

ANALYTICAL CHEMICAL TESTING LABORATORY, INC.

Consulting Chemists, Scientists, & Engineers

January 9, 2014

Report To: Hanalei River Heritage Foundation
Post Office Box 518
Hanalei, HI 96714

Report Of: Significant Findings Report- Review of Test America Report ID 320-4779-1
10 Sediment Samples- Near Kauai North Shore, Hanalei Bay, and Anini Bay, Hawaii
Sampled on Nov. 12 and 13, 2013

Job #: 14-3306

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Analytical Chemical Testing Laboratory, Inc's (ACT) Analytical Chemist, Mr. Robert M. Naman, has reviewed Test America's Report ID# 320-4779-1 presented to the Hanalei River Heritage Foundation on the results of analysis of 10 sediment samples from specific locations near Hanalei Bay and Anini Bay, Hawaii. All aspects of the reported data were reviewed including Organic Semi-Volatiles; Herbicides; Dioxins; Furans; Organo-chlorine Pesticides; Organo-Phosphorus Pesticides; and Heavy Metals. Also reviewed was a report by North Coast Laboratories, Ltd. of Arcata, CA, for Glyphosate in each of the sediment samples from Hanalei Bay, Hawaii. The information presented herein is the Significant Findings with respect to ACT's review of the supplied report. Our Significant Findings are as follows:

SAMPLE SEDIMENT LOCATIONS

- 1 Hanalei Bay 1
- 2 Hanalei Bay 2
- 3 Anini Bay 1
- 4 Anini Bay 2
- 5 Sealodge Reef 1
- 6 Sealodge Reef 2
- 7 Hanalei River 1
- 8 Hanalei River 2
- 9 Anini Creek 1
- 10 Anini Creek 2

SIGNIFICANT FINDINGS

Organic Semi-Volatile Compounds showed no detection of Method listed compounds in any of the 10 samples submitted. However, Tentatively Identified Organic Compounds were detected and estimated in each analysis. The findings are:

SAMPLE LOCATIONS TIC ORGANIC COMPOUNDS ESTIMATED TO BE PRESENT

1 Hanalei Bay 1	Benzaldehyde 270 ug/Kg; Bicyclo undec-4-ene 470 ug/Kg; 1H-Cycloprop-azulene 430 ug/kg; Approximately 12,000 ug/Kg of Unknown Alkanes, Organic Acids, And Unknown Organic Compounds
2 Hanalei Bay 2	Benzaldehyde 220 ug/Kg; Bicyclo undec-4-ene 430 ug/Kg; Approximately 5,000 ug/Kg of Unknown Alkanes, Organic Acids, And Unknown Organic Compounds
3 Anini Bay 1	Approximately 2,200 ug/Kg of Unknown Organic Acids, And Unknown Organic Compounds
4 Anini Bay 2	Approximately 1,300 ug/Kg of Unknown Organic Acids, And Unknown Organic Compounds
5 Sealodge Reef 1	Approximately 22,000 ug/Kg of Unknown Organic Compounds
6 Sealodge Reef 2	Approximately 10,500 ug/Kg of Unknown Organic Compounds
7 Hanalei River 1	Approximately 8,000 ug/Kg of Unknown Organic Compounds
8 Hanalei River 2	Bicyclo undec-4-ene 360 ug/Kg; Approximately 7,500 ug/Kg of Unknown Alkanes And Unknown Organic Compounds
9 Anini Creek 1	Approximately 1,000 ug/Kg of Unknown Organic Compounds
10 Anini Creek 2	Approximately 1,300 ug/Kg of Unknown Organic Compounds

SIGNIFICANT FINDINGS

<u>TEST GROUP</u>	<u>RESULTS OF TESTING</u>
Herbicides	Not Detected in significant levels in any of the 10 samples
Dioxins & Furans	Not Detected in any of the 10 samples
Organo-Chlorine Pesticides	Trace Levels reported present in all 10 samples but present in insignificant amounts and not verified
Organo-Phosphorus Pesticides	Not Detected in any of the 10 samples
Glyphosate	Not Detected in any of the 10 samples

