

# ISM Sediment Sampling Strategies and Techniques



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# ISM Sampling vs Discrete Sampling – What is it and Why Bother?

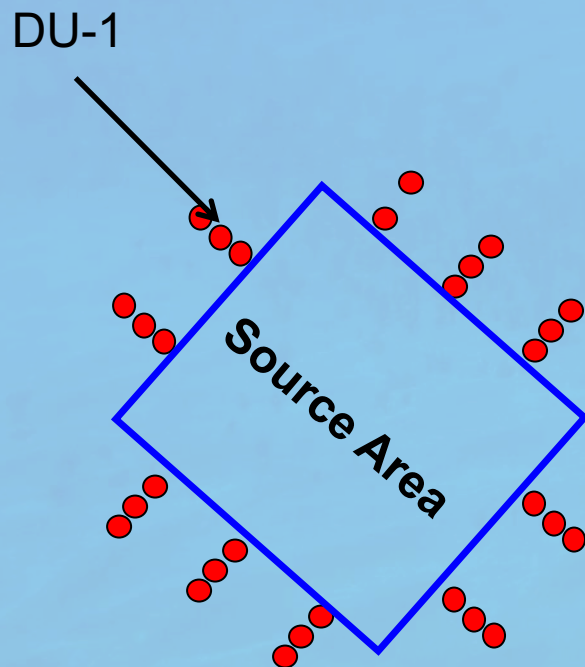
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- Incremental Sampling Methodology or “**ISM**” offers “**Systematic Planning**” and provides a clear framework for development of environmental investigation objectives.
- Decision Units or DUs are used to specify the desired resolution of the investigation with respect to source area.
  - Characterization
  - Risk Assessment
  - Remediation



# Traditional Site Investigation Approach

## ● Proposed Discrete Samples (30)

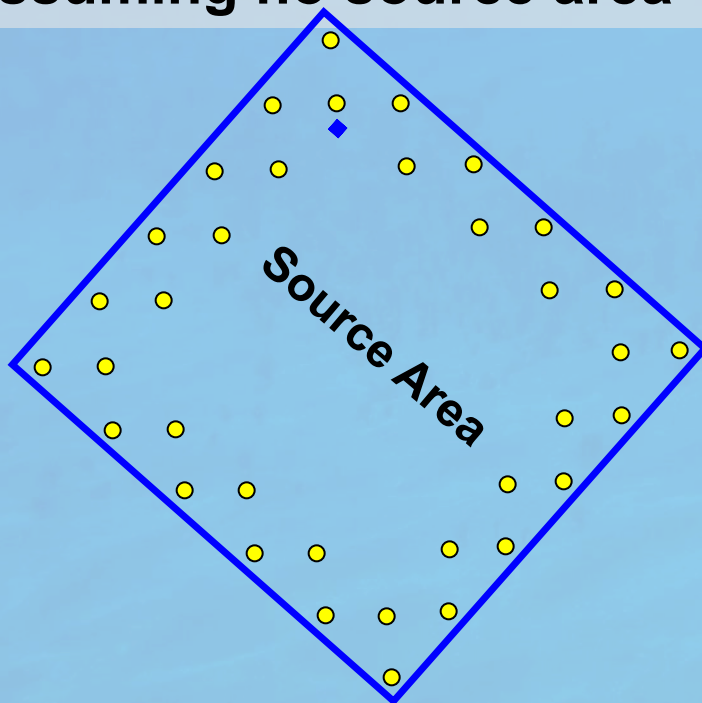


- Potential Concerns
  - Inadequate number of sample points to define outer boundaries
  - High risk of False Negatives and False Positives
  - Confusion over small or sample sized “hot spots”
  - Cost of 30 analyses
  - Sample points should be randomly located for estimation of exposure point concentration (EPC)



# ISM Approach (Option 1)

**Designate an exposure area DU  
assuming no source area**



• Increment location

- **Advantages**

- More representative
- Risk evaluation objective identified up front
- Increments randomly and evenly spaced to minimize size of hot spot missed
- Quick and cheap if minimal contamination suspected

