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Temporary restoration of bull trout passage at Albeni Falls Dam

2007 Progress Report

Brian J. Bellgraph and Katherine A. Deters
Pacific Northwest National Laboratory
Richland, Washington

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Work Element A: 165 – Produce Environmental Compliance Documentation – Obtain necessary permits for fish collection and animal handling

All procedures involving the handling of bull trout for this study were reviewed and approved by the Institutional Animal Care and Use Committee for Toxicology Northwest and the Pacific Northwest National Laboratory prior to handling fish (IACUC File: 2007-19; Animal Welfare Assurance number: A3353-01).

Work Element B: 70 – Install Fish Monitoring Equipment – Procure, install and test stationary radio receiver stations

Equipment purchased by PNNL in 2007 included two Lotek SRX600 receivers, five 6-element Yagi antennas, six solar panels, three solar panel charger controllers, three steel "Knaack" toolboxes, hand tools, and consumable supplies for installation of monitoring equipment. All other radio receivers and equipment were made available by PNNL for use on this study.

Eleven radio telemetry receivers were installed during the summer and fall of 2007 to track bull trout in the study area (Figure 1). Four radio receivers controlling a total of 13 Yagi antennas were installed to monitor bull trout at Albeni Falls Dam (Figure 2). One receiver with five antennas monitored the spillway tailrace at Albeni Falls Dam (Station 1), one receiver with five antennas monitored the spillway forebay (Station 2), one receiver with one antenna monitored the powerhouse tailrace (Station 3) and one receiver with two antennas monitored the powerhouse forebay (Station 4). Receiver stations with two Yagi antennas each were installed at the mouth of the Priest River (Station 5; 0.4 km from the Pend Oreille River), on the Pend Oreille River near the railroad bridge at Dover, Idaho (Station 6 on the north bank; Station 7 on the south bank), Gold Creek (Station 8; 0.2 km from Pend Oreille Lake), Granite Creek (Station 9; 2.7 km from Pend Oreille Lake), Lightning Creek (Station 10; 1.5 km from the Clark Fork River), and Trestle Creek (Station 11; 1.1 km from Pend Oreille Lake) (Figure 1). Yagi antennas located on tributary creeks and on the Pend Oreille River at Dover, Idaho were configured to differentiate upstream and downstream movements of passing fish.

