1 Introduction

For the last seven years, the Delta Modeling Section has been developing and enhancing its Delta Simulation Model (DSM2) and support tools. The following are brief summaries of work that has been conducted during the past year. The names of the contributing authors are in parentheses.

Chapter 2 – DSM2 Schematic Viewing Program

This chapter introduces the DSM2 Schematic Viewing Program (DSVP), a new graphical user interface that may be used to view model input and output data. DSVP allows the user to view time series data through an animation routine. Section staff is using a beta version of DSVP; however, further development is ongoing. (*Tawnly Pranger*)

Chapter 3 – DSM2 San Joaquin River Boundary Extension

This chapter describes the Section's initial efforts to extend the DSM2 San Joaquin River (SJR) boundary upstream of Vernalis. Many Delta water supply, water quality, and fishery issues are closely linked to conditions in the San Joaquin River. Extension of the boundary will provide a tool to investigate how the Delta may respond to different SJR management strategies. Channel geometry has been developed along the SJR from Vernalis upstream to the Bear Creek confluence near Stevinson. Several trial runs of DSM2-HYDRO have been conducted to test and refine the channel geometry. In coordination with the San Joaquin River Management Program's Water Quality Subcommittee, historical data are being collected to calibrate the boundary extension. (*Thomas Pate*)

Chapter 4 – VPlotter

This chapter describes VPlotter, the latest in the group of VISTA tools for retrieving, manipulating, and managing time series data. VPlotter builds upon existing functionality of VISTA and VScript. VPlotter focuses on repeatability and automation.
(*Nicky Sandhu*)

Chapter 5 – DSM2 Particle Tracking Model Development

This chapter provides an update on DSM2-PTM development efforts. PTM simulations have primarily been limited to neutrally buoyant particles. Work during the past year has focused on incorporating more sophisticated particle behavior characteristics and developing a graphical user interface to define and modify these characteristics. The following behaviors have been incorporated: life stage or phase; development time; fall velocity; mortality rate; and vertical positioning. Behavior characteristics that are in the process of being implemented include transverse positioning, flow positioning, and water quality responses. (*Aaron Miller*)

Chapter 6 – Effects of Salinity-Induced Density Variation on DSM2 Hydrodynamics

This chapter discusses the results of a DSM2 experiment conducted to measure the effects of a salinity-induced feedback on hydrodynamic results. Results suggest that for typical model applications, baroclinic effects may be ignored as they are mild compared with model error. Baroclinic effects depend strongly on hydrology but weakly on location. (*Eli Ateljevich*)

Chapter 7 – Artificial Neural Network Development

This chapter reviews progress made in development and use of Artificial Neural Networks for estimating salinity at various locations in the Delta. An ANN was developed to estimate DSM2 tidal boundary salinity at Martinez for forecasting applications. (*Tawnly Pranger*)

Chapter 8 – Filling In and Forecasting DSM2 Tidal Boundary Stage

This chapter describes a new approach to fill in missing historical and forecast future Martinez stage values. An adequate characterization of stage at Martinez, the DSM2 downstream tidal boundary, is critical in order for HYDRO to simulate Delta hydrodynamics accurately. The approach combines a traditional astronomical tide model that predicts periodic fluctuations with a vector autoregressive model that predicts non-periodic residue. The approach produces fill-in values that are extremely accurate, regardless of events which take place during the fill-in period. The approach also improves tide forecasts, with the largest improvements during the first week. (*Eli Ateljevich*)

Chapter 9 – Dissolved Oxygen Modeling Using DSM2-QUAL

This chapter summarizes work conducted in preparation of a dissolved oxygen calibration in the vicinity of Stockton on the San Joaquin River. DSM2-QUAL was updated to reflect changes in hydrodynamics and general input/output modules. Calibration efforts will be conducted in coordination with the San Joaquin River Total Maximum Daily Load (TMDL) stakeholder process. (*Hari Rajbhandari*)

Chapter 10 – DSM2 Recalibration

This chapter describes the Section's participation in an Interagency Ecological Program project work team to recalibrate DSM2-HYDRO and QUAL with new geometry and flow data. The team, including staff from DWR (Department of Water Resources), USGS (U.S. Geological Survey), USBR (U.S. Bureau of Reclamation), CCWD (Contra Costa Water District), MWDSC (Metropolitan Water District of Southern California), and Stanford University, was formed in late 1998 and posted initial results in 1999. The team plans to have both HYDRO and QUAL calibrated by middle of summer 2000. Intermediate results may be viewed on a publicly available website.
(*Parviz Nader-Tehrani and Bijaya Shrestha*)

Chapter 11 – DSM2-QUAL Initialization

This chapter surveys methods of initializing DSM2-QUAL real-time model runs. When the model simulation period is long compared to system memory, initial conditions influence only a small fraction of the run. In such cases (e.g. planning studies), the model is typically "cold started" from a numerically convenient initial condition. This approach, which relies on long-term system memory loss, is not sufficiently accurate for real-time model applications. Two "warm start" schemes, an "optimization-based" approach and a "patch-based snapshot" approach, were developed to generate initial conditions for real-time applications. Both are shown to provide reasonably good initial conditions; both schemes are shown to be superior to the "cold start" approach.
(*Eli Ateljevich*)