- **Disadvantages**

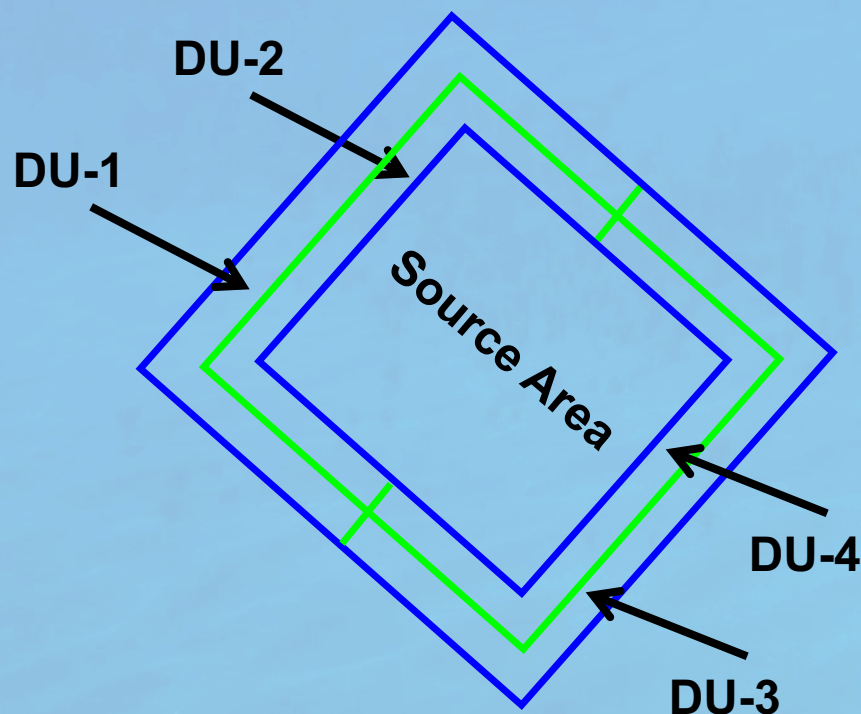
- Additional sampling required if DU fails





# ISM Approach (Option 2)

## Four Decision Units



## • Advantages

- Addresses both source area and perimeter as well as directional variability if an exceedance is found
- Best approach to minimize additional sampling
- Will minimize remediation volumes if DU exceeds screening level
- If increments are collected using cores, vertical delineation is easily done with stacked DUs



# Fundamental Error = Sampling Error + Laboratory Error

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- Incremental samples are used to estimate the mean concentration of contaminants within designated DUs.
- Stringent laboratory or field processing methods are used to ensure that the representativeness of the field sample is carried forward through analysis of the sample.
- The resulting combination of Systematic Planning, Decision Units and laboratory or field processing helps to ensure that the resulting data are defensible and repeatable.

## ISM References:

- 1) Interstate & Regulatory Council (ITRC). 2012. *Incremental Sampling Methodology*. ISM-1. Washington, D.C.: Interstate Technology & Regulatory Council, Incremental Sampling Methodology Team. [www.itrcweb.org](http://www.itrcweb.org).
- 2) State of Hawaii Department of Health, Office of Hazard Evaluation and Emergency Response. 2008 and Updates. *Technical Guidance Manual for Implementation of the Hawaii State Contingency Plan*, Interim-Final. [www.hawaiidoh.org/tgm](http://www.hawaiidoh.org/tgm)