ORGANIC COMPONENTS SIGNIFICANT FINDINGS SUMMARY

In summary, there exists a substantial amount of unknown organic compounds that are present in these sediments as Tentatively Identified Compounds (TIC). The significance of these organic compounds has not been established, but some are cyclic and others are straight chain Alkanes and unknown Organic Acids. No research exists for these unknown compounds and therefore causes much speculation considering that most of the sediments contain between 5,000 and 22,000 ug/Kg of these TIC components. At these levels a great concern exists for the marine life subjected to these compounds and any persons consuming these compounds may be affected in ways that are yet to be understood. Human health and the environment must coexist in a symbiotic harmony that does not allow for the potential impact presented here and the unknown affects that the presence of these compounds could have on human health and proper organ function.

HEAVY METALS

SAMPLE SEDIMENT LOCATIONS

RESULTS OF TESTING

1	Hanalei Bay 1	Significant Level of Arsenic	18 mg/Kg
		Significant Level of Chromium	130 mg/Kg
		Significant Level of Nickel	150 mg/Kg
		Significant Level of Cadmium	0.99 mg/Kg
		Significant Level of Cobalt	23 mg/Kg
		Significant Level of Copper	26 mg/Kg
		Significant Level of Selenium	0.92 mg/Kg
		Significant Level of Vanadium	80 mg/Kg
2	Hanalei Bay 2	Significant Level of Arsenic	16 mg/Kg
		Significant Level of Chromium	100 mg/Kg
		Significant Level of Nickel	130 mg/Kg
		Significant Level of Cadmium	0.74 mg/Kg
		Significant Level of Cobalt	19 mg/Kg
		Significant Level of Copper	20 mg/Kg
		Significant Level of Selenium	0.65 mg/Kg
		Significant Level of Vanadium	61 mg/Kg
3	Anini Bay 1	Significant Level of Arsenic	9.8 mg/Kg
		Significant Level of Chromium	44 mg/Kg
		Significant Level of Nickel	18 mg/Kg
		Significant Level of Cadmium	0.34 mg/Kg
		Significant Level of Cobalt	4.7 mg/Kg
		Significant Level of Copper	5.1 mg/Kg
		Significant Level of Selenium	0.73 mg/Kg
		Significant Level of Vanadium	45 mg/Kg
4	Anini Bay 2	Significant Level of Arsenic	12 mg/Kg
		Significant Level of Chromium	43 mg/Kg
		Significant Level of Nickel	28 mg/Kg
		Significant Level of Cobalt	1.8 mg/Kg
		Significant Level of Copper	5.2 mg/Kg
		Significant Level of Selenium	1.8 mg/Kg
		Significant Level of Vanadium	41 mg/Kg

SIGNIFICANT FINDINGS

Heavy Metals (con't)

SAMPLE SEDIMENT LOCATIONS

RESULTS OF TESTING

5	Sealodge Reef 1	Significant Level of Arsenic	3.0 mg/Kg
		Significant Level of Chromium	15 mg/Kg
		Significant Level of Nickel	1.4 mg/Kg
		Significant Level of Cobalt	1.8 mg/Kg
		Significant Level of Selenium	1.4 mg/Kg
		Significant Level of Vanadium	6.5 mg/Kg
6	Sealodge Reef 2	Significant Level of Arsenic	2.0 mg/Kg
		Significant Level of Chromium	12 mg/Kg
		Significant Level of Nickel	8.2 mg/Kg
		Significant Level of Cobalt	1.4 mg/Kg
		Significant Level of Selenium	0.58 mg/Kg
		Significant Level of Vanadium	4.8 mg/Kg
7	Hanalei River 1	Significant Level of Arsenic	14 mg/Kg
		Significant Level of Chromium	160 mg/Kg
		Significant Level of Nickel	480 mg/Kg
		Significant Level of Cadmium	1.2 mg/Kg
		Significant Level of Cobalt	55 mg/Kg
		Significant Level of Copper	39 mg/Kg
		Significant Level of Vanadium	77 mg/Kg
8	Hanalei River 2	Significant Level of Arsenic	15 mg/Kg
		Significant Level of Chromium	180 mg/Kg
		Significant Level of Nickel	530 mg/Kg
		Significant Level of Cadmium	1.2 mg/Kg
		Significant Level of Cobalt	61 mg/Kg
		Significant Level of Copper	43 mg/Kg
		Significant Level of Selenium	0.99 mg/Kg
		Significant Level of Vanadium	88 mg/Kg

