Quarterly Progress Report
(July 24, 2012)

Grantee:	University of Alaska Fairbanks/Office of Sponsored Programs
Project Name:	Eagle Hydrokinetic Project - Eagle Hydro - INE - Debris - Anchoring
Grant #:	01198-00 -UAF G6078 (Denali Commission award).
Period of Report:	April, 2012, through June, 2012.

Introduction

The debris mitigation project goals are to:

(1) Develop a test debris mitigation platform that will allow us to test various debris mitigation technologies and methods. (completed)
(2) Prepare the Nenana test site infrastructure (e.g., anchoring/mooring system) to be able to accommodate the debris mitigation platform tests (completed) and possibly retest the New Energy Turbine, as appropriate.
(3) Obtain necessary permits and conduct the necessary baseline studies to prepare for the debris mitigation testing. (completed)
(4) Conduct the debris mitigation technology and debris management methods testing.

Refer to previous quarterly reports for a general description of the project and activities to-date. Previous quarterly reports were submitted on 10/15/2011, 1/16/2012, and 4/3/2012.

Activities and progress

The research debris diversion platform (RDDP) fabrication was completed in May and the RDDP was transported to the Inland Barge storage yard until the chain to the midstream anchor could be recovered. We also transported our larger buoy to the storage yard in preparation for attaching it to the anchor chain. Initial attempts to recover the anchor chain in late May failed due to the fact that the lead line from the chain to shore had been covered with silt as the river current velocity slowed last fall. The near-shore ice froze to the riverbed and also froze the riverbed to some unknown depth, trapping the anchor line in the frozen silt. We were forced to wait until June 12th, when the riverbed ice had thawed, for a second attempt to recover the anchor chain. This effort was successful, but with much effort as the line was still silt covered (and had a submerged small tree on it). We managed to acquire the chain and deploy our new buoy onto the chain (Figure 1). The RDDP will be attached to the buoy for testing.

On June 15th we assembled the RDDP. Later in June, after assembly, we made initial tests of the RDDP's water worthiness. These tests showed the RDDP to be front heavy that required ballasting the rear tanks to bring the device to an even keel. A need for ballasting was anticipated and was accommodated by having the pontoons constructed with three separate watertight chambers to allow ballasting as needed. Water worthiness testing demonstrated that the ballasted RDDP could be maneuvered into place using our research boat and that the RDDP behaved as expected in the water. The front debris sweep (the round drum in front) worked well, rotating with little resistance under the influence of the current.

During this quarter AHERC acquired a high-resolution sonar (BlueView) to allow us to examine objects underwater (e.g., debris and the operation of the RDDP). Preliminary efforts were done to understand how to use the sonar and make measurements (Figure 3).

The surface debris video monitoring system developed in 2011 was upgraded by including additional batteries, a solar panel to charge the batteries, and improved software and operating procedures (Figure 4). The upgrade eliminates the need to run a generator to operate the system, increases the time between required service visits, and reduces or eliminates the problem of computer lockups.

Planned activities for the next quarter

Next quarter we plan to deploy the RDDP and test its ability to divert debris. This will be done by collecting debris upstream and guiding it to impact the RDDP. These interactions will be recorded using video cameras mounted on the RDDP and from the shore mounted surface debris monitoring system. Initially, short-term deployments and testing of the RDDP will be done. We will also measure the river current profiles both upstream and downstream of the buoy and RDDP to determine their influence on current profiles, which could affect the operation of hydrokinetic power generating devices. Once we are comfortable with the overall performance of the RDDP we will deploy it long-term and monitor its general interaction with river debris using video surveillance. We will continue monitoring surface debris using our surface debris video monitoring system and working to deploy the high-resolution sonar in an effort to observe submerged debris to better determine the amount of debris that flows under water and where it flows in the river system. We will also begin working on an Alaska Energy Authority phase I project to characterize debris (funds are being set up at the university now) in the Tanana River that will enhance our efforts to examine debris mitigation methods for hydrokinetic turbines. As part of this phase I project we will start preparing the mechanical debris detection device developed for ORPC for deployment in the Tanana. Parts, supplies, and some fabrication activities will need to be completed prior to deployment.

Figure 1. Buoy deployed in the Tanana River at the AHERC test site.

Figure 2. Unballasted (a) and ballasted (b) RDDP. Water transport mobility tests (c) and tethered to the buoy for water worthiness testing.

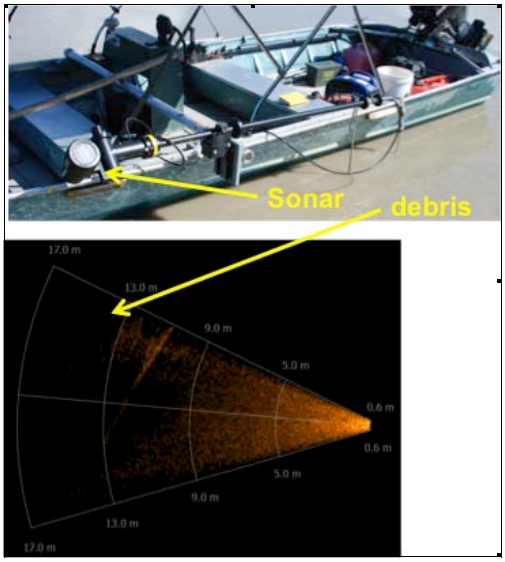

Figure 3. Research boat with mounted BlueView sonar and image of debris taken with the sonar in the Tanana River at Nenana.

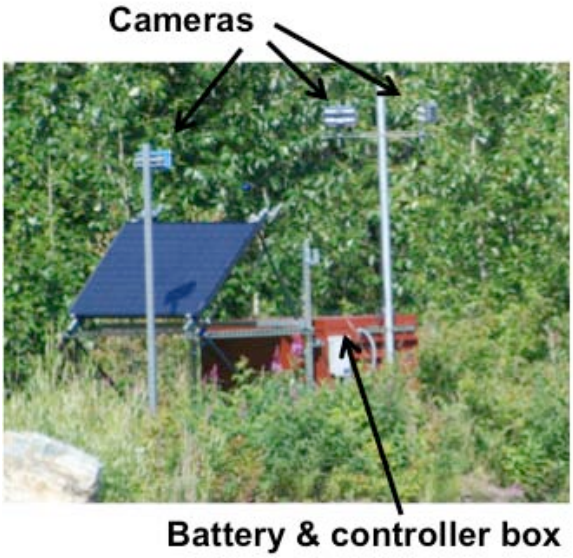

Figure 4. Debris monitoring video system. The system is mounted on shore with cameras pointed at the RDDP/buoy location and upstream from the RDDP/buoy. A third (security) camera is pointed back at the system. The above picture was taken from a boat tethered to the buoy looking back at shore.