6.0 GROUNDWATER FLOW MODEL

6.0 GROUNDWATER FLOW MODEL

Prior Groundwater Modeling Studies in Imperial Valley

There have been four prior groundwater models constructed covering some portion of the study area. The USBR constructed the All-American Canal Ground Water Model (Bureau of Reclamation 1988) using a modified version of the Illinois State Water Survey Aquifer Simulation Program (Prickett and Lonnquist 1971). The model consists of 3 layers, 26 columns, and 29 rows covering the 90-mile by 81-mile area of the East Mesa, Mexicali Valley, and Imperial Valley depicted in Figure 6-1. The model was calibrated to the rise in water levels along the AAC during the period 1940 to 1972 using the hydraulic conductivity distribution given in Figure 6-1. The All-American Canal Ground Water Model hydraulic conductivity values are low west of the East Highline Canal where the aquifer is composed of low permeability lake sediments and high in the East Mesa where the aquifer is composed of high permeability sands and gravel. The highest hydraulic conductivity values are primarily along the border in East Mesa and in Mexicali, which is consistent with a longitudinal resistivity survey of Imperial Valley (Bureau of Reclamation 1972).

Imperial County and IID constructed the Imperial County Ground Water Model using a version of the Integrated Groundwater and Surface Water Model (IGSM) Model (Montgomery Watson, 1995). The model consists of 2 layers and 1,432 elements covering 4,017 square miles in the East Mesa, Imperial Valley, Borrego Valley, Ocotillo Valley, West Salton Sea, and East Salton Sea basins as depicted in Figure 6-1. The model was calibrated to the water levels during the period 1970 to 1990 using the hydraulic conductivity distribution given in Figure 6-1. The Imperial County Ground Water Model hydraulic conductivity values are smallest in the valley center at the south shoreline of the Salton Sea, and values gradually increase to the southeast. The highest hydraulic conductivity values are in the southeast near Pilot Knob.

Professor G. Fogg of the University of California, Davis constructed a Coachella Canal seepage model using a version of the finite element FLUMPS developed at Lawrence Berkeley Laboratory (Narasimhan *et al.* 1978). The model consists of 1 layer and 140 elements covering 1,015 square miles of the East Mesa and Imperial Valley as depicted in Figure 6-2. The model was calibrated under steady state conditions for water levels during 1942 and under transient conditions for the period 1942 to 1986 using

the hydraulic conductivity distribution given in Figure 6-2. The model hydraulic conductivity values are lower to the west where the aquifer is composed of low permeability lake sediments and higher towards the East Mesa where the aquifer is composed of high permeability sands and gravel.

The Republic of Mexico developed a model (Bureau of Reclamation 1991) using a modified version of the Illinois State Water Survey Aquifer Simulation Program (Prickett and Lonnquist 1971). The model consists of 24 columns and 20 rows covering a 660-square-mile area of the East Mesa and Mexicali Valley. The model was calibrated to the rise in water levels along the AAC; the model hydraulic conductivity values were not documented.

6.1 MODEL CONSTRUCTION AND ASSUMPTIONS

Code Selection. The USGS groundwater model MODFLOW was selected for use in this study (McDonald and Harbaugh 1988). The MODFLOW model is appropriate given the objectives of the Salton Sea seepage study and the characteristics of the aquifers in the East Salton Sea, Imperial Valley, and the East Mesa. The MODFLOW code has been well tested and is widely accepted by the technical community.

6.1.1 Location and Grid Design

6.1.1.1 Areal Extent and Boundary Location

The model was constructed using 3 horizontal layers, 186 rows, and 103 columns covering the 93-mile by 52-mile area of the East Salton Sea, East Mesa, and central Imperial Valley depicted in Figure 6-3. The modeled area was selected considering the following:

- It includes all canal reaches to be lined and the canal seepage flow paths to the Salton Sea and the adjacent wetlands;
- It includes natural boundaries along the edges of the groundwater basin such as the Chocolate Mountains;

