lower Coachella Valley is lined with concrete. Though the original CB had a capacity of 2,500 cfs, the recently lined 49-mile section has a design capacity of 1,550 cfs (Salton Sea Authority 1998).

The AAC is 82 miles long, originating at Imperial Dam. None of the AAC is lined. The capacity of the AAC is 7,755 cfs near Drop No.1, gradually reducing to 2,655 cfs at the final connection to the Westside Main Canal, approximately 10 miles west of Calexico. The Canal supplies three northerly trending branch canals which originate just north of the international border: the East Highline Canal, the Central Main Canal, and the Westside Main Canal. A network of feeder canals branch from these primary supply canals. The Imperial Irrigation District distribution system includes over 1,600 miles of irrigation canals, 10 regulating reservoirs, and over 14,000 appurtenant structures, including gates, checks, drops, wasteways, spillways, and delivery turnouts (Montgomery Watson 1995).

Several of the canals, including the AAC from Drop 3 to Drop 5, and the East Highline Canal along the southernmost 10 miles, have seepage recovery drains installed immediately adjacent to the canals. Shallow groundwater derived from canal seepage flows directly into these seepage recovery drains. The seepage recovery water is collected in a sump and pumped back into the canal very near the canal length where seepage loss occurred.

The central part of the Imperial Valley consists of 500,000 acres of irrigated and drained farmland. The irrigated portions of Imperial Valley contain an extensive network of drainage canals and subsurface tile drains. The tile drains were installed to prevent waterlogging and salt buildup in the clay rich soils. Tile drains are typically at a depth of 5 to 6 feet (a few may be as deep as 7 feet at the outlet end), and carry subsurface water containing dissolved salts to sumps at the tail end of selected fields or discharge directly to drainage canals. The drainage canals receive both tail water and tile drainage. All drainwater ultimately is discharged to the Salton Sea, either directly from drainage ditches or by way of the New and Alamo Rivers (Schroeder, Rivera *et al.* 1993). The majority of the flow in the drain system is agricultural runoff, although some is intercepted groundwater that has moved up into the drains from the deeper aquifer near the east boundary of the irrigated area (Loeltz *et al.* 1975).

2.1.4.3 Wetlands

Seepage along the AAC has induced wetland vegetation to develop along the canal in a landscape that was previously dry desert. These wetlands are dominated by an invasive exotic phreatophyte--salt cedar. Salt

cedar has taken over approximately 50 percent of the total wetland acreage. The intersection of topographic lows and the seepage-maintained high water table has induced 1,422 acres of wetlands between Drops 3 and 4 (Bureau of Reclamation 1994). A regional view of wetlands and groundwater discharge areas is shown on Figure 2-6a, and the wetlands and groundwater discharge areas for the AAC are shown on Figure2-6b. For a complete discussion on the wetlands adjacent to the AAC, refer to the Environmental Impact Statement/Environmental Impact Report for the AAC Project by the Bureau of Reclamation dated March 1994 and Section 4.0 of this report.

Seepage along the CB has also induced wetlands habitat in an area that was originally dry desert. Wetlands are defined by the U.S. Fish and Wildlife Service as lands transitional between terrestrial and aquatic systems where soils are wet or flooded. Salt cedar has taken over approximately 70 percent of the total wetland acreage. Approximately 40 percent of the total wetland vegetation and 85 percent of the marsh vegetation are located within the Salt Creek Area. Prior to construction of the CB, artesian flow occurred naturally in the Salt Creek Area; therefore, seepage losses along this portion of the canal only represent a portion of surface flow along Salt Creek. The wetlands and groundwater discharge areas for the CB are shown on Figure 2-6c. For a complete discussion of the wetlands adjacent to the CB, refer to the Environmental Impact Statement/Environmental Impact Report for the Coachella Canal Lining Project by the Bureau of Reclamation dated December 1993 and Section 5.0 of this report.

2.1.4.4 Historical Overview

By 1900, over 1,000 people had settled in the Imperial Valley, and available water supplies were insufficient to sustain agriculture and infrastructure development. Construction began on a conveyance canal system in 1900, which would divert Colorado River water from a point in Mexico. By 1902, 400 miles of canals and lateral branches were in service, and nearly 100,000 acres of farmland had been prepared for cultivation. By the end of 1904, the canals had silted up, the Colorado River was low, and the demand for water had increased. To increase flow to the canal system, the control gates on the river were bypassed by making cuts in the bank and building wing dams from shore to deflect water into the canals. Plans for new control gates were completed in November 1904, but were not approved before the next major flood (Norris and Webb 1976).

The last uncontrolled flooding of the Salton Trough by the Colorado River occurred in 1905 to 1907, when the present Salton Sea was formed. In the early summer of 1905, approximately 16 percent of the Colorado

River entered the canal system, and by October, 100 percent was diverted into Imperial Valley. New control gates were completed in early 1906, and in February 1907, the breach was finally sealed. The water surface elevation of the Salton Sea was then 198 feet below sea level, its highest historic recorded elevation.

2.1.5 Groundwater

2.1.5.1 Aquifer Description

Although the valley fill is more than 20,000 feet thick, this study addressed the heterogeneous sequence of nonmarine deposits in approximately the upper 1,000 feet of the basin, corresponding to deposits of late Tertiary and Quaternary age. Groundwater is found within two anisotropic units: a shallow, unconfined, alluvial aquifer that is bounded at depth by an aquitard; and a deeper, semi-confined, alluvial aquifer that is bounded above by the aquitard and at depth by bedrock. The hydraulic connection between groundwater in the deeper aquifer and the shallow aquifer is poor. The thickness and elevation of the aquifers vary in relation to the ground surface topography. Cross-sections A-A' and B-B' (Figures 3-5 and 3-6) illustrate the general lithology of the two hydrostratigraphic units and the aquitard. The shallow aquifer, aquitard, and deepar aquifer corrrespond to Layers 1, 2, and 3, as described in Section 6 (Groundwater Flow Model).

