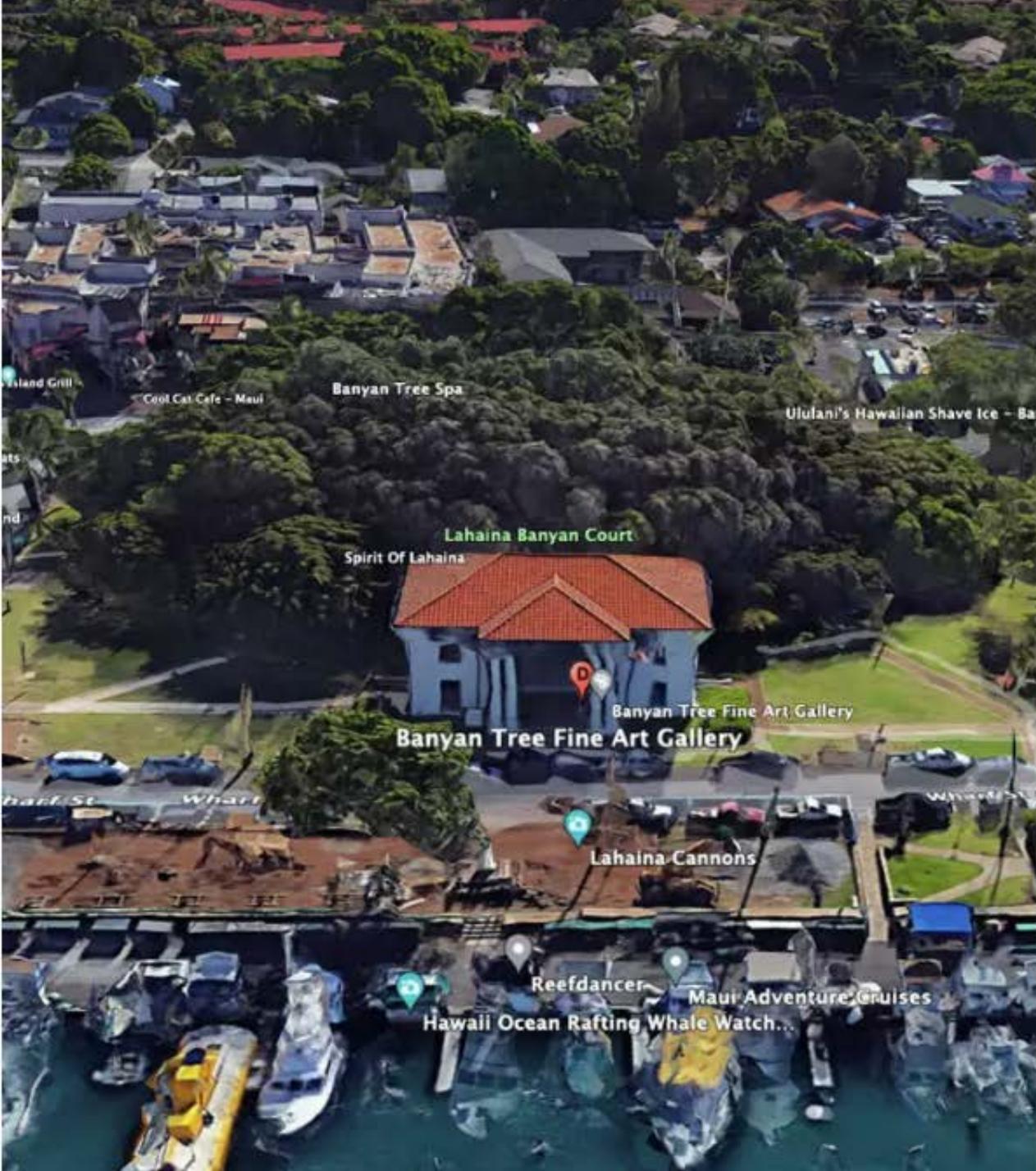
- State of Hawaii Department of Transportation, Highways Maui District
- Maui District manages a permitted MS4 program under the NPDES
- Urbanized Area of Maui
 - >50,000 people
 - Kahului
 - Wailuku to Waikapu
 - Waiehu to Paia



Stormwater Management Program – Central Maui

- SWMP describes the procedures, program activities, and best management practices implemented with respect to certain **control measures**
- SWMP is obligated to address the urbanized area of Central Maui, but is applied to the **entirety of the island of Maui**
 - Public Education and Outreach
 - Public Involvement
 - **Illicit Discharge Detection and Elimination**
 - Industrial and Commercial Facility Inspections
 - **Construction Site Runoff Control**
 - **Post-Construction Runoff Control**
 - **Pollution Prevention and Good Housekeeping**
 - Erosion Control









Lahaina Wildfire

- August 8, 2023
- Nearby hurricane-driven winds spread fire fast and wide
- More than 2,200 structures
- \$5.5 Billion in damages to infrastructure and housing
- Over 2,100 acres burned
- 102 lives lost
- Lahaina town was destroyed and littered with rubble, ash, and unknown hazardous materials along federal, state and county roadways.





