

## Evaluating Water Quality Best Management Practices for Reservoirs in North Central Texas

Texas Water Resources Institute  
FY 03 Federal Appropriated Funds  
Project # X7-9764801-0

Quarter no. 11 From 4/8/06 Through 7/7/06

### **Progress in Meeting Project Milestones and Output Commitments**

#### Task, Deliverables and Schedules

The Texas Water Resources Institute (TWRI) along with the Texas A&M University Spatial Sciences Laboratory (SSL), Alan Plummer Associates, Inc. (APAI) and Espey Consultants, Inc. (EC) have been diligently working to complete project deliverables. Project efforts during the eleventh quarter focused on modeling activities. The SSL and EC have collaborated on efforts to interact SWAT, QUAL2E and WASP models to predict nutrient and sediment loadings of Cedar Creek and Eagle Mountain Watersheds. SWAT, QUAL2E and WASP have successfully been integrated. APAI has begun collecting data from wastewater treatment plants within Richland Chambers Watershed and will begin inputting this data into an Access database. TWRI continues to update its Web site containing water quality information, specifically related to project efforts, for scientists and the general public.

In looking forward to the next quarter, work will continue as it relates to running BMP scenarios through SWAT seeking a 30 to 40 percent reduction in loadings. Making BMP scenario runs through the newly developed SWAT/QUAL2E/WASP model and computing the economic cost associated with these BMPs will be the focus of the twelfth quarter as well as finalizing modeling activities for Eagle Mountain Reservoir Watershed. Additionally, work will continue in the development a draft of the watershed protection plan for Cedar Creek watershed. The process will begin to gather stakeholder input for the watershed plan. The watershed protection plan will include EPA's nine elements. Work associated with Eagle Mountain Reservoir modeling activities will continue. Activities for Richland Chambers Reservoir will be initiated.

The status of tasks, milestones and deliverables will be defined using the following terms:

Pending	Work has not started on the deliverable
Initiated	Work has started
Completed	Objectives were achieved and deliverables are finished
Deferred	Work has started, but further action is delayed pending other information, the completion of another objective, staff restraints, etc.
Ongoing	Work will continue throughout the term of the contract

**Task 1 SWAT Modeling**

Due Date	Status	Deliverables
1/1/04	Completed	1. Complete model calibration and validation for Cedar Creek
4/1/04	Initiated	2. Development of Watershed databases
10/1/04	Initiated	3. Development and Evaluation of Different BMP strategies for Cedar Creek Watershed
1/1/05	Initiated	4. Model calibration and validation for Eagle Mountain Watershed
9/1/05	Pending	5. Development and evaluation of different BMP strategies for Eagle Mountain Watershed
9/1/05	Initiated	6. Development of ArcGIS/ArcHydro interface for SWAT and WASP
9/1/05	Pending	7. Development of interface for using NEXRAD weather information for SWAT
7/1/06	Pending	8. Model calibration and validation for Richland Chambers Watershed
10/1/06	Pending	9. Development and evaluation of different BMP strategies for Richland Chambers Watershed

Comments:

- The Spatial Sciences Lab (SSL), in cooperation with Blackland Agricultural Research and Extension Center, has completed the validation and calibration of the SWAT model for Cedar Creek Watershed. This deliverable is 100 percent complete.
- SSL has been in contact with state and federal agencies (TCEQ, TRWD, NRCS and USGS) to obtain GIS data for the watershed database. The Access database, once complete, will contain information on land use, soils, elevation, weather and watershed delineation data. This deliverable is currently 90 percent complete.
- The research team has identified BMPs which will be beneficial in reducing loadings in stream segments and Cedar Creek Reservoir. SWAT runs have been made to get estimates as to the type of reservoir loadings (point or non point sources) and sources of contamination (stream segments, tributary flow or resuspension of reservoir sediments). These model runs have helped focus BMP selection.
- The research team has begun to run BMP scenarios through the SWAT/QUAL2E/WASP model to look at plausible BMPs to implement and at which locations, as well as the overall reduction these BMPs will have on nutrient and sediment loading into Cedar Creek Reservoir. This deliverable is 50 percent complete.
- SSL has collected water quality data and weather station data for Eagle Mountain Reservoir. Basins and sub-basins have been delineated for the SWAT model and the process is under way to calibrate and validate the model. The SWAT model has been calibrated and validated for hydrologic processes. Furthermore SWAT has been calibrated and preliminarily validated for water quality parameters.

