

Form 9-1366
(May 2018)

U.S. Department of the Interior
U.S. Geological Survey
Joint Funding Agreement
FOR
Water Resource Investigations

Customer #: 600000753
Agreement #: 19MLJFAALDA020
Project #: ML009Z5
TIN #: [REDACTED]

Fixed Cost Agreement YES[X] NO[]

THIS AGREEMENT is entered into as of the August 1, 2019, by the U.S. GEOLOGICAL SURVEY, Lower Mississippi Gulf Water Science Center, UNITED STATES DEPARTMENT OF THE INTERIOR, party of the first part, and the Baldwin County Commission party of the second part.

1. The parties hereto agree that subject to the availability of appropriations and in accordance with their respective authorities there shall be maintained in cooperation Water Resource Investigations (per Statement of Work), herein called the program. The USGS legal authority is 43 USC 36C; 43 USC 50, and 43 USC 50b.

2. The following amounts shall be contributed to cover all of the cost of the necessary field and analytical work directly related to this program. 2(b) include In-Kind-Services in the amount of \$0.00

- (a) \$0 by the party of the first part during the period August 1, 2019 to September 30, 2021
- (b) \$80,450 by the party of the second part during the period August 1, 2019 to September 30, 2021
- (c) Contributions are provided by the party of the first part through other USGS regional or national programs, in the amount of:

Description of the USGS regional/national program:
- (d) Additional or reduced amounts by each party during the above period or succeeding periods as may be determined by mutual agreement and set forth in an exchange of letters between the parties.
- (e) The performance period may be changed by mutual agreement and set forth in an exchange of letters between the parties.

3. The costs of this program may be paid by either party in conformity with the laws and regulations respectively governing each party.

4. The field and analytical work pertaining to this program shall be under the direction of or subject to periodic review by an authorized representative of the party of the first part.

5. The areas to be included in the program shall be determined by mutual agreement between the parties hereto or their authorized representatives. The methods employed in the field and office shall be those adopted by the party of the first part to insure the required standards of accuracy subject to modification by mutual agreement.

6. During the course of this program, all field and analytical work of either party pertaining to this program shall be open to the inspection of the other party, and if the work is not being carried on in a mutually satisfactory manner, either party may terminate this agreement upon 60 days written notice to the other party.

7. The original records resulting from this program will be deposited in the office of origin of those records. Upon request, copies of the original records will be provided to the office of the other party.

8. The maps, records or reports resulting from this program shall be made available to the public as promptly as possible. The maps, records or reports normally will be published by the party of the first part. However, the party of the second part reserves the right to publish the results of this program, and if already published by the party of the first part shall, upon request, be furnished by the party of the first part, at cost, impressions suitable for purposes of reproduction similar to that for which the original copy was prepared. The maps, records or reports published by either party shall contain a statement of the cooperative relations between the parties. The Parties acknowledge that scientific information and data developed as a result of the Scope of Work (SOW) are subject to applicable USGS review, approval, and release requirements, which are available on the USGS Fundamental Science Practices website (<https://www.usgs.gov/about/organization/science-support/science-quality-and-integrity/fundamental-science-practices>).

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9. Billing for this agreement will be rendered **quarterly**. Invoices not paid within 60 days from the billing date will bear Interest, Penalties, and Administrative cost at the annual rate pursuant the Debt Collection Act of 1982, (codified at 31 U.S.C. § 3717) established by the U.S. Treasury.

USGS Technical Point of Contact

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U.S. Geological Survey
United States
Department of Interior

Baldwin County Commission

Signature

By  Date: 07/17/2019
Name: Scott Gain
Title: Director, LMG Water Science Center

Signatures

By  Date: 7-29-19
Name: Charles F. Anderson
Title: Chairman

By _____ Date: _____
Name:
Title:

By _____ Date: _____
Name:
Title:

PROPOSAL FOR CONSTRUCTION, INSTALLATION, OPERATION AND MAINTENANCE OF A STREAM-GAGING STATION ON FISH RIVER AT COUNTY ROAD 32, BALDWIN COUNTY, ALABAMA

Problem: The Baldwin County Commission is interested in funding a new stream-gaging stations on Fish River at Baldwin County Road 32 to assist authorities in flood forecasting and flood alert efforts. Flooding of roadways, campgrounds, residential communities, etc. are of major concern in the area. Additional river stage and streamflow data for Fish River will improve managers' ability to predict the timing and magnitude of flood events that could help protect property and lives.

Objective: The U.S. Geological Survey (USGS) is proposing a joint funding agreement between the USGS and the Baldwin County Commission to include the construction/installation and operation of a continuous-record stream-gaging station on Fish River in the Baldwin County, Alabama that will monitor both stage and streamflow. The objectives of this project are to: (1) install the gage structure to house instrumentation to continuously record stage or gage height and transmit data hourly for display on the USGS web page, (2) install reference gage such as a staff plate or wire-weight gage in order to verify electronically recorded stage readings, (3) to maintain the operation of the gage and recording instrumentation during routine site visits and to cross reference electronically recorded stage readings with the reference stage in order to apply needed data corrections, (4) store data in USGS Automated Data Processing System and archive data for historical reference, (5) installation of a multi-directional velocity sensor, (6) making manual routine, low and high-volume flow measurements throughout the study period and over the full range of flow conditions, and (7) to develop and maintain dual ratings to establish relationships between stage and cross-sectional channel area; and point velocity and mean cross-sectional velocity in order to compute streamflow volume (discharge) in cubic feet per second.