Scope

Mitigate the impacts of runoff from the burn zone and protect the receiving waters from potentially hazardous materials and pollutants before the upcoming rainy season.





Challenges - Stormwater Flow

- Large watershed area
- Long shorefront discharge area
- Short flow path to discharge
- Short times of concentration

From approximately the Lahaina Civic Center on the north side of Lahaina to Front Street/Honoapiilani Highway intersection on the south side is approximately 4.2 miles. The business district (Front Street) including beachfront homes that were destroyed line most of the shoreline making interception and treatment of stormwater a challenge.





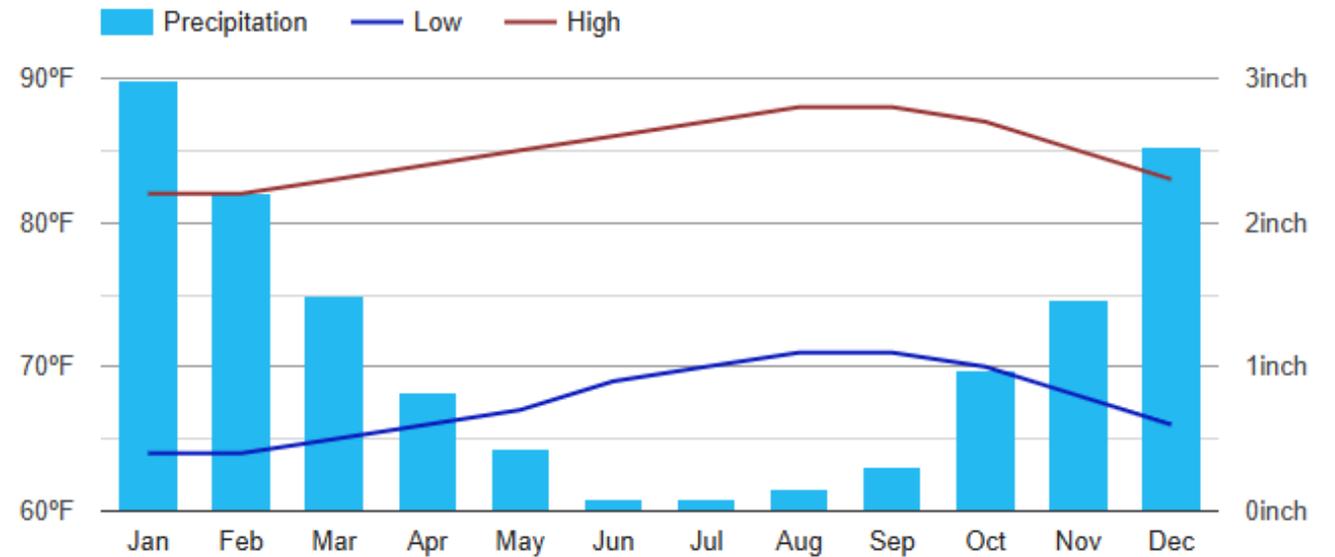
Lahaina Civic Center

Front St/Honoapiilani Hwy Intersection

Lahaina Wildfire Extents

Challenges – Race Against Time

- Fire: August 3, 2023
- Approaching rainy season



Source: U.S. Climate Data for Lahaina;
Average 1981-2010 normals



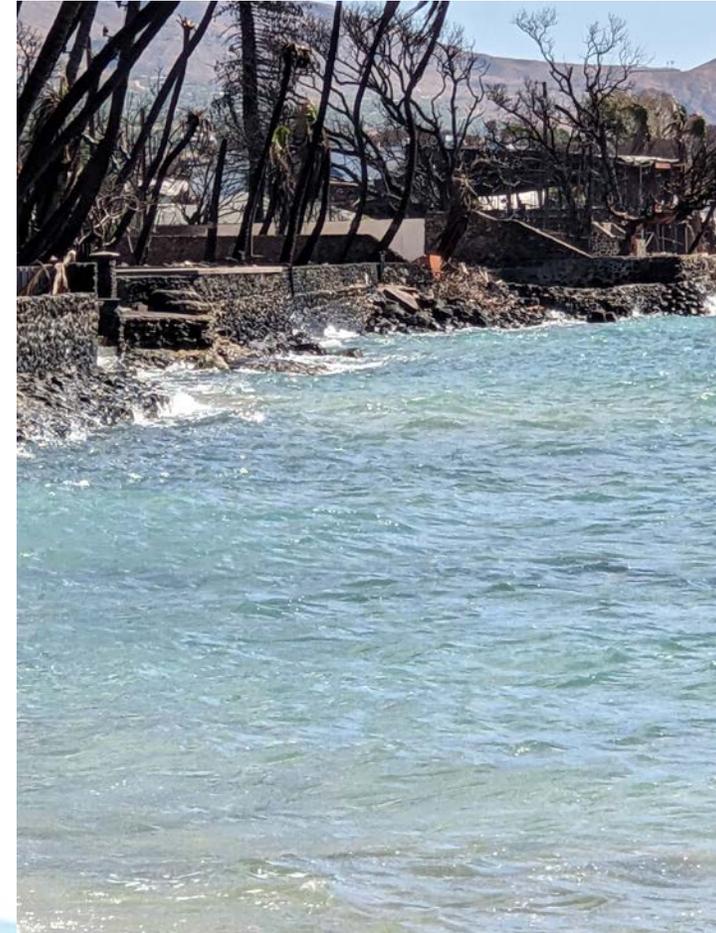
Challenges – Understanding the Drainage Systems

- Condition of stormwater infrastructure unknown
- Conflicting records of County of Maui drainage structures
- Safety in the field



Challenges – Contributing to the Problem

- Do not want to add chemicals that are harmful to people and the environment just to improve runoff