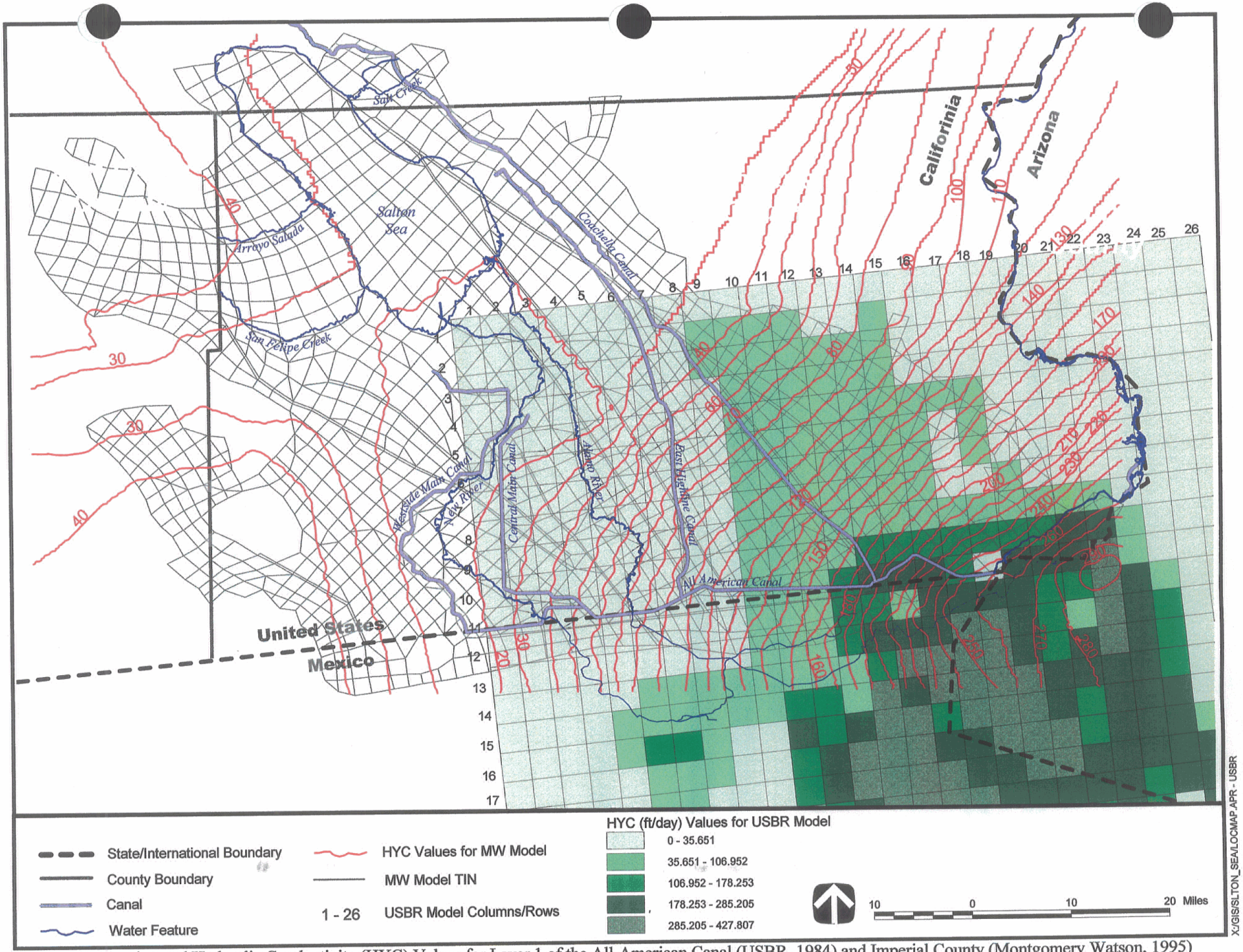

Figure 6-1 Location and Hydraulic Conductivity (HYC) Values for Layer 1 of the All-American Canal (USBR, 1984) and Imperial County (Montgomery Watson, 1995) Groundwater Models