# Activity Slide 1-Example of DU Establishment







# Activity Slide 2- Decision Unit Determination





# Activity Slide 2A- Decision Unit Determination







# Activity Slide 2B- Decision Unit Determination







# Activity Slide 2C – Examples of Possible DUs





# Activity Slide 3: Which DUs would you lay out?



A



B



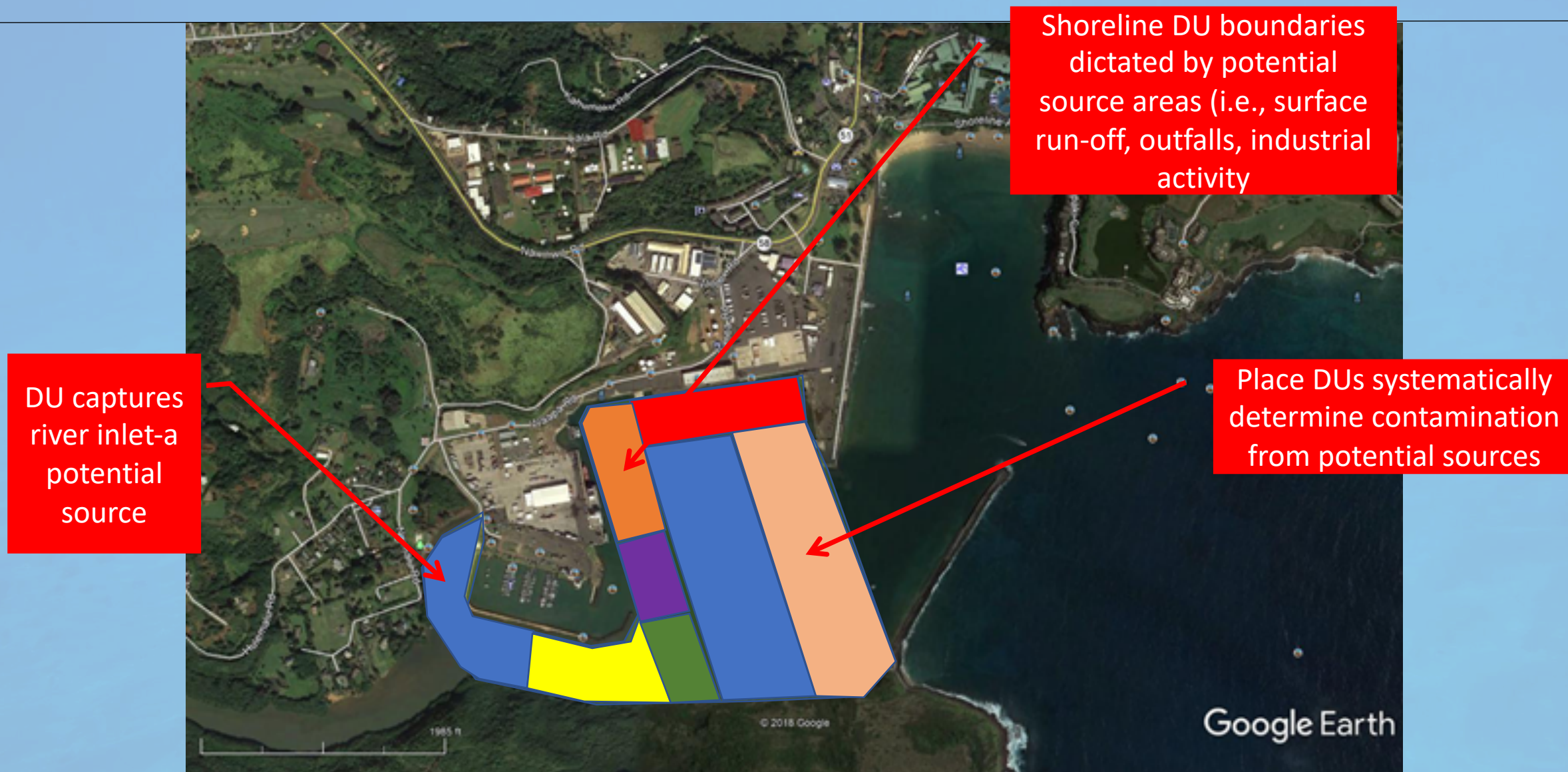
C

Why?