SIGNIFICANT FINDINGS

Heavy Metals (con't)

SAMPLE SEDIMENT LOCATIONS

RESULTS OF TESTING

9	Anini Creek 1	Significant Level of Arsenic	32 mg/Kg
		Significant Level of Chromium	180 mg/Kg
		Significant Level of Nickel	18 mg/Kg
		Significant Level of Cobalt	20 mg/Kg
		Significant Level of Selenium	1.8 mg/Kg
		Significant Level of Vanadium	25 mg/Kg
10	Anini Creek 2	Significant Level of Arsenic	9.1 mg/Kg
		Significant Level of Chromium	39 mg/Kg
		Significant Level of Nickel	21 mg/Kg
		Significant Level of Cadmium	0.37 mg/Kg
		Significant Level of Cobalt	4.4 mg/Kg
		Significant Level of Selenium	1.5 mg/Kg
		Significant Level of Vanadium	32 mg/Kg

mg/Kg = milligrams per Kilogram = Parts per Million

HEAVY METALS RESULTS DISCUSSION

Results show elevated concentrations of Arsenic in every sample tested, ranging from 2.1 mg/Kg to 18 mg/Kg, or p.p.m. At these elevated levels, Arsenic uptake into oysters, mollusks, crabs, bivalves, and bottom dwellers and feeders allows for ingestion by humans consuming these marine organisms. Arsenic is a poison and an EPA Listed Hazardous Metal that can deleteriously affect the life cycle and impair normal functions of these marine life. When allowed to enter into the food chain, humans consuming these marine life can also be affected by Arsenic's presence. It is also likely that coral reefs could be seriously affected by the Arsenic presence in these samples at the levels reported in the sediments. The US EPA regulates leachable Arsenic from sediments and lists the Hazardous Leachable level (TCLP) of Arsenic as 5.0 mg/L, or p.p.m.

Results show elevated concentrations of Cadmium in 6 of 10 samples tested, ranging from 0.34 mg/Kg to 1.2 mg/Kg, or p.p.m. At these elevated levels, Cadmium uptake into marine life would likely be a concern from ingestion by humans consuming these marine organisms. Cadmium is an EPA Listed Hazardous Metal that can also affect the life cycle and impair normal functions of marine life. When allowed to enter into the food chain, humans consuming these marine life can also be affected by Cadmium's presence. It is also likely that coral reefs could be seriously affected by the Cadmium presence in these samples at the levels reported in the sediments. The US EPA regulates leachable Cadmium from sediments and lists the Hazardous Leachable level (TCLP) of Cadmium as 1.0 mg/L, or p.p.m.

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HEAVY METALS RESULTS DISCUSSION (con't)

Results show elevated concentrations of Chromium in every sample tested, ranging from 12 mg/Kg to 160 mg/Kg, or p.p.m. At these elevated levels, Chromium uptake into marine life allows for ingestion by humans consuming these marine organisms. Chromium is a poison and a carcinogen, and is an EPA Listed Hazardous Metal that can deleteriously affect the life cycle and impair normal functions of marine life. It can affect normal protein synthesis in healthy organisms and when allowed to enter into the food chain, humans consuming these marine life can also be affected by Chromium's presence. It is also likely that coral reefs could be seriously affected by the Chromium presence in these samples at the levels reported in the sediments. The US EPA regulates leachable Chromium from sediments and lists the Hazardous Leachable level (TCLP) of Chromium as 5.0 mg/L, or p.p.m.