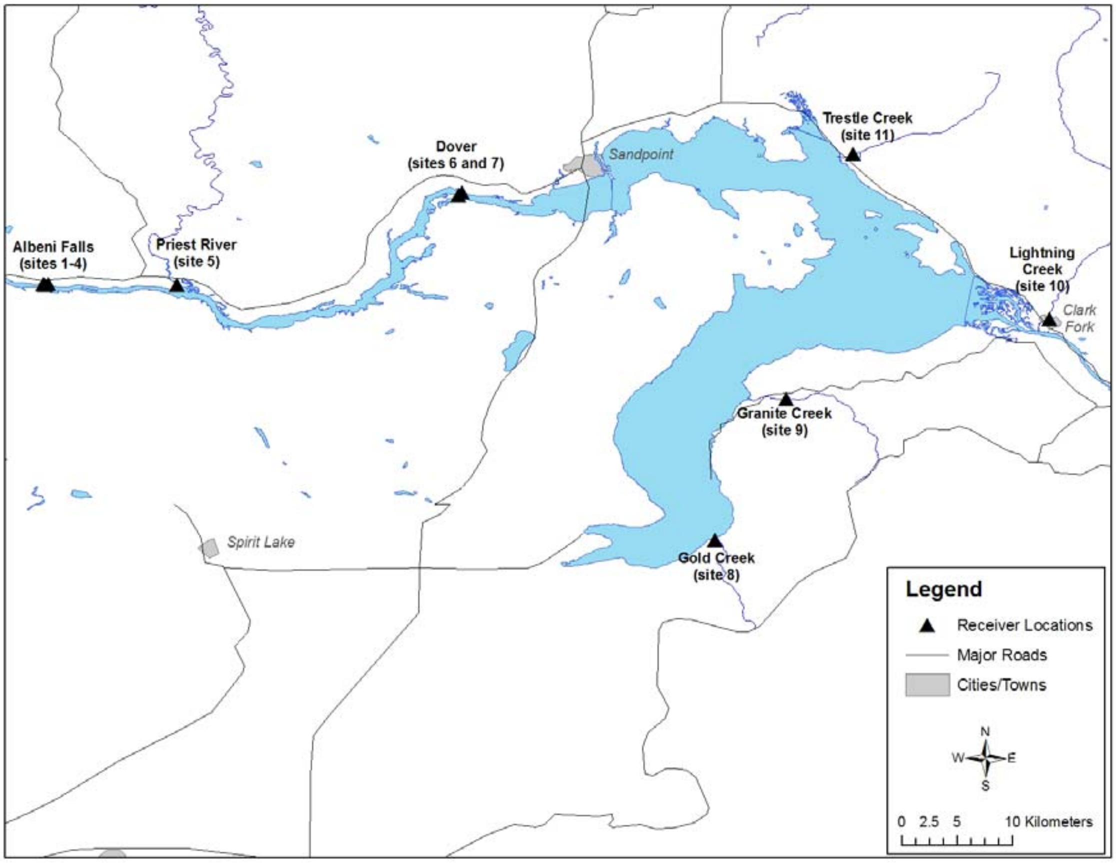

Figure 1. Locations of all radio receiving monitoring stations on the Pend Oreille River and Pend Oreille Lake in 2007.

Radio receivers and corresponding electronic components were housed within plastic tool boxes (stations at Albeni Falls Dam), a locked maintenance building (station at mouth of Priest River), or steel "Knaack" tool boxes (all other stations). Monitoring stations at the Albeni Falls Dam spillway (forebay and tailrace), Albeni Falls Dam powerhouse tailrace, mouth of the Priest River, and Granite Creek used 110 V AC as the primary power source and each was backed up with one 12 V DC deep cycle battery in case of primary power failure. Each of the six remaining stations was autonomous and powered by two 12 V DC deep cycle batteries charged by a solar panel. Receivers with multiple antennas were connected to an antenna switchbox that controlled the antenna scanning process. Antennas were elevated 2 to 7 m above the surface of the water to maximize detection distance at each monitoring station and were mounted to adjacent trees or to metal-pipe booms that were bolted to the equipment box. Equipment boxes at all sites were padlocked and chained to a fixed object (e.g., railing at dams or trees) to deter tampering or theft.