**Task 2 In-Stream and Reservoir Modeling**

Due Date	Status	Deliverables
4/1/04	Completed	1. Development of In-stream modeling (QUAL2E) for Cedar Creek Watershed
10/1/04	Completed	2. Development of Reservoir Modeling (WASP) for Cedar Creek Reservoir
10/1/04	Initiated	3. Development and Evaluation of Different BMP strategies for Cedar Creek Reservoir
1/1/05	Initiated	4. Data Collection for Reservoir Modeling (WASP) for Eagle Mountain
7/1/05	Initiated	5. Development of Reservoir Modeling (WASP) for Eagle Mountain Watershed
9/1/05	Pending	6. Development and Evaluation of Different BMP strategies for Eagle Mountain Watershed
7/1/06	Pending	7. Assist TRWD in development of In-stream modeling (QUAL2E) for Richland Chambers Watershed
7/1/06	Pending	8. Development of Reservoir Modeling (WASP) for Richland Chambers Reservoir
10/1/06	Pending	9. Development and Evaluation of Different BMP strategies for Richland Chambers Watershed

Comments:

- QUAL2E modeling has been completed and coefficients have been submitted to the SWAT modeling team. This deliverable is 100 percent complete.
- EC completed its work on the Cedar Creek WASP postprocessor, and input data related to nutrient kinetics and sediment sources of nutrients were finalized. The Cedar Creek WASP model has been validated and calibrated. This deliverable is 100 percent complete.
- The research team has begun to identify specific BMPs, which will be beneficial in reducing nutrient loadings in stream segments and Cedar Creek Reservoir. A technical memo with regard to BMP suggestions is in the process of being completed. Preliminary results show a necessary reduction of nutrients entering the reservoir to be within the 30-40 percent range in order to effectively reduce chlorophyll a concentrations within Cedar Creek Reservoir.
- EC has begun collecting data and delineating Eagle Mountain Reservoir segments for WASP modeling. The group is working on the reservoir's mass balance calibration for modeling runs. This task is 50 percent complete.

### **Task 3 Study of Wastewater Treatment Plants**

Due Date	Status	Deliverables
7/1/04	Completed	1. Development of a Database for Wastewater Treatment Plants in Cedar Creek and Eagle Mountain Watersheds
10/1/04	Completed	2. Assessment of Impact of Wastewater Treatment Plants (point source discharges) for Cedar Creek and Eagle Mountain Reservoirs
4/1/05	Initiated	3. Development of a Database for Wastewater Treatment Plants in the Richland-Chambers Watershed
7/1/05	Initiated	4. Assessment of Impact of Wastewater Treatment Plants (point source discharge) for Richland-Chambers Reservoir
4/1/06	Pending	5. Development of a Database for Wastewater Treatment Plants in the Benbrook Watershed
7/1/06	Pending	6. Develop information on biosolid disposal areas in the Benbrook Reservoir watershed