Results show elevated concentrations of Cobalt in every sample tested, ranging from 1.4 mg/Kg to 60 mg/Kg, or p.p.m. Cobalt can also be radioactive and can remain in sediments for long periods of time. At these elevated levels, Cobalt uptake into marine life would likely be a concern from ingestion by humans consuming these marine organisms. When allowed to enter into the food chain, humans consuming these marine life can also be affected by Cobalt's presence. It is also likely that coral reefs could be seriously affected by the Cobalt presence in these samples at the levels reported in the sediments.

Results show elevated concentrations of Nickel in every sample tested, ranging from 8.2 mg/Kg to 530 mg/Kg, or p.p.m. Nickel uptake into marine life would also likely be a concern from ingestion by humans consuming these marine organisms. It is also likely that coral reefs could be seriously affected by these levels of Nickel reported in the sediments analyzed.

Results show elevated concentrations of Selenium in 9 of 10 samples tested, ranging from 0.58 mg/Kg to 1.8 mg/Kg, or p.p.m. At these elevated levels, Selenium uptake into marine life would likely be a concern from ingestion by humans consuming these marine organisms. Selenium is an EPA Listed Hazardous Metal that can also affect the life cycle and impair normal functions of marine life. When allowed to enter into the food chain, humans consuming these marine life can also be affected by Selenium's presence. It is also likely that coral reefs could be seriously affected by the Selenium presence in these samples at the levels reported in the sediments. The US EPA regulates leachable Selenium from sediments and lists the Hazardous Leachable level (TCLP) of Selenium as 1.0 mg/L, or p.p.m.

Results show elevated levels of Vanadium present in every sample tested, ranging from 4.8 mg/Kg to 88 mg/Kg, or p.p.m. At these elevated levels, Vanadium uptake into marine life would likely be a concern from ingestion by humans consuming these marine organisms. When allowed to enter into the food chain, humans consuming these marine life can also be affected by Vanadium's presence. It is also likely that coral reefs could be seriously affected by the Vanadium presence in these samples at the levels reported in the sediments.

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HEAVY METALS RESULTS DISCUSSION (con't)

Results show elevated levels of other metals including Zinc which was present in every sample tested, ranging from 2.2 mg/Kg to 82 mg/Kg, or p.p.m. Zinc uptake into marine life could also be a

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concern from ingestion by humans consuming these marine organisms. It is also likely that coral reefs could be seriously affected by the Zinc presence in these samples at the levels reported in the sediments. Heavy Metals contamination in general can have a serious adverse impact on the normal life cycle and function of marine life. Because of the large variety of metals detected in these samples, the metals present and the combined levels detected in the sediments would likely be a strong contributor to the demise of the coral reefs in the areas in question.

FINAL SUMMARY

Organic Compounds present when coupled with Heavy Metals can affect internal organs of all organisms and are a clear danger to human health and the marine environment. Normal life cycles and development in marine life can be disrupted from the presence of the compounds detected in this report and will generate concerns that cannot go unnoticed. The results produced by this report only point to a need for further testing and research with target organisms to develop a better understanding of the long-term impacts of the presence of these substances. The real danger which has not been discussed here is the affect these substances have on microscopic organisms which can be greatly affected by changes in the aquatic matrix in which all marine life thrives. These concerns should also be researched and studied to attain a better understanding of what measures may be able to be utilized to minimize the impact presented by the results discovered in this report. Water column analysis would likely need to be addressed as well to get a better picture of the degree and presence of dissolved compounds and contaminants that are present. A serious attempt should also be made to determine the source of these compounds in these sediments so that further impact can be prohibited. Scientific methods and models should be developed to gain understanding and real insight for future human impact on marine environments and human health.

The information presented here constitutes the professional opinions of the undersigned, as relates to this report and the data generated by it.

We appreciate this opportunity to be of service. If there are any questions, please feel free to call.

Very truly yours,

ANALYTICAL CHEMICAL TESTING LABORATORY, INC.



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