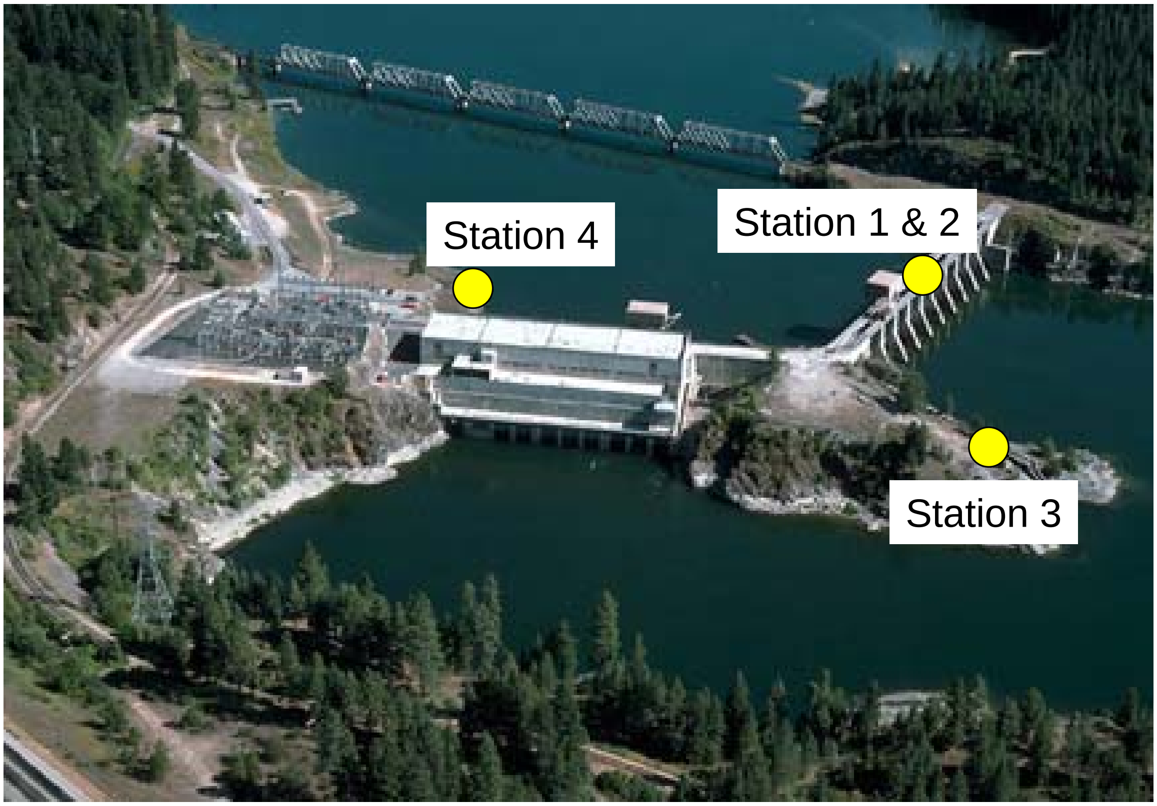

Figure 2. Locations of radio receiving monitoring stations at Albeni Falls Dam.

Reception range of all monitoring stations was tested after installation in 2007. Range tests were conducted for all four receivers at Albeni Falls Dam (Figure 3 and Figure 4). Transects located about 100 m apart, parallel to the concrete of the dam spillway, and extending the width of the river were used to test the tailrace and forebay receivers on the spillway. A linear transect extending from the downstream end of the dam logchute to the opposing bank of the powerhouse tailrace was used to test the powerhouse tailrace monitoring station. A linear transect extending across the forebay, parallel to the powerhouse, was used to test the powerhouse forebay monitoring station. Formal transects were established at the Dover Railroad Bridge site to test receiver range across the entire river width (Figure 5). At about 50 m along each transect at Albeni Falls Dam and the Dover Railroad Bridge, a transmitter was lowered into the water at 1-m depth intervals and the signal strength of the transmitter decoded by the receiver was recorded. Range testing of receivers at the mouth of the Priest River and the Pend Oreille Lake tributaries ensured that radio transmitters could be heard across the width of the tributary at all depths (for the Priest River station), in the deepest water within 50 m of the station (for small tributary stations), and that upstream and downstream movements could be differentiated. Measurements along formal transects were not used because stream width and depth were much less than in the Pend Oreille River and thus, signal strength of transmitters was greater and more easily decoded by receivers.