#### Comments:

- The wastewater treatment database is complete with information from both Cedar Creek and Eagle Mountain Reservoirs. This deliverable is 100 percent complete.
- APAI has developed a database containing all wastewater treatment plants in the Cedar Creek and Eagle Mountain Watersheds. Data contained in these databases include process diagrams of plant's current capacity, as well as diagrams of future upgrades that could be made to make the plant more efficient and to meet operating demands. Also included in the database is information regarding operating capacity, permit information, quality of discharged effluent, fate of released effluent and proximity to water bodies. Cost estimates for all process recommendations are included. This deliverable is 100 percent complete.
- APAI has developed a flow balance program that provides modeling capability within the WASP model that is more compatible with current modeling employed using SWAT model. APAI incorporated the previously developed internal flow balance program into an Access application capable of managing extensive historical flow data and SWAT model output. The group structured the visual basic program to accommodate user-defined time periods, as small as one day (previously set up on a monthly time period), and developed input data for Eagle Mountain Reservoir. This deliverable is 100 percent complete.
- APAI, working with TRWD, has identified all wastewater treatment plants permitted to discharge waste into Richland Chambers Watershed. APAI has begun to collect general data on all wastewater treatment plants for the database, but will only do further analysis on those whose discharge flows into Richland Chambers Reservoir. They include: Corsicana - both plants; Walden Woods (direct discharge); Pelican Isle (direct discharge); Dawson (Richland Creek) and; Ennis (Chambers Creek). This deliverable is 75 percent complete.

#### **Task 4 Administration**

Due Date	Status	Deliverables
1/5/04	Completed	1. Write QAPP
1/7/04	Completed	2. Quarterly Progress Reports
4/7/04	Completed	
7/7/04	Completed	
10/7/04	Completed	
1/7/05	Completed	
4/7/05	Completed	
7/7/05	Completed	
10/7/05	Completed	
1/7/06	Completed	
4/7/06	Completed	
7/7/06	Completed	
10/7/06	Ongoing	3. Final Report

#### Comments:

- TWRI continually updates the Web site created specifically for the North Central Texas Water Quality Project. The Web site can be accessed at the following address: <http://nctx-water.tamu.edu>
- On May 2, 2006, project participants met at the Blackland Agricultural Research and Extension Center in Temple, TX to discuss project deliverables and outcomes to date.
- Project Manager Clint Wolfe attended the Texas River and reservoir Managers Meeting in Austin, TX, May 18-19, 2006.

## **Problems or Obstacles Encountered and Remedial Actions Taken**

The Spatial Sciences Laboratory and Blackland Agricultural Research and Extension Center have been working closely with Texas Water Resources Institute (TWRI) towards successful completion of project deliverables. Significant progress has been made in modeling Cedar Creek and Eagle Mountain Watersheds. For the Cedar Creek watershed, hydrology calibration and validation is 100 percent complete, and for Eagle Mountain watershed, hydrology calibration and validation is 100 percent complete. Efforts continue to complete water quality validations for Eagle Mountain watershed.

The sediment survey for Cedar Creek Reservoir Watershed is complete and those findings are being used to update SWAT parameters. The goal is to have the most accurate information possible to use in developing a scientifically sound watershed protection plan. EPA Project funds were not used to pay for this additional work.

## **Work Planned for Next Quarter**

### Task 1: SWAT Modeling

Continue running the SWAT/QUAL2E/WASP model using select BMP scenarios and looking at total load reductions within the reservoir. Finalize which BMP strategies are most effective and least costly at reducing nutrient, sediment and pollutant loadings into Cedar Creek Reservoir. Finalize model validation for Eagle Mountain Reservoir.

### Task 2: In-Stream and Reservoir Modeling

Finalize development and integration of QUAL2E and WASP models for Eagle Mountain Reservoir.

### Task 3: Study of Wastewater Treatment Plants

Continue evaluating impacts that wastewater treatment plants and their discharges have on water quality of Richland Chambers Reservoir. Begin looking at Benbrook Reservoir.

### Task 4: Administration

Continue working with TRWD, SSL, EC and APAI in moving forward with project deliverables and reporting progress on a quarterly basis. Efforts will be made to publicize the project and raise awareness of water quality issues within the study area. Furthermore, TWRI will work to secure additional funding for this project above the

additional federally appropriated funds received in FY 06. TWRI will work with TAES contracts and grants to allocate funds to cooperating entities.

Additional funds currently used to support project activities include federally appropriated monies from USDA-NRCS to conduct economic analysis of BMP scenarios at reducing loadings in North Central Texas Watersheds and to develop educational program materials on watershed management.