

**Texas A&M AgriLife
Texas Water Resources Institute**

**SWAT Model Simulation of the Arroyo Colorado Watershed
CWA 319(h)
TSSWCB Agreement No. 02-021-07-09**

Quarter no. 6 From 10/1/08 Through 12/31/08

I. Abstract

Final model runs are being conducted to calibrate and validate the model. Upon completion of the model, project personnel will begin drafting the final report to be submitted during the next quarter. TWRI anticipates expending most of the funds for the project by March 1, 2009, the project end date.

II. Overall Progress and Results by Task

TASK 1: Coordinate and Administer Project

Subtask 1.1: TWRI will coordinate project efforts with all project partners, as well as ongoing projects in the watershed. These projects include the Arroyo Colorado Ag NPS Assessment, Education of BMPs in the Arroyo Colorado Watershed, and the WQMP Implementation Assistance in the Arroyo Colorado Watershed. TWRI will participate in Arroyo Colorado Watershed Partnership meetings (steering committee and work groups) to report progress and coordinate efforts. TTVN meetings or teleconferences will be held, as appropriate, with project partners to discuss project activities, project schedule, lines of responsibility, communication needs, and other requirements.

The following actions have been completed during this reporting period:

- a. Project PI provided a presentation on the status of the SWAT model development at the steering committee meeting on October 23.
- b. An Ag Issues Workgroup Meeting will be held on Jan 26, 2009.

86% Complete

Subtask 1.2: TWRI will prepare electronic quarterly reports for submission to the TSSWCB. Progress reports shall document all activities performed within a quarter and shall be submitted by the 15th of January, April, July, and October. All progress reports will be provided to all project partners.

The following actions have been completed during this reporting period:

- a. Submitted Year 2, Quarter 2 Report on January 22, 2009.

86% Complete

Subtask 1.3: TWRI, with support from SSL and TAES, will develop a QAPP for activities in Task 2 consistent with EPA Requirements for Quality Assurance Project Plans (QA/R-5) and the TSSWCB Quality Management Plan.

100% Complete

Subtask 1.4: TWRI will implement the approved QAPP and provide revisions and necessary amendments to the QAPP.

The following actions have been completed during this reporting period:

- a. TWRI submitted an annual update of the QAPP to TSSWCB during the last quarter on September 26, 2008.

86% Complete

Subtask 1.5: TWRI will attend meetings with the TSSWCB project manager and other meetings, as needed, to review project status, deliverables, and other project matters.

The following actions have been completed during this reporting period:

- a. TWRI continued to provide information to the project personnel about contractual obligations including report deadlines and budget.
- b. TWRI facilitated a meeting between AgriLife and TSSWCB to discuss model scenarios.

86% Complete

Subtask 1.6: TWRI will perform accounting functions for project funds and will submit appropriate Reimbursement Forms to TSSWCB at least quarterly.

The following actions have been completed during this reporting period:

- a. An invoice for the amount of \$35,508.97 was submitted for the period of September 1, 2008 through November 30, 2008. Total funds expended on the project thus far is \$39,384.44

42% Complete

Subtask 1.7: TWRI will develop, host and maintain an internet website for the dissemination of information.

The following actions have been completed during this reporting period:

- a. The Arroyo Colorado Web site, <http://www.arroyocolorado.org> continues to be updated.

86% Complete

Subtask 1.8: TWRI, with assistance from SSL and TAES, will develop the final report and technical documentation of the project for submission to TSSWCB, EPA, and project partners.

0% Complete

Task 2: Watershed data compilation, analysis, and simulation using SWAT

Subtask 2.1: Various data such as land use (current and historical), soil, BMP implementation locations, topography, sub-watershed delineation (matching earlier HSPF sub-watersheds), long-term weather data, crop management practices, stream flow and water quality data (current and historical) on sediment, BOD, and nutrients, for the Arroyo Colorado Watershed will be compiled for the period of 1999-2006 from sources such as USGS, TCEQ, TWDB, TPWD, IBWC, Nueces River Authority (NRA), TAES, TCE, and NRCS.

The following actions have been completed during this reporting period:

- a. Data assembly complete.

100 % Complete

Subtask 2.2: The SWAT model will be set up and calibrated to measured flow and in-stream measurements of sediment, BOD, and nutrient concentrations for the period of 1999-2003 (with 1999 as warm-up period) using monitoring data available from USGS and IBWC stream gages, as well as data from the TWDB, TCEQ, and NRA. Model parameters related to (sub) watershed/landscape processes will be adjusted to match the measured and simulated flow, sediment, BOD and nutrient loading at key locations in each subwatershed.

The following actions have been completed during this reporting period:

- a. In preparation for set-up and calibration:

Model setup is nearly over. Different BMPs existing in the watershed are represented in the present model set up. Once the BMP representation is complete the flow calibration attempted earlier will be repeated for the updated model setup (with BMPs). The procedure for flow calibration is as follows. About 14 flow based parameters were selected to identify the parameters sensitive to stream flow. Latin hypercube sampling method was used for the sensitivity analysis. The parameters identified as sensitive (to stream flow) were divided into certain intervals and a semi-automated calibration procedure is designed to do flow calibration. The calibration program runs for all the possible combination of parameters within the parameters used for calibration and the ranges considered. For example, if we use 3 parameters for calibration and each parameter has 4 possible values, then the total number of calibration model runs will be 64 (4x4x4). The calibration program has some inbuilt tools for calculating model performance measures (such as Nash and Sutcliffe Efficiency, R^2 , mean absolute error etc.) for each calibration model run. The combination of parameters that brings best model performance will be used for looking at the sediment and nutrient results. After receiving the location of different BMPs, the SWAT input files will be changed to accommodate the existing BMPs in the watershed. Then the flow calibration will be repeated for the complete model setup with BMPs before proceeding to sediment and nutrient modeling

86% Complete

Subtask 2.3: Subsequent to calibration, the model will be validated using measured flow and in-stream measurements of sediment, BOD, and nutrient concentrations for the period of 2004-2006.

The following actions have been completed during this reporting period:

- a. No action to report at this time.

0% Complete

Subtask 2.4: Simulate load reduction scenarios for a suite of management measures specified by the TSSWCB.

The following actions have been completed during this reporting period:

- a. No action to report at this time.

0% Complete

Subtask 2.5: Provide TSSWCB the flow and watershed loadings to the Arroyo Colorado, as determined by SWAT, for input by TCEQ into the EFDC model. SWAT output will include time series of average daily flow (in CMS) and sediment, BOD, NH₃-N, NO₂+NO₃, TN, OP and TP loadings (in metric units of mass) at the Port of Harlingen and for each sub-basin (10-14) downstream of the Port of Harlingen (flow to be reported as flow volume for the sub-basins).

The following actions have been completed during this reporting period:

- a. No action to report at this time.

0% Complete

III. Related Issues/Current Problems and Favorable or Unusual Developments

- None to report at this time.

IV. Projected Work for Next Quarter

Task 1

- Submit the final report

Task 2

- Conduct final model runs to calibrate and validate the model. Submit the final project report