- Do not want to trample cultural sites
- Do not want to hinder the cleanup by blocking access



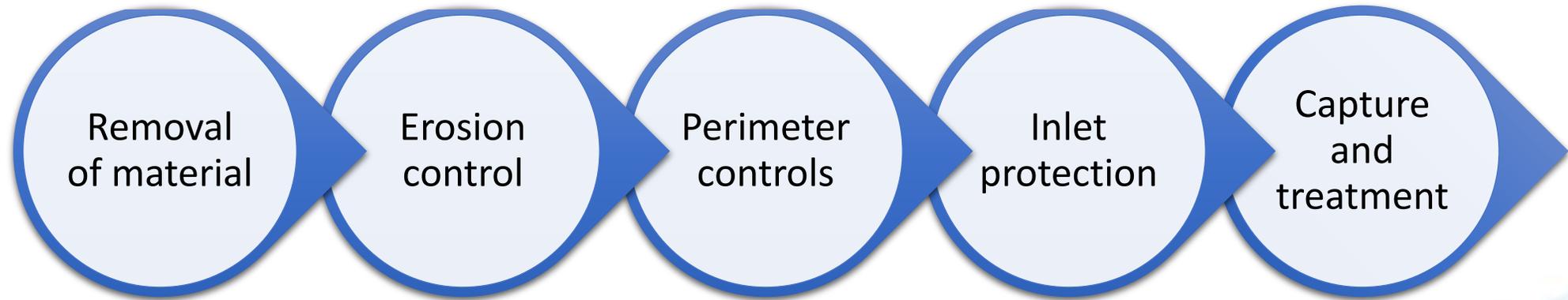
Challenges – Who's the Leader?

- In the early weeks post-fire, who was going to lead the stormwater mitigation effort?
- Federal: Federal Highways Administration; EPA; US Army Corps of Engineers
- State: DOT Highways Maui District; DOH Clean Water Branch
- County: Maui DPW



Emergency Stormwater Treatment Project - Lahaina

Stormwater treatment BMP train:



Best Management Practice – Debris Removal

- Drain cleaning with vacuum trucks
- Street sweeping



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Debris Removal – Outcomes



Lahaina Debris Removal Outcomes

- 150 storm drainage structures cleaned
- 144 pipes cleaned
- Approximately 12.5 miles of roadways were swept on multiple occurrences

Totaling approximately **100 tons of material** (including water) that Maui District removed from Lahaina within a four-month time frame.

Best Management Practice – Erosion Control

- **Permanent ground stabilization**

Flexterra erosion control material was deployed in open grubbed areas that were prone to erosion during storm events. Only nontoxic and biodegradable materials that have been previously used on Maui are being used for the ground stabilization medium.