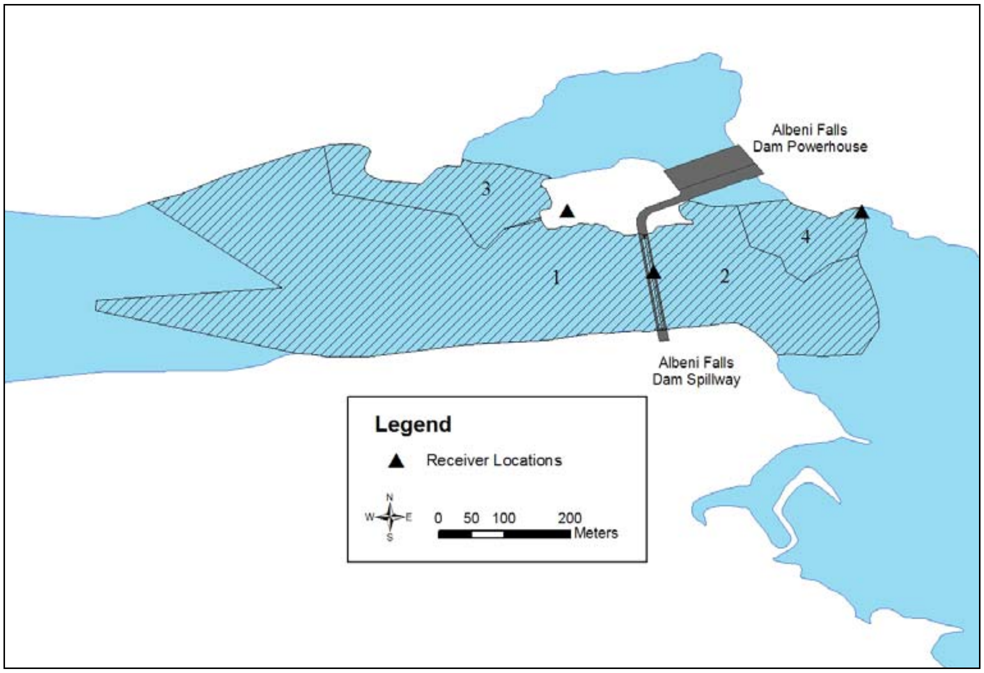

Figure 3. Reception range of receivers at Albeni Falls Dam on the Pend Oreille River at 1-m depth. The cross-hatched polygons represent areas where radio receivers decoded a fish transmitter with a signal strength greater than 100. Numbered polygons correspond to receivers monitoring the spillway tailrace (1), spillway forebay (2), powerhouse tailrace (3), and powerhouse forebay (4). The reception range of receiver 4 overlaps the range of receiver 2.

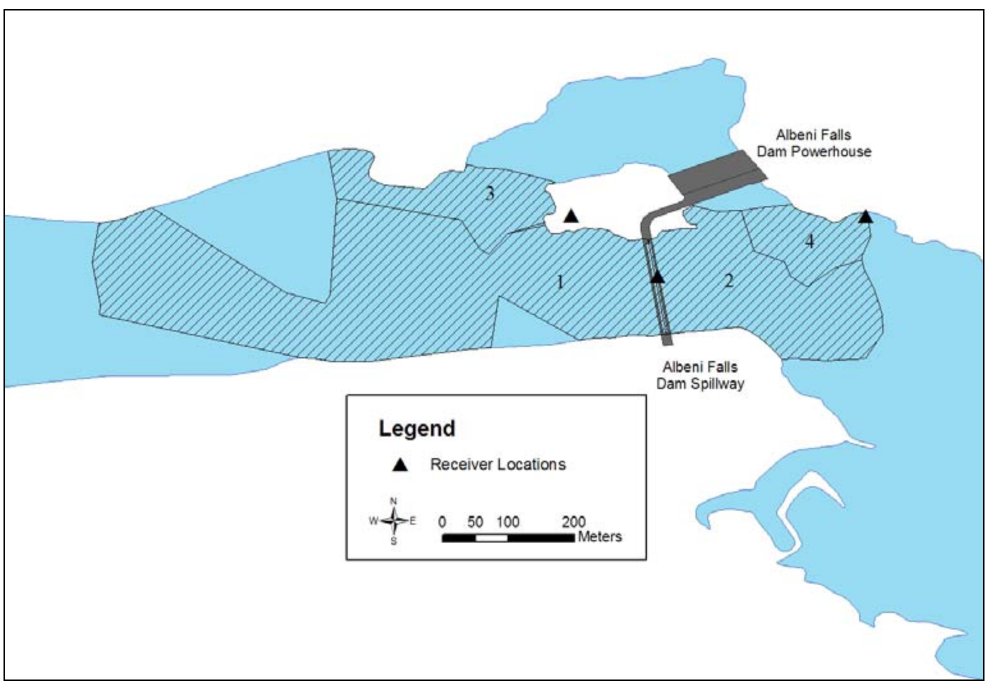

Figure 4. Reception range of receivers at Albeni Falls Dam on the Pend Oreille River at 5-m depth. The cross-hatched polygons represent areas where the respective radio receivers decoded a fish transmitter with a signal strength greater than 100. Numbered polygons correspond to receivers monitoring the spillway tailrace (1), spillway forebay (2), powerhouse tailrace (3), and powerhouse forebay (4). The reception range of receiver 4 overlaps the range of receiver 2.