# Activity Slide 3 – Examples of Possible DUs





# Key Factors in Determining ISM Sediment Sample Collection Methods

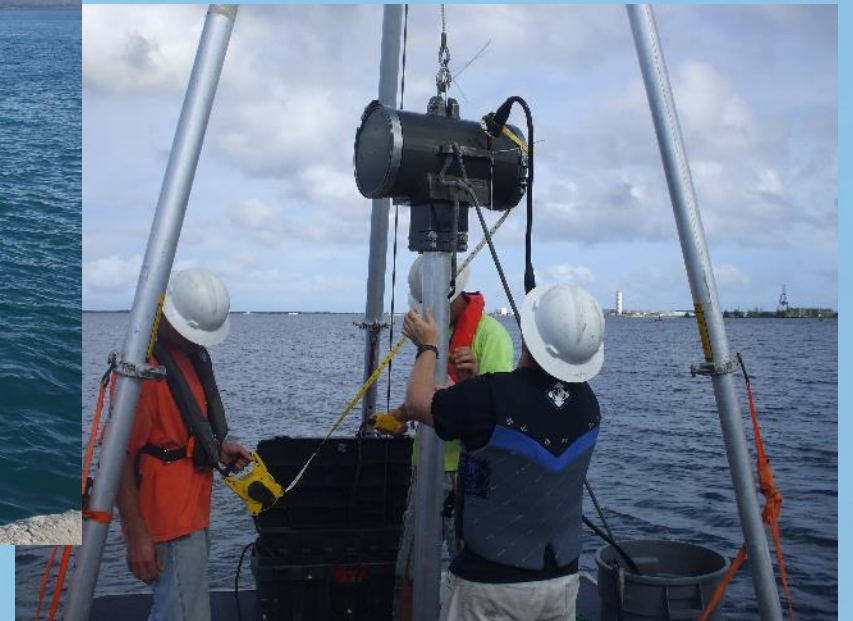
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- Sediment Type – Clay, sand, gravel
- Water Depth and Movement (tide, current, etc.)
- Sample Platform (boat, dock, etc.)
- Data Goals
- DU Establishment
  - Establish DUs to best attain goals of the project
    - If characterizing for dredge sediment management/disposal, tailor DUs to fit with planned dredge techniques if possible (e.g., vertical DUs may vary depending on the precision of the dredge technique.
    - If sampling for characterization/point source pollution determination, DU locations and size can be based on suspected contaminant source locations. Vertical DUs may be necessary.



# Sampling Equipment Adaptation

Downsize traditional bulky equipment in order to facilitate collection of multiple increments required for ISM sampling





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- A map of Oceania, showing the Pacific Ocean region. Major landmasses and islands are labeled, including Australia, New Zealand, Papua New Guinea, New Guinea, and various island groups like the Northern Mariana Islands, Guam, Palau, Micronesia, Marshall Islands, Nauru, Kiribati, Tuvalu, Tokelau, Samoa, American Samoa, Cook Islands, Niue, Tonga, Fiji, Vanuatu, New Caledonia, Solomon Islands, and French Polynesia. The map also shows several smaller islands and atolls, such as Wake Island, Johnston Island, Palmyra, Jarvis, Howland/Baker Island, and Pitcairn Island. The map is color-coded with different shades of blue for the ocean and yellow for the landmasses.