Erosion Control – Post Rain Event



Photos taken on 1/9/2023

Erosion Control – Outcomes



Lahaina Erosion Control Outcomes

- Maui District stabilized approximately **8.8 acres of exposed areas** with Flexterra.



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Best Management Practice – Perimeter Controls

- **Reducing pollutant transport**

EnviroSoxx were installed along the edge of roadways. They act as a barrier to retain sediment on adjacent properties which minimizes sediment from entering storm drain structures. EnviroSoxx contains compost FilterMedia™ and natural sorbent materials to reduce pollutant transport in runoff.



Best Management Practice – Perimeter Controls

- **Considerations**

- Access
- Installation
- Advanced Treatment
- Availability
- Longevity
- Replacement

EnviroSoxx Industrial Blend Filter

Pollutant Group	Pollutant	Removal Rate	TechLink Reference
Heavy Metals	Aluminum (Al)	44%	#3343
Heavy Metals	Arsenic (Ar)	11%	#3343
Heavy Metals	Cadmium (Cd)	73%	#3325
Heavy Metals	Chromium (Cr)	47%	#3325
Heavy Metals	Copper (Cu)	70%	#3325
Heavy Metals	Iron (Fe)	44%	#3343
Heavy Metals	Lead (Pb)	73%	#3325
Heavy Metals	Nickel (Ni)	69%	#3325
Heavy Metals	Selenium (Se)	18%	#3343
Heavy Metals	Zinc (Zn)	53%	#3325
Hydrocarbons	Diesel	99%	#3325
Hydrocarbons	Motor Oil	99%	#3325
Hydrocarbons	Gasoline	54%	#3325
Nutrients	Ammonium Nitrogen (NH4-N)	54%	#3328
Nutrients	Total Nitrogen	20%	#3343
General	Total Solids	97%	#3333
General	TSS	80%	#3317
General	Turbidity	63%	#3308



Perimeter Controls – Post Rain Event



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Photos taken on 1/9/2023

Perimeter Controls – Post Rain Event (Cont.)



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Photos taken on 1/9/2023

Perimeter Control – Outcomes



Lahaina Perimeter Control Outcomes

- Maui District installed nearly 36,000 linear feet or 6.8 miles of EnviroSoxx along the edge of roadways and at storm drain inlets.



Best Management Practice – Inlet Protection

- **Protecting inlets with filter socks**

EnviroSoxx were used as part of a treatment train for perimeter control and inlet protection. The EnviroSoxx industrial filter blend targets a range of heavy metals, hydrocarbons, nutrients, and sediment.

- **Installing inlet and catch basin filters**

Once the material was removed from drainage structures, curb inlet filters and grate guards were installed on catch basins and grated drain inlets on State Highways and federally aided roads to catch debris carried by stormwater before it entered drainage structures.



Inlet Protection - Post Rain Event



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Photos taken on 1/9/2023

Inlet Protection - Post Rain Event (Cont.)



Photos taken on 1/9/2023

Best Management Practice – Capture and Treatment

- **Flow**

Filtered stormwater will accumulate in the storm drainage system.

- **Capture**

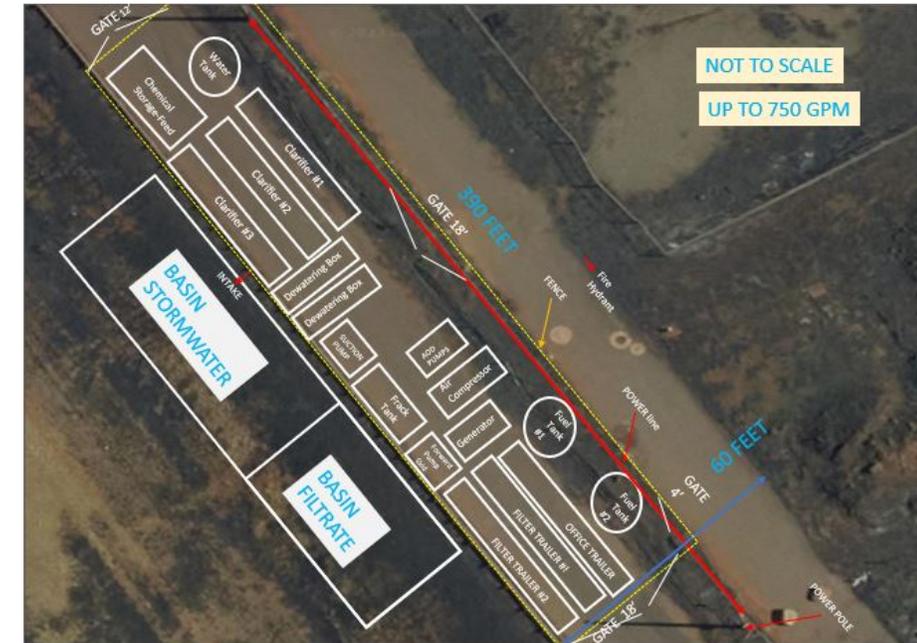
Stormwater collected in the drainage system will be diverted from discharging through outfalls.