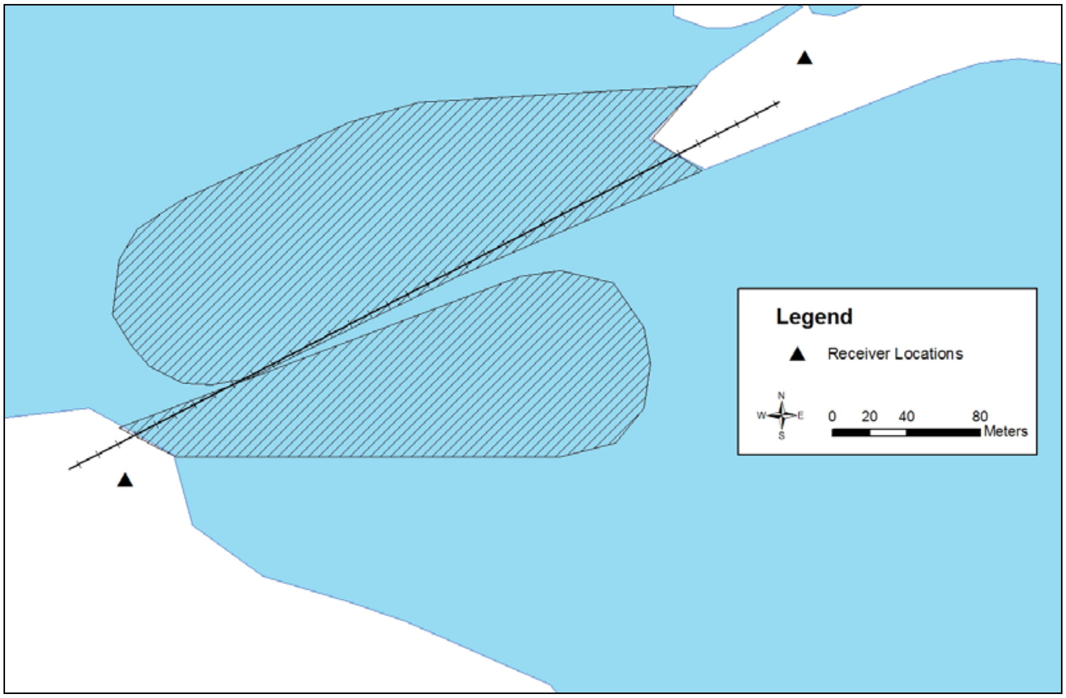

Figure 5. Reception range of receivers at the Dover Railroad Bridge on the Pend Oreille River at 5-m depth. The cross-hatched polygons represent areas where the respective radio receivers decoded a fish transmitter at a depth of 5 m. The polygon at the north end of the map coincides with the receiver on the north bank of the Pend Oreille River and the polygon at the south end of the map coincides with the receiver on the south bank of the river. The railroad is denoted by the hatched line extending from the north to south bank of the river.

Radio receivers, antenna switch boxes, and deep cycle batteries were removed from monitoring stations in November 2007 and stored for the winter because no bull trout were tagged in 2007. The remaining hardware (e.g., equipment boxes, solar panels, and Yagi antennas) was not removed and thus, will require less time to initialize monitoring stations in 2008.

Despite our best efforts to minimize tampering of monitoring equipment, vandalism occurred at the two Dover Railroad Bridge sites. The station at the north end of the Dover railroad bridge was vandalized once in August and once in November. The first incident in August was minimal and only required replacement of a solar panel. The second incident in November was more substantial: the equipment box including all electronic equipment was stolen from the monitoring station site (the chain securing the box to a tree was cut). One 6-element Yagi antenna and a solar panel were also destroyed. The monitoring station at the south end of the Dover railroad bridge also had its solar panel destroyed by vandalism in June and was replaced in July. To deter future vandalism at the south station, the new solar panel was installed in a different location and the old solar panel was left as a decoy. The monitoring station at the south end of the Dover railroad bridge had not been re-vandalized as of inspection in November.

The occurrence of vandalism at the Dover railroad bridge necessitates that new equipment sites be found in order to reduce the potential for future vandalism. Thus, private landowners adjacent to the Dover railroad bridge have been contacted to assess the feasibility of moving stations to private land. Increased visibility and limited public access of monitoring stations on private land would likely decrease the potential of vandalism to the monitoring stations near the Dover railroad bridge. Replacing the radio receiving monitoring stations at the Dover railroad bridge with an acoustic receiver, which may have a lower potential of being vandalized, is also being considered.

Work Element C: 28 – Trap and Haul – Transport bull trout above Albeni Falls Dam

Since no bull trout were captured during electrofishing surveys in 2007, no fish were transported.

Work Element D: 158 – Mark/Tag Animals – Implant combination radio acoustic transmitter (CART) into bull trout

Since no bull trout were captured during electrofishing surveys in 2007, no fish were implanted with transmitters in 2007. However, potential surgeons from Eastern Washington University and the Kalispel Tribe of Indians were trained by an experienced fish surgeon from PNNL prior to the start of fieldwork in 2007.

