Report as of FY2006 for 2006FL147B: "Development and documentation of upconing and drawdown models for regulatory use"

Publications

- Other Publications:
  - Motz, L. H., and Acar, Ozlem. 2006. Evaluation and Documentation of SJRWMD Groundwater Models for Use by Permit Applicants, Draft Final Report, St. Johns River Water Management District, Palatka, Florida, 84 pp.

Report Follows

PROJECT STATUS

EVALUATION AND DOCUMENTATION OF SJRWMD GROUNDWATER MODELS FOR USE BY PERMIT APPLICANTS

by

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1.1 Background and Objectives

In groundwater permit applications to the St. Johns River Water Management District (District), applicants may be required to address pumping impacts in terms of saltwater upconing and drawdown impacts. Extensive hydrogeological investigations that include numerical modeling may be required in some cases to address these issues. However, in other cases, analytical modeling techniques may be sufficient to assess impacts. In particular, analytical modeling techniques are useful in screening for impacts and/or conducting preliminary investigations that may indicate the need for more detailed investigations. The District currently utilizes several analytical groundwater models for these purposes, including a saltwater upconing model and a pumping impact model that are based on solutions by Motz (1992) and Denis and Motz (1998). For these two District models, there is a need to improve their utilization and prepare model documentation in a manner that will make these models more accessible to permit applicants and others through the District's web site. To meet this need, the University of Florida (University) has evaluated the two existing models and modified the computer codes to enhance their capabilities and accessibility to permit applicants. In addition, the University has documented the improvements in the model codes so that the executable codes and documentation can be posted on the District's web site.

1.2 Scope of Work

The investigation described in this report consisted of four tasks:

- Enhancement of the saltwater upconing model;
- Enhancement of the two-layer drawdown model;
- Preparation of a draft final project report (user's manual); and
- Preparation of a final project report (user's manual).

In the first task, documentation was developed for the model that calculates vertical upconing of the saltwater-freshwater interface beneath a single pumping well and beneath multiple pumping wells in a wellfield. Pumping beneath a single well is simulated using the single-well steady-state solution for a leaky aquifer (Motz 1992). The pumping effects of

multiple wells are simulated using the steady-state solution for multiple wells pumping from a leaky aquifer (Motz 1994). Benchmark testing of the saltwater upconing solution was performed, and the FORTRAN source code SWUP (Saltwater Upconing Program for single and multiple wells) and executable files for single- and multiple-well applications were submitted to the District for review. In the second task, documentation was developed for the model that is used to calculate pumping impacts on groundwater levels in a two-layer aquifer system. This model, based on Denis and Motz (1998), is used to calculate steady-state and transient drawdowns due to pumping from one or more wells that can be located in either or both layers and can be designated as either pumping or recharge wells. Similar to the saltwater upconing model, benchmark testing of the two-layer drawdown model was performed, and the FORTRAN source code COUAQ (Coupled Aquifer Program for single and multiple wells) and executable files for single- and multiple-well applications were submitted to the District for review. In the third task, a draft report was prepared as a user's manual that included a description of the problem, the solutions used, listings of the source codes, the results of the benchmark testing, and example problems to illustrate how to use the enhanced models. The fourth task consisted of submitting this final project report that incorporates the review comments and suggested revisions resulting from the District's review of the draft report. Along with the final report, electronic copies of the source codes, executable files, and input and output files for the benchmark and example problems will be submitted to the District. In addition, a one-day training session will be provided to District staff.

Complete details of this project are available in the Final Project Report:

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