A.   Project Identifiers

1)   *Project Title:* Connectivity between MPA sites on Tutuila, American Samoa
2)   *NOAA Grant Award Number*: NA10NMF4630360
3)   *Project Manager:* DMWR
4)   *Period Covered by this Report:* 04/01/2011 – 12/31/2013

B.   Project Summary

Coral reefs in American Samoa are characterized by low abundances of certain key reef species and few apex predators. In addition, many locations are impacted by polluted watersheds, sediment run-off and seasonal increases in sea temperatures. The causes of these impacts range from high fishing pressure in the past, to habitat degradation, population pressure and also include the physical features of the reef. A network of MPAs is in the process of being designed to protect coral reef habitat and ensure the sustainability of fish stocks into the future. An effective MPA network depends on the ecological connectivity between the sites and the selection of 'resilient' areas that are less impacted from watershed intrusion and more flushed by fresh oceanic water. The main objective of the project was to develop a model of MPA connectivity in Tutuila Island, American Samoa. Specifically, a preliminary model of circulation around Tutuila, American Samoa will be validated with drifter data taken at existing and proposed Marine Protected Area (MPA) sites and other important locations. The model will be run multiple times under different lunar and seasonal scenarios to predict the impact of watersheds on MPAs, identify potential larval pathways among MPAs, and to use this information to build a more resilient MPA network. The model will be available and maintained on island with a trained local agency staff member capable of running scenarios.

C.   Summary of Achievements

Field deployment of drifters to determine surface currents and gather data from priority areas

Drifter deployment protocols were developed, tested and refined. In addition, drifter data encoding and processing were refined. Drogues (underwater sails) were designed and produced using 3/4 PVC pipe and heavy duty plastic to reduce wind effects on the drifters.

Sites that were prioritized were MPA locations and proposed MPA locations. However, due to limitations on boat availability and the high cost of fuel, data were gathered whenever possible (usually while other surveyors were carrying out research). Data were collected from Pago Pago harbor in September 2011, Fagamalo in 2011, 2012 and 2013, Fagasa on Sep 20th 2011; Fagaitua in September 2011, Vatia on September 2011. Data were also collected in Manu'a in September 2011, October 2012 and April 2013 as part of a different project and from the back reef pools in Tutuila (as part of an intern's project from the University of Hawaii). All of these data can be used to validate the model.

Purchase ADCIRC modeling software and high specification computer to run the circulation model on

ADCIRC modeling software purchased. The computer is now running with the model successfully installed.

Carry out ADCP surveys (under separate funding) to provide data for subsequent input to the ADCIRC model

The ADCP Project which was funded by the Western Pacific Regional Fisheries Management Council is now completed and all the data is available for incorporation into the ADCIRC model. Data collection from other projects (e.g. ASPA monitoring of currents around wastewater outfalls) can be used to validate the model. ADCP surveys were carried out on 23rd May 2011 at Fagamalo, 14th June 2011 at Aunu'u, 4th August 2011 at Amanave, 5th August 2011 at Taema Bank, 23rd September 2011 at Fagamalo and October 2012 and April 2013 at Ofu and Olosega on Manu'a Islands.

Download ADCIRC model onto interim computer and test its operation

Dr Wiles worked in American Samoa for three weeks in December 2011 and January 2012 to complete the setting up of the model onto the high specification computer unit. He also installed GNOME (NOAA, particle tracking software) in order to run particle tracking simulations using the model. A staff training session was held in Feb 2012 for the MPA Program staff to better understand the theory behind scientific modeling and to learn how to use the particle tracking software.

The model has currently run for two and half days which was not sufficient time to give information about larval behavior (given that many reef fish larvae have pelagic larval stages of approx. 30 days). In addition to this, although the model is currently set up with the tidal information, it does not have the large-scale background currents incorporated. Investigation into the synergies between ADCIRC and ROMS needs to be carried out in order to ensure a logical method is followed to achieve the objective of having a working circulation model for the territory.

Collect existing data for parameterization of model

Access to specific datasets such as the CSIRO BLUELink ReANalysis (BRAN) has been granted, and are being formatted for input into ADCIRC. Other datasets were obtained in previous half of year.

D.   Major Problems Faced by the Project

The project facilitated the purchase of infrastructure and collection of data to develop the oceanographic connectivity model. However, the model was not developed for various reasons and the failure of some assumptions. The original principal investigators were contract workers on-island and could provide the technical expertise as a side project. In addition, the budget for additional technical assistance was for an intern. When the original investigators left the Territory and the intern took another job opportunity, the project languished when it was assumed by a senior local technician. The technician did not have the technical expertise although he underwent training on oceanographic

modeling. On the other hand, he did a good job in organizing the field data collection. There were several requests for no-cost extension until technical expertise could be obtained. Communication between the technician and the original investigators (who were still willing to help but have become very busy with new jobs) languished. In the end, we were able to find technical expertise when the project was already warned that no-cost extension was not an option. This was too late and the budget assumption was too low for technical expertise. The department still thinks this is an important project and is still looking for opportunities for funding given the purchased infrastructure.

Table 1: Budgeted and Actual expenditures

ITEM	BUDGET	ACTUAL	BALANCE
Supplies & Expenses	5,000	4,700.14	299.86
Contractual Services	13,100	7,908.55	5,191.45
Travel	3,200	0	3,200
Other Expenses	500	0	500
Capital Outlays	5,000	0	5,000
Total	**26,800**	**12,608.69**	**14,191.31**