Training was performed at the Eastern Washington University fish laboratory. Surgeon trainees were first taught the basics of fish surgery. Trainees then practiced tying knots with different types of suture material (i.e., Ethilon, Monocryl, and Vicryl) while the instructor monitored progress. Incisions were made into pieces of neoprene and trainees practiced the correct spacing of sutures. Once the trainees were competent at closing the neoprene incisions, they advanced to making and closing incisions on one euthanized test fish. Finally, each trainee performed practice surgeries on six live fish (five rainbow trout and one yellow perch). Following surgery, fish were placed in a recovery tank and held for two weeks to assess post-tagging mortality. No fish died during the two week monitoring period.

The surgery setup was similar to what surgeons would use in the field (e.g., on a boat or the riverbank). Each fish was anesthetized in an insulated cooler with 80 to 100 mg of MS-222 per liter of water. When the fish was sedated to a level where it did not respond to tactile stimuli, it was placed ventral side up in a groove of foam. Maintenance anesthetic (80 to 100 mg of MS-222 per liter of water) was gravity-fed by a tube directly to the gills of the fish. The anesthetic was delivered to the fish at a rate that maintained steady gill movement.

Surgical instruments and transmitters were disinfected in 70% ethanol and rinsed in distilled water prior to surgery. The incision was made on the ventral side of the fish approximately 15 mm from and parallel to the mid-ventral line. Small radio transmitters were implanted in the fish for training purposes. An incision of about 20 mm was necessary to accommodate the radio transmitter; however, incision length will likely be longer for combination acoustic and radio transmitters (CART) implanted in the field.

Once the incision was made, the hole for the antenna was made using a either a spinal needle or disposable PIT tag needle tip. First, a scoopula (i.e., a hand tool with a flat end) was inserted through the incision and placed against the body wall to protect the internal organs from puncture by the needle tip during the cutting of the antenna hole. The antenna hole was made about 30 to 40 mm posterior from the end of the incision and a few millimeters farther from the mid-ventral line than the transmitter incision. The transmitter was then inserted into the peritoneal cavity after guiding the antenna through the needle and removing the needle from the body wall. Slight adjustment of the transmitter and antenna ensured the tag was placed horizontally within the fish. The incision was then closed with three simple, interrupted sutures using 2-0 Ethilon, which is the same suture material that will be used in the field.

Work Element E: 157 – Collect/Generate/Validate Field and Lab Data – Weekly electrofishing

Staff at Eastern Washington University led the weekly electrofishing task. No PNNL staff assisted with this work element in 2007.

Work Element F: 157 – Collect/Generate/Validate Field and Lab Data – Download stationary ground radio receiving stations

Formal biweekly downloading of receiving stations was not needed since no bull trout were implanted with transmitters in 2007. However, data were downloaded at least monthly in 2007 to assess system performance and calibrate stations. A standard operating procedure was established for personnel downloading data, which includes a basic check of monitoring station performance and guidelines for saving and maintaining data. This formal procedure will be implemented after installation of receivers in spring 2008.

Work Element G: 157 - Collect/Generate/Validate Field and Lab Data – Mobile tracking surveys by fixed wing aircraft, vehicle and boat

Mobile tracking surveys were not implemented in 2007 since no bull trout were tagged.

Work Element H: 162 – Analyze/Interpret Data – Data reduction and analysis

Data reduction and analysis was not needed in 2007 since no bull trout were tagged.

Work Element I: 119 – Manage and Administer Projects – Manage Project

Management of collaboration between PNNL and EWU was required to accomplish the work elements. Crews of two to four members consisting of staff from PNNL and EWU were assembled to install monitoring equipment. Coordination was also necessary between PNNL and EWU staff to negotiate permissions with landowners to install monitoring stations on federal, state, and private property. All necessary permissions and legal documents were negotiated between Eastern Washington University (the signee) and the respective federal, state and private landowners before installation of monitoring equipment. The management of sound relationships with landowners will be vital to continuation of research in future years. The 2008 scope of work was also created in Pisces for the second year of the project.

Work Element J: 132 – Produce Annual Report – Submit Annual Report for the period May 2007 to December 2008.

The report described herein satisfies this work element.

Work Element K: 185 – Produce Pisces Status Report – Periodic Status Reports for BPA

Quarterly status reports were submitted to BPA through the Pisces reporting system.