- **Conveyance**

The diverted stormwater will be pumped through an installed piping network to a lined basin for further treatment.

- **Treatment**

The collected stormwater will be treated via a clarification process.



Water Quality Outcomes



State of Hawaii, Department of Health
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LAHAINA COASTAL WATER QUALITY REPORTS SHOW AREA SAFE FOR OCEAN RECREATION

Posted on Apr 11, 2024 in [Newsroom](#)

HONOLULU – The Hawai'i Department of Health (DOH) reviewed test results from multiple monitoring activities conducted by state agencies and community partners to confirm that the coastal waters around Lahaina are safe for ocean recreation.

DOH has reviewed the University of Hawai'i (UH) efforts that spanned five sampling events since October 2023, the Surfrider Foundation's (Surfrider) brown water sampling on January 10, 2024, together with screening sampling completed by the Department of Land and Natural Resources (DLNR) in November 2023, and has determined that Lahaina coastal waters pose no significant risk to human health. These multiple lines of evidence for coastal environmental quality are positive signs for recovery of the environment from the Maui wildfires.

The data analyzed will be part of DOH's Comprehensive Environmental Monitoring and Sampling Program, which brings together federal, state, and community partners to monitor and collaborate on environmental data related to wildfire recovery. The DOH and its partners will continue to monitor coastal environmental quality in Lahaina.

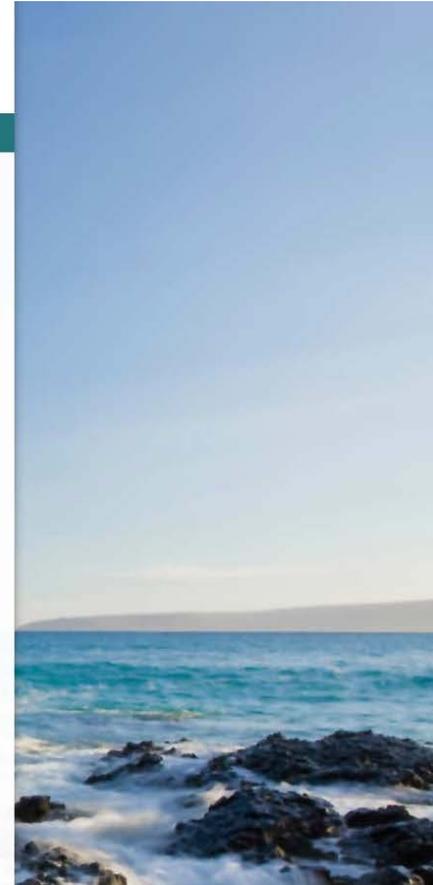
"These results provide the community with reassurance that the coastal waters around Lahaina are safe for ocean recreation with no significant human health impacts as a result of the wildfires," said Deputy Director for Environmental Health Kathleen Ho. "We continue to advise residents to heed brown water advisories, as bacteriological quality remains a concern at all times in brown water conditions. DOH appreciates the collaboration and partnership of our community partners and DLNR in monitoring environmental quality in Lahaina."

The UH study's monitoring efforts included nutrients, metals, carbonate chemistry, microbial communities, and coral stress metabolites.

"Our work has provided important data for understanding marine environment impacts," said UH principal investigator Dr. Andrea Kealoha. "The metal concentrations we have measured in seawater do not indicate human health concerns. We will continue to study any potential impact on coral reefs and share data with our community and partners."

In preparation for future planned dredging work in the Lahaina Small Boat Harbor, DLNR Division of Boating and Ocean Recreation collected screening samples of harbor sediments and analyzed them for metals, PAHs, dioxins, total petroleum hydrocarbons, and an extended list of other organic contaminants. The results of these tests also demonstrated no significant risk to human health.

"While collected for our dredging study, DOH's ability to use these data to contribute to human health assessment demonstrates the importance of multi-agency collaboration in response to the wildfires," said DLNR Deputy Director Ryan Kanaka'ole.



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Mahalo!

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