Figure 6-12  Comparison of Simulated and Observed Water Level Contours for 1979 Steady-State Calibration, Model Layer 1
Figure 6-13  Contour of 1979 Steady-State Model Error (feet), Model Layer 1
Figure 6-14. Cross-plot of Steady-State Simulated vs. Observed Heads
indicating that the data are well correlated throughout the range of observed heads so that the model replicates the average gradient fairly well. The two exceptions include a well near the northwestern model boundary, far from the canals (009S009E04M001S), and a well completed in model Layer 3 (013S018E33A001S). As shown in Figure A-3, well 13S18E33A shows a sharp drop of 30 feet in the observed heads at the beginning of 1983. The model does not reproduce this drop. There is no pumping well or other groundwater sink in the vicinity of well 13S18E33A, and neighboring wells with hydrographs do not show similar drops in head during this period. The model agrees with data from well 13S18E33A after the drop until the mid-1990s.

Figure 6-15 shows a plot of the difference between the heads in Layer 3 and the ground surface elevation. Positive values indicate the head is below land surface, and negative values indicate artesian conditions, with the head above land surface. Artesian conditions for Layer 3 are observed in the Eastern Imperial Valley, between the Alamo River and the East Highline Canal, and in the East Salton Sea area; thus, the predicted area of artesian conditions agrees fairly well with the site conceptual model (see Figure 6-5).

6.2.4 Transient Calibration Results

A transient simulation was conducted for the period from 1979, following the lining of the first 49 miles, to 2006. Observed data generally extend to 1988 for flow and to 1999 for water levels. Simulated and observed water levels are compared during the period for several monitoring wells in Figures 6-16 through 6-18. The average model error is 1.99 feet, the absolute model error is 6.4 feet, and the standard deviation of the error is 7.0 feet. Additional hydrographs are shown in Figures A-1 through A-3. In general, the slope of the water levels versus time compare quite well in the simulated and observed data, and the model and measured data both trend to steady state conditions during the early 1990s. However, several hydrographs on Figures 6-17 and 6-18 show a slight rise in observed water levels starting in the early 1990s (e.g., 6926 and 7611.08). This rise is not simulated by the model because the CHD heads at La Mesa Drain are prescribed to trend towards the 1979-to-1993 average values after 1993. Observed water-level contours are not available after 1993. The hydrograph on Figure A-2 (15S14E18C) shows simulated heads consistently higher than observed heads by approximately 7 feet. This well is in the IID area where constant heads 6 feet below land surface are simulated in the model. The uncertainty in the land surface elevation is about 10 to 15 feet, and is thus greater than the difference between the simulated and observed heads on Figure A-2.
The total predicted drop in heads from the pre-lining to 1990 post-lining conditions are nearly identical to the measured values. These comparisons indicate that the model canal seepage rates, transmissivity, and storativity values reproduce the same trends in water levels and overall changes in water levels that were observed, validating the model hydraulic behavior. Given that the model data also correlate well with field measurements of aquifer parameters, the model would appear to adequately represent the aquifer system response to canal seepage.

Tables 6-3 and 6-4 compare the simulated and observed water budgets for the transient simulation period. There is very good agreement, with the average difference between the simulated and observed water budget data being less than 10 percent and many items matching within 5 percent. Model error during 1993 is quite similar to error for the steady-state simulation prior to the transient run, indicating that the model does not appear to be drifting out of calibration. This suggests model prediction errors may also be expected to be distributed randomly as observed in both model calibrations, and a known bias is not anticipated.

Table 6-5 shows a summary of prescribed groundwater flux from Coachella Valley to the Salton Sea, with a reversal in gradient observed in 1998 due to pumping in Coachella Valley. Figure 6-19 shows the simulated and observed water levels in Salton Sea, with generally good agreement over the time period.

6.3 MODEL SENSITIVITY ANALYSIS

Table 6-6 summarizes the results of the sensitivity analysis on the transient groundwater model, giving a brief description of the parameters varied in each sensitivity case and reporting the model results in terms of mean error, mean absolute error, RMS error, and scaled RMS error. The sensitivity analyses can generally be grouped into the following categories:

- Global increase/decrease of hydraulic conductivity throughout the entire model to define sensitivity to entire model hydraulic conductivity;

- Global increase/decrease of specific yield and storativity throughout the entire model to define sensitivity to entire model storage coefficients; and

- Changes in regional boundary conditions to define their impact on the model.