



WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2004GU29B

Title: Speciation studies of arsenic in Guam Waters Phase II.

Project Type: Research

Focus Categories: Water Quality, Toxic Substances, Recreation

Keywords: Arsenic speciation, organic and inorganic arsenic, hydride generation, HPLC, GC

Start Date: 03/01/2004

End Date: 02/28/2005

Federal Funds: \$31,199

Non-Federal Matching Funds: \$0

Congressional District: n/a

Principal Investigator:

Maika Vuki

Abstract

Arsenic is a ubiquitous element and is present in minerals, sediment and water. Arsenic contamination in water has received significant attention over the last few years due to its carcinogenic properties. There had been reported incidences of arsenic contamination in drinking waters in the US and also internationally. USA EPA has recently revised the Maximum Contamination Level for As to 10ppb. Guam's main water source is from the limestone aquifer that lies in the northern half of the island. An estimated 80% of the total water source is derived from the aquifer and the remaining comes from the surface water on the southern part of the island. There are more than 100 wells that serve the population and most of these are located on the northern part of the island. Some of these wells are connected through conduits that flow out through springs along Tumon Bay. Initial studies in 2001 conducted by Guam EPA along the Tumon Bay springs show unusually high levels of arsenic from these springs. This was followed up with the speciation studies of arsenic along the same springs. Results from the speciation study show low levels of arsenic. The big differences in the two sets of data and the differences in methodology used renders these data inconclusive. Further investigation is required verify these data. The aim of this project is to verify the differences from the two studies and to also extend the investigation into sediments and biological materials to establish

the possible sinks and the mobilization conditions for arsenic species. The objectives are
i. To investigate the levels of Arsenic in Tumon Bay, the connecting freshwater wells on
Guam and other potential sites during the wet and dry season.ii.

To conduct speciation studies of arsenic to ascertain the levels of the different forms of
As both organic and inorganic.iii. To conduct speciation study on the sediments and biota
samplesiv.

To conduct an inter-laboratory validation exercise v. To correlate the levels of arsenic to
the likely sources and sinks.vi. To relate these levels to the parameters; pH, alkalinity,
salinity, dissolved oxygen.

The hydride generation method coupled with Atomic Absorption Spectroscopy that was
successfully developed from the first part of this study has shown adequate differentiation
between the inorganic arsenic(III) and arsenic(V) species. Part of this continuing project
will be to develop and set up the method for differentiating the organic forms of arsenic.
For this the Gas Chromatograph and HPLC method will be used. Water samples will be
collected from the Tumon Bay area, ground water wells, and other potential
contamination sites for comparison. Sediments and biological samples will also be
collected from the study sites. This study will establish the levels and the forms of arsenic
in the environment and will show whether there is any threat of arsenic contamination in
Guam waters. It will also explain the differences from the two studies. The data will
assist the relevant authorities in Guam on monitoring and designing management
guidelines to address any potential threat to the environment. It will also provide
necessary training and skills for speciation studies and analytical instrumentation
experience for graduate and under graduate students at the University of Guam.