Approach: The proposed study site has been selected at the Fish River bridge located on Baldwin County Road 32 about one mile downstream of the confluence of Polecat Creek with Fish River. The desired location for the monitoring sensors and gage structures have been identified.

For Stage Monitoring

A radar sensor will be used as the primary instrument for recording stage and will be housed in an aluminum structure mounted to the downstream side of the bridge at about mid channel. The communication wiring will be run through conduit to a shelter off the bridge that will house and support the datalogger /transmitter, batteries, voltage regulator, solar panel, and GOES antenna. A staff plate or wire-weight gage will serve as the reference gage and will be mounted under the bridge to one of the bridge piers in the channel or to the downstream side of the bridge.

The stage will be recorded and logged at 15-minute intervals and transmitted via GOES (Geostationary Operational Environmental Satellite) every hour. The data will be displayed on the USGS web site at <http://al.water.usgs.gov/data>, and will be updated every hour as data are transmitted. Also, instrumentation can be programmed to record stage by random transmission whenever the stage meets or exceeds a defined threshold. Random transmissions can be set to

transmit data every 1 to 5 minutes.

USGS hydrographers will visit the site on routine scheduled field trips (usually every 6 to 8 weeks) to perform general maintenance on the gage (battery replacement, data retrieval, etc.), cross reference the staff plate gage readings or wire-weight gage with the sensor readings to verify the accuracy of the sensors and apply needed data corrections and making streamflow measurements. The staff plate gage or wire-weight gage will be referenced to mean sea level or other arbitrary datum using standard USGS surveying methods, and levels will be run every one to three years to validate reference points and benchmarks. Additional field visits will be necessary throughout the project to troubleshoot and fix problems with the instrumentation as they occur.

For Streamflow Monitoring

The tidal influence and bi-directional flows of the Fish River at this site prohibits the operation of the normal stream gage, for which a stage to discharge relationship is developed to compute continuous flow or discharge from stage readings. Therefore, since stage alone cannot be used to compute discharge, a two dimensional side-looking Acoustic Doppler Velocity Meter (ADVM) will be employed at the site to measure flow direction and velocity. The development of a stable mean-velocity to index-velocity rating may be difficult to derive due to the flow dynamics of the channel; therefore the initial year of the study will require intensive efforts to measure flows over the full range of the hydrograph in order to develop a rating to compute continuous flow.

To derive continuous discharge the following procedures will be performed:

1. Install a velocity sensor to measure index velocity.
2. Survey the cross section of the stream and develop a stage to area relationship.
3. Record continuous stage and velocity at predetermined intervals.
4. Make manual discharge measurements and compute mean velocity.
5. Develop a relationship between index velocity (measured at fixed point) and mean velocity (measured during manual discharge measurements).

To develop the relationship between index velocity and mean velocity the following steps will be performed:

1. Measure discharge (Q_m) at the site during varying hydrologic conditions.
2. Use continuously recorded stage data to determine area from the established stage-area rating (A_r).
3. Compute mean velocity (V_m) from equation: $Q_m/A_r = V_m$
4. Plot index velocity measured from ADCP or ADVM vs. mean velocity from discharge measurements to develop relationship or rating curve.

A bracket will be fixed to the side of the mid-channel bridge pier to mount a side-looker acoustic Doppler current meter (ADVM) in order to measure velocity horizontally across the middle of the channel. Velocity readings collected with the ADVM and stage data collected with the radar sensor will be stored in the DCP and transmitted hourly or more frequently if random transmissions are established.

Products: The data will be inputted and stored in the USGS Automated Data Processing System at the Alabama Water Science Center in Montgomery, Alabama; and will be available from the USGS National Water Information System Web Interface (NWISWeb). Also, data tables and other information will be available to the Baldwin County Commission upon request.

Personnel: Existing personnel in the Alabama Water Science of the USGS are available for this project. These personnel include a supervisory hydrologist to manage the project and hydrologic technicians to execute the project and perform the work assignments. The ability to obtain realtime data is an important feature because it allows the USGS hydrographers to check the data daily for accuracy. If questionable data, missing transmissions, or spikes occur, data may be edited or cleaned up based on these observations in the office; however, for problems that can not be resolved in the USGS office, a technician will be sent to the gage to correct the problems usually within one to two working days.

Funding: The project can be funded under the USGS's Cooperative Water Program by a Joint Funding Agreement (JFA) between the Baldwin County Commission and the USGS. With this type agreement, the USGS can use matching funds from the Cooperative Water Program upon their availability to fund up to fifty percent of the construction, installation, and operation and maintenance (O&M) cost.

The cost for the construction and installation of the gages is site specific, but usually ranges from \$12,000 to \$35,000 and is depends on the availability of a suitable structure for securing the monitoring sensors and the gage house. The cost estimates will include equipment and labor costs required for construction and installation of the gage.

The annual O&M cost for index-velocity discharge station is \$23,600 per year. Currently, there are no USGS matching funds available for work, therefore, Baldwin County will be responsible for the full cost to construct and for the operation and maintenance of the station.

The table below is the breakdown of the cost for a new stream-gaging station on Fish River at Baldwin County Road 32 for FY2019, FY2020, and FY2021. The USGS fiscal year runs from October 1 through September 30.

New Stream-Gaging Stations on Fish River at Baldwin County Road 32	FY 2019	FY2020	FY 2021
August 2019 to September 2020			
Construction/Installation Costs	\$33,250		
Annual Operation & Maintenance Cost		\$23,600	\$23,600
Total Cost for Baldwin County Commission (without USGS Matching Funds)	\$33,250	\$23,600	\$23,600