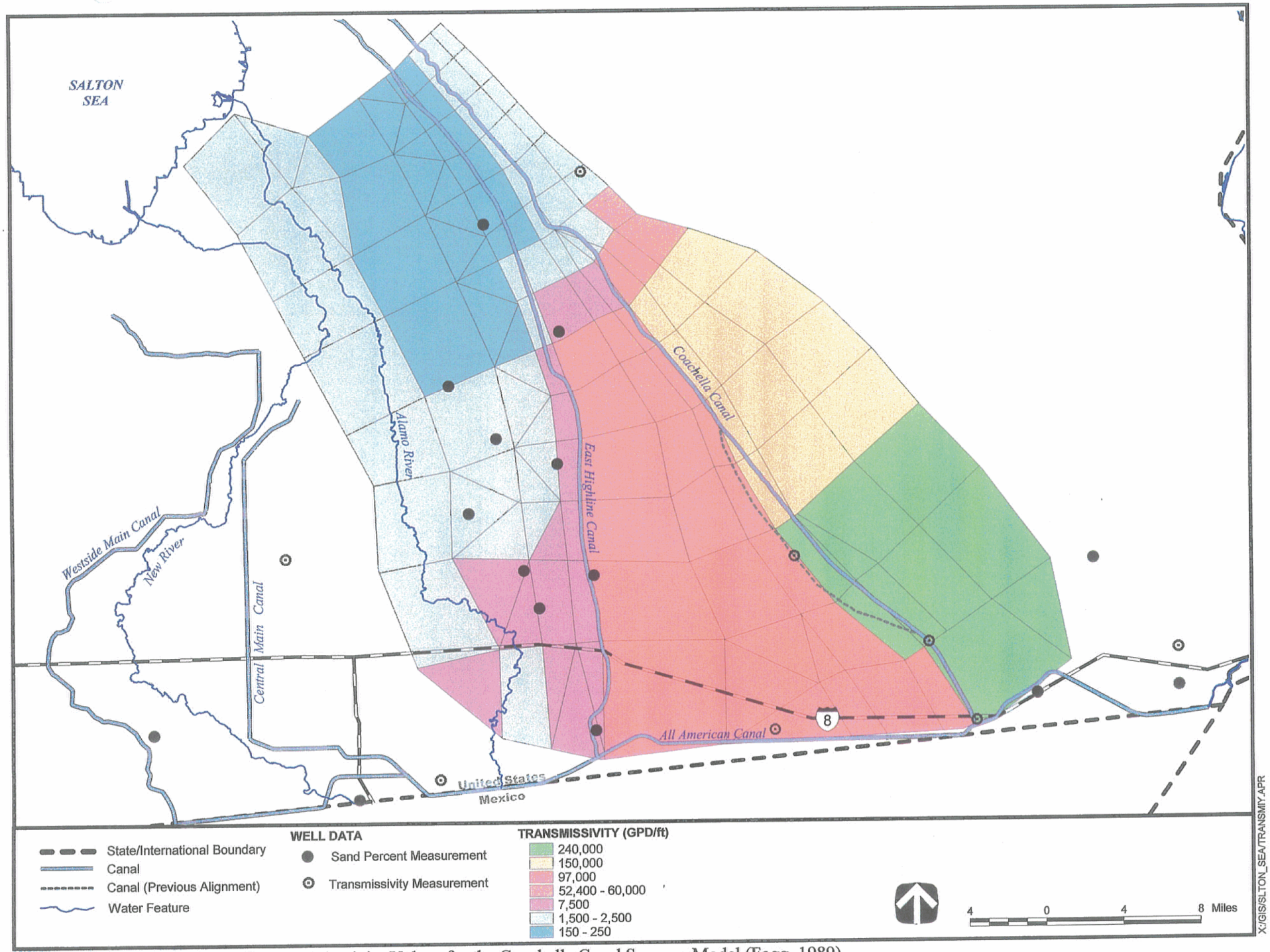

Figure 6-2 Location and Hydraulic Conductivity Values for the Coachella Canal Seepage Model (Fogg, 1989)