1 Introduction

Over the last eleven years, the Bay-Delta Office's Delta Modeling Section and Division of Environmental Services' Suisun Marsh Planning Section have been developing and enhancing the Delta Simulation Model 2 (DSM2), the tools used to support DSM2 modeling, and other Delta flow and salinity estimation tools. The following are brief summaries of work that was conducted during the past year. The names of contributing authors are in parentheses.

Chapter 2 – REALM Update

Last year's annual progress report introduced development of a new multi-dimensional decision-support system for modeling in the Delta. The Delta Modeling Section has initiated contracts with several outside parties for technical assistance and has already tested prototype 2D flow and transport solvers. This chapter discusses both the work that has been completed in the past year and addresses funding scenarios and future deliverables.
(Eli Ateljevich and Ralph Finch)

Chapter 3 – DSM2 Geometry Investigations

The most recent DSM2-HYDRO and QUAL recalibration was described in the 2001 annual report. Since that time the U.S. Geological Survey (USGS) has collected 10-minute flow data at six locations surrounding Franks Tract. The DSM2 geometry around Franks Tract was modified in an effort to investigate sensitivities in DSM2's ability to simulate flow and EC around Franks Tract. This chapter describes the work performed in this series of geometry investigations.
(*Bob Suits and Jim Wilde*)

Chapter 4 – Modeling DO & Temperature in DSM2 Planning Studies

The boundary conditions necessary to simulate dissolved oxygen (DO) and water temperature in a standard DSM2 16-year planning study were developed as part of DWR's Integrated Storage Investigations's In-Delta Storage (ISI-IDS) project. Missing data consisting of DO, temperature, and climate data from 1974 – 1991 were generated with surrogate data from 1997 – 2001. The remaining water quality parameters necessary to model DO and water temperature were based on various samples taken from the Delta. This chapter summarizes the methods used to develop all of these boundary conditions.
(*Hari Rajbhandari*)

Chapter 5 – Calculating Net Delta Outflow Using CALSIM II and DSM2

CALSIM II input is frequently used as the input in DSM2 planning studies, thus leading to frequent comparisons between CALSIM and DSM2 Net Delta Outflow (NDO) estimates. However, Net Delta Outflow is difficult to physically measure in the Delta and the simple mass balance techniques used to calculate CALSIM NDO do not exactly match the NDO estimated by DSM2 at Martinez. This chapter explains why different methods of calculating NDO result in different flow estimates while outlining several common techniques that can be used to accurately estimate NDO in CALSIM and DSM2.
(*Jamie Anderson*)

Chapter 6 – Net Delta Outflow Computations for DSM2 Steady State Simulations

Chapter 6 makes use of the Net Delta Outflow computation techniques presented in Chapter 5, but focuses on using these techniques to address the accuracy of DSM2 in simulating steady state conditions (i.e. conserving mass) and simulating gradual transitions between steady state conditions. Steady state conditions are tested for three downstream tidal forcing conditions: a constant stage, a 25-hour 19-year repeating tide, and an adjusted astronomical tide. All three conditions are useful in explaining some of the basic flow and stage patterns that occur in the Delta.
(*Jamie Anderson*)

Chapter 7 – Extensions and Improvements to DSM2

Work on the DSM2 database was first reported in the 2002 annual report. This new version of DSM2, DSM2-DB, has since been expanded to include additional new improvements. The features discussed in this chapter include the graphical users interface (GUI), new treatment of gates in DSM2, trigger and action based operating rules, the HDF5 data storage format, and parallel processing. All of these new DSM2 extensions are available only to the DSM2-DB. DSM2-DB is currently undergoing testing.
(*Ralph Finch, Eli Ateljevich, Edward Diamond, and Tawnly Pranger*)

Chapter 8 – Real-Time Data and Forecasting Proof of Concept and Development

The Department has been using DSM2 to produce short-term water quality and south Delta water level forecasts since 2001. Recently, the Department's Municipal Water Quality Investigations (MWQI) program has organized a Real-Time Data and Forecasting (RTDF) committee composed of DWR and water contractors to investigate improving the Department's current DSM2 short-term Delta water quality forecasts and extending these forecasts down the California Aqueduct. This chapter describes the background behind the RTDF committee and the Section's work with that committee, focusing on a DSM2-Aqueduct seasonal forecast model proof of concept and the development tasks associated with building both short-term and long-term models capable of addressing the needs of MWQI and the water contractors.
(*Michael Mierzwa and Bob Suits*)

Chapter 9 – Using QUAL Fingerprinting Results to Develop DOC Constraints in CALSIM

The concept of fingerprinting using DSM2 was introduced in the 2002 annual report. Since that time, DSM2 fingerprinting studies have been used to help develop dissolved organic carbon constraints for use in CALSIM in support of DWR's Integrated Storage Investigations's In-Delta Storage (ISI-IDS) project. The CALSIM organic carbon constraints were developed by using DSM2 to establish a relationship between volume of releases and various flow parameters. This chapter discusses the basic methodology used to develop volume - flow relationships using volumetric fingerprinting results for use in any study by using the ISI-IDS project as an example.
(*Michael Mierzwa and Jim Wilde*)

Chapter 10 – Development of Tidal Analysis Routines

Chapter 10 introduces a tidal analysis post-processing tool developed by DWR's Division of Environmental Services Suisun Marsh Section that calculates tidal datum parameters and the phase difference between stage and tidal current. Though this tool is currently available for post-processing RMA model results, this chapter focuses on the methodology used by the tidal analysis routines to calculate the tidal datum parameters. This same methodology can be extended to the analysis of either field data or other model results as well.
(*Brad Tom*)

Chapter 11 – Website and DSM2 Users Group

The Delta Modeling Section introduces two of its newest outreach efforts: a newly redesigned webpage and a DSM2 Users Group. The redesigned Section webpage follows a standard format adopted by the Department of Water Resources allowing easy navigation. A DSM2 Users Group was formed to meet the increasing demand for DSM2 support by bringing various DSM2 users together to discuss both current DSM2 work and future model / study needs. The DSM2 Users Group makes use of the new webpage by hosting a new bulletin board where questions and answers from all uses are publicly posted and archived.
(*Min Yu*)

Chapter 12 – Calculating Clifton Court Forebay Inflow

The State Water Project's Clifton Court Forebay inflow is controlled by a series of five radial gates. The flow entering the forebay through these gates is not directly measured. In 1988 equations were developed to estimate the flow through each gate based on stage differences inside and outside of the forebay. The 1988 equations are useful in estimating historical flow through the individual forebay gates. This chapter describes these inflow equations and then compares them with another technique used by DWR's Delta Field Division to estimate the inflow through the gates.
(Kate Le)