# Case Study: Kapalama Canal

3 DUs

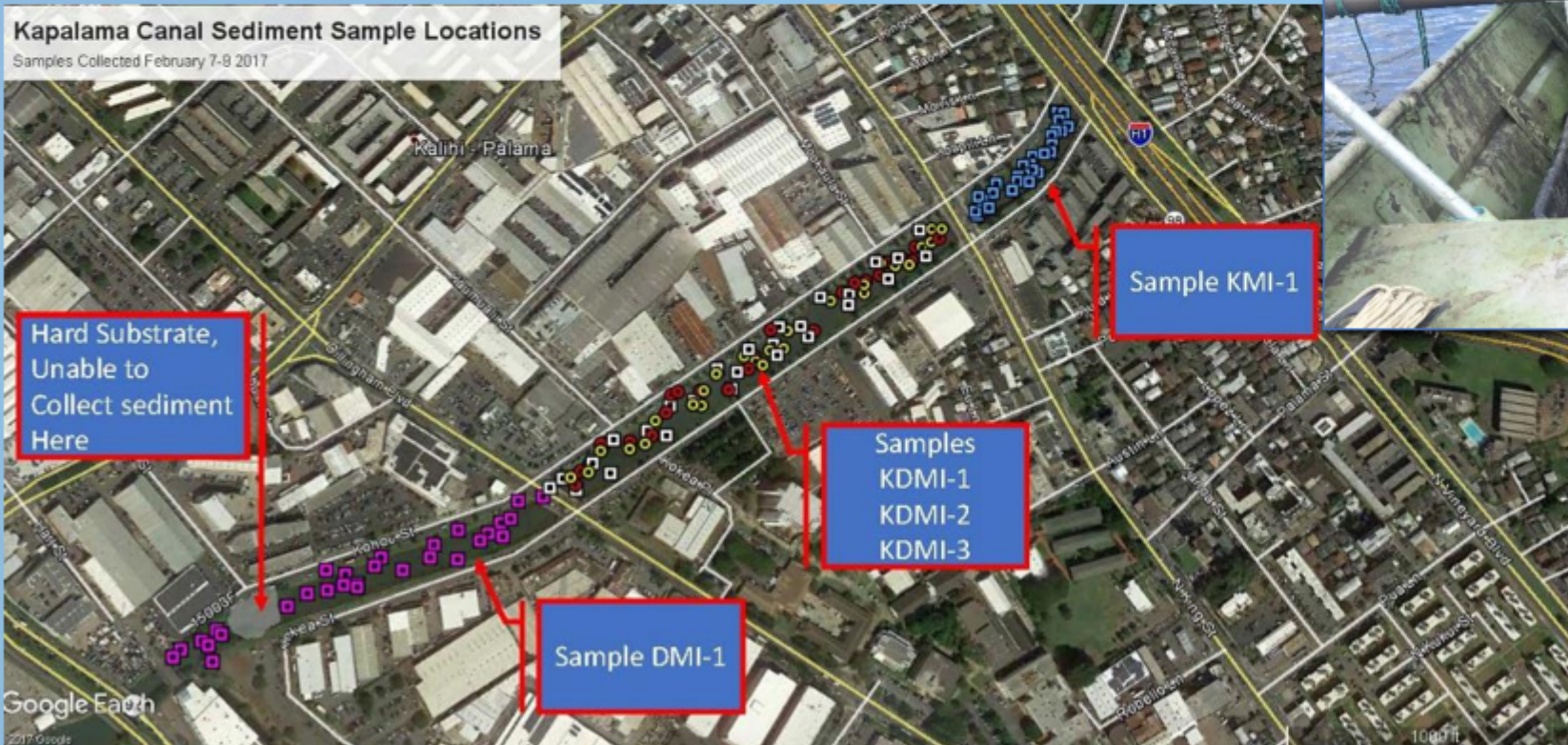
150 Increments (Cores 2.5-4.5 ft long)

2 Days

RSD <24%

## Kapalama Canal Sediment Sample Locations

Samples Collected February 7-9 2017

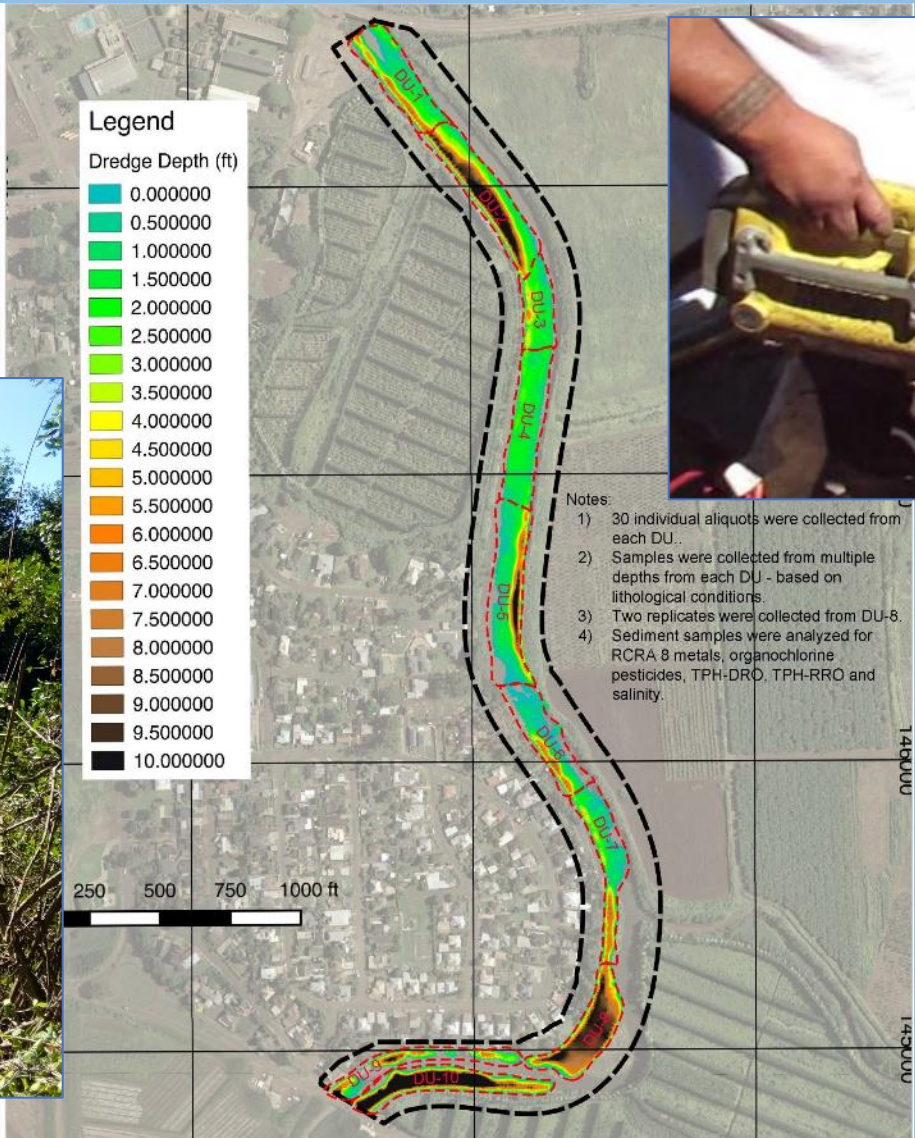






# Case Study: Kiikii Stream

10 DUs  
360 Increments (Cores 2.5-10 ft long)  
8 Days  
RSD <30%







# Case Study: Kahawainui Stream

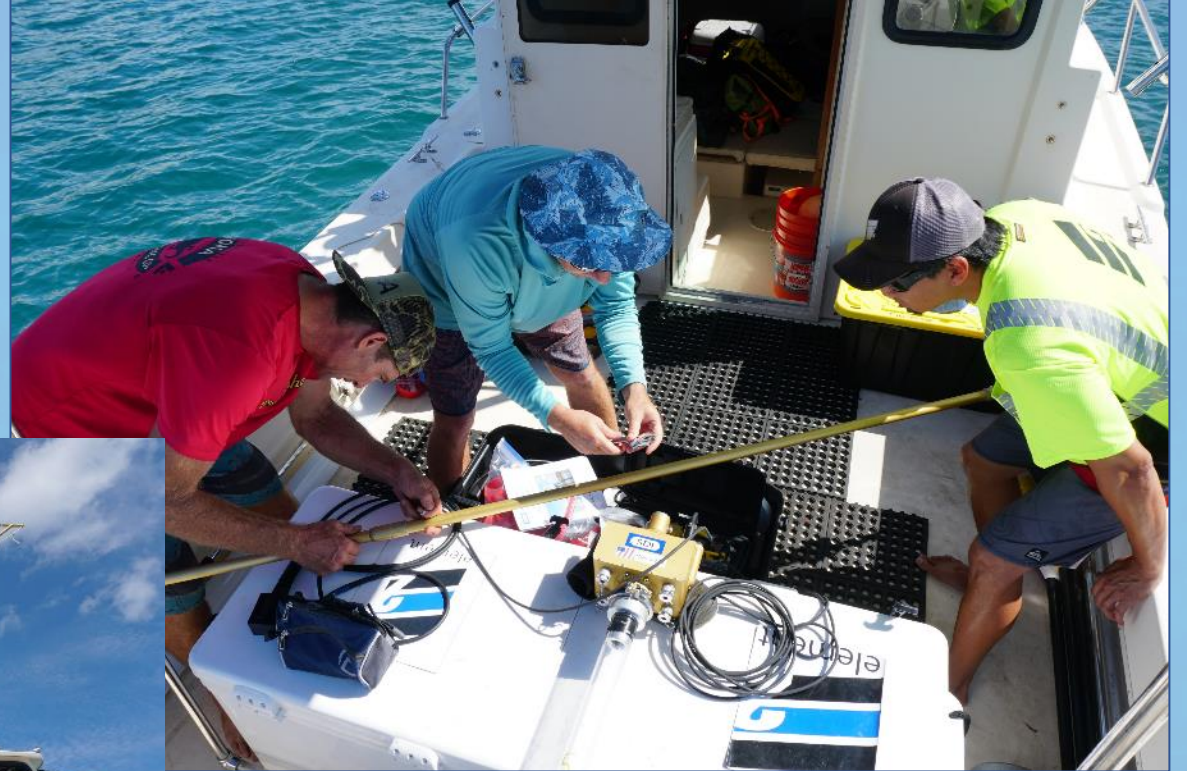
- 8 DUs
- 300 Increments (Cores 1-3 ft long)
- 4 Days
- RSD <23%





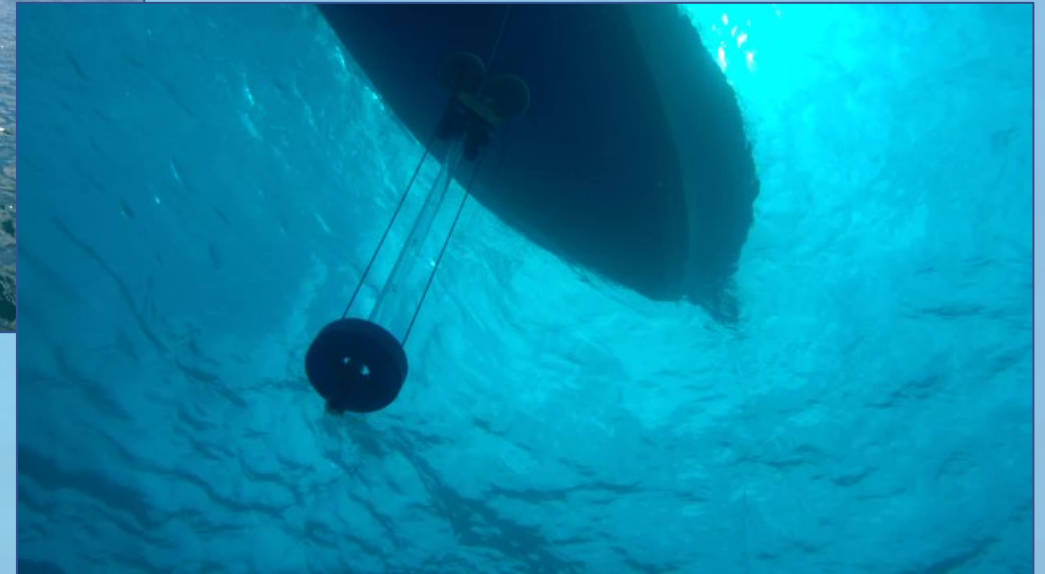


# Sampling Evolution-Mini Vibracore





# Mini Vibracore







# Take-Aways

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- ISM Sediment Sampling is Labor Intensive
- Requires flexibility/adaptability of collection methods
- Sample collection methods are evolving and getting better
- Overall, may cost more in sampling effort but will result in superior data, potentially leading to far greater savings during construction, dredging, disposal and/or decision making down the road.



# Questions/Discussion

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