Groundwater in the study area occurs in water-bearing formations in sub-basins within and adjacent to the Salton Trough, including the Imperial Valley, West Salton Sea, Ocotillo Valley, Coyote Wells Valley, Chocolate Valley, the East Salton Sea, Amos Valley, and Ogilby Valley sub-basins (Figure 2-7). The regional aquifer system is bordered by the Salton Sea on the north, the Chocolate Mountains on the northeast, the Mesa de San Luis on the southeast, the Sierra de Las Cucapan and Laguna Salada on the south west, and the Peninsular Range on the west. Imperial Valley is the largest of the subbasins, covering approximately 1,870 square miles. Generally, this basin underlies the irrigated acreage in Imperial Valley, as well as the East and West Mesa areas (Montgomery Watson 1995).

The groundwater reservoir in the Imperial Valley consists primarily of Pliocene to Plesistocene age valley fill deposits more than 20,000 feet thick. These deposits are underlain by rocks of pre-Tertiary age that are referred to as the basement complex. The last marine invasion of the Salton Trough is represented by the Imperial Formation. It is overlain by a thick, heterogeneous sequence of nonmarine Colorado River deposits generally consisting of silt, sand, and clay. Some of the deposits were derived locally, but most were

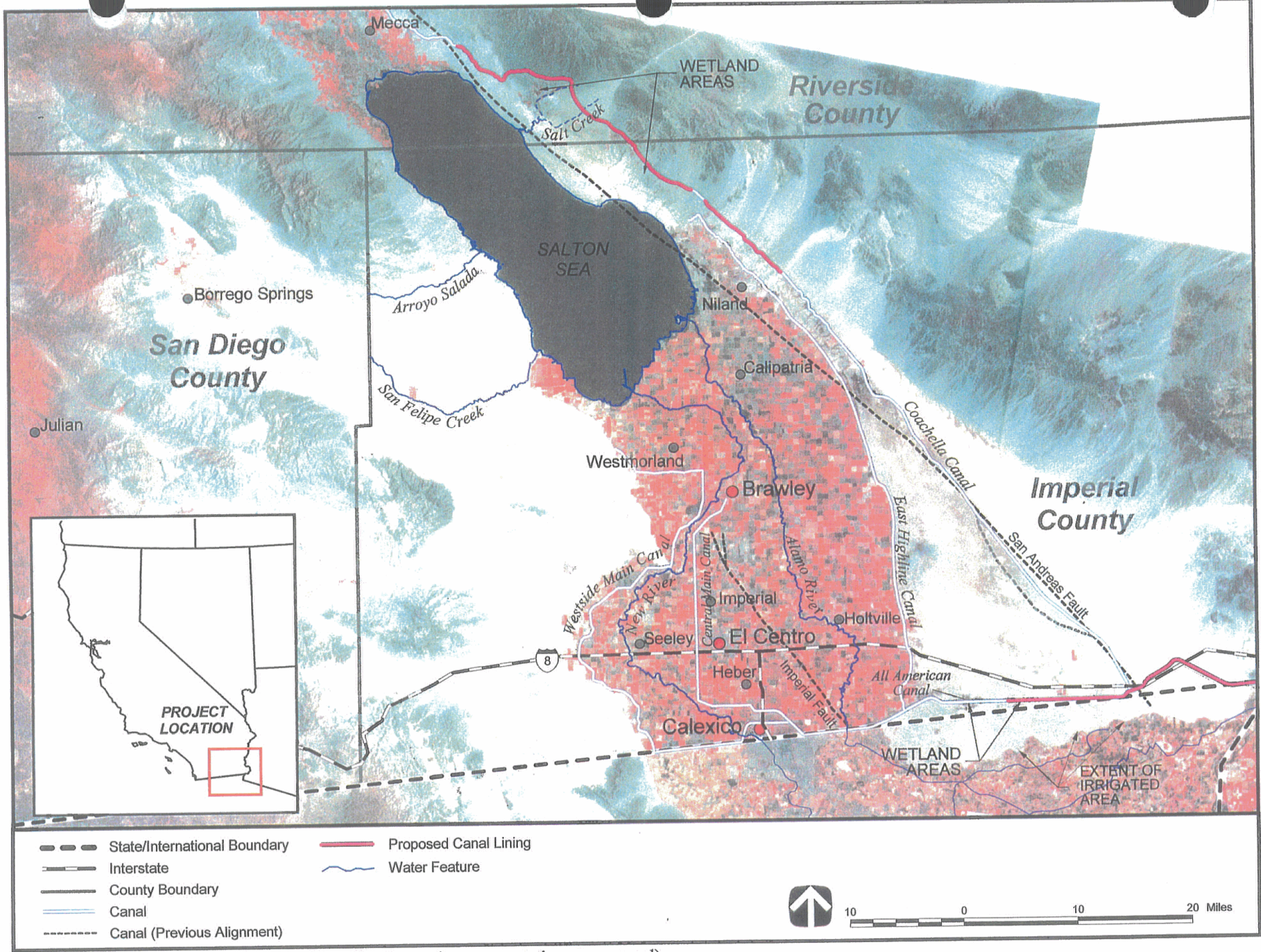

Figure 2-6a Regional View of Infrared Satellite Image (green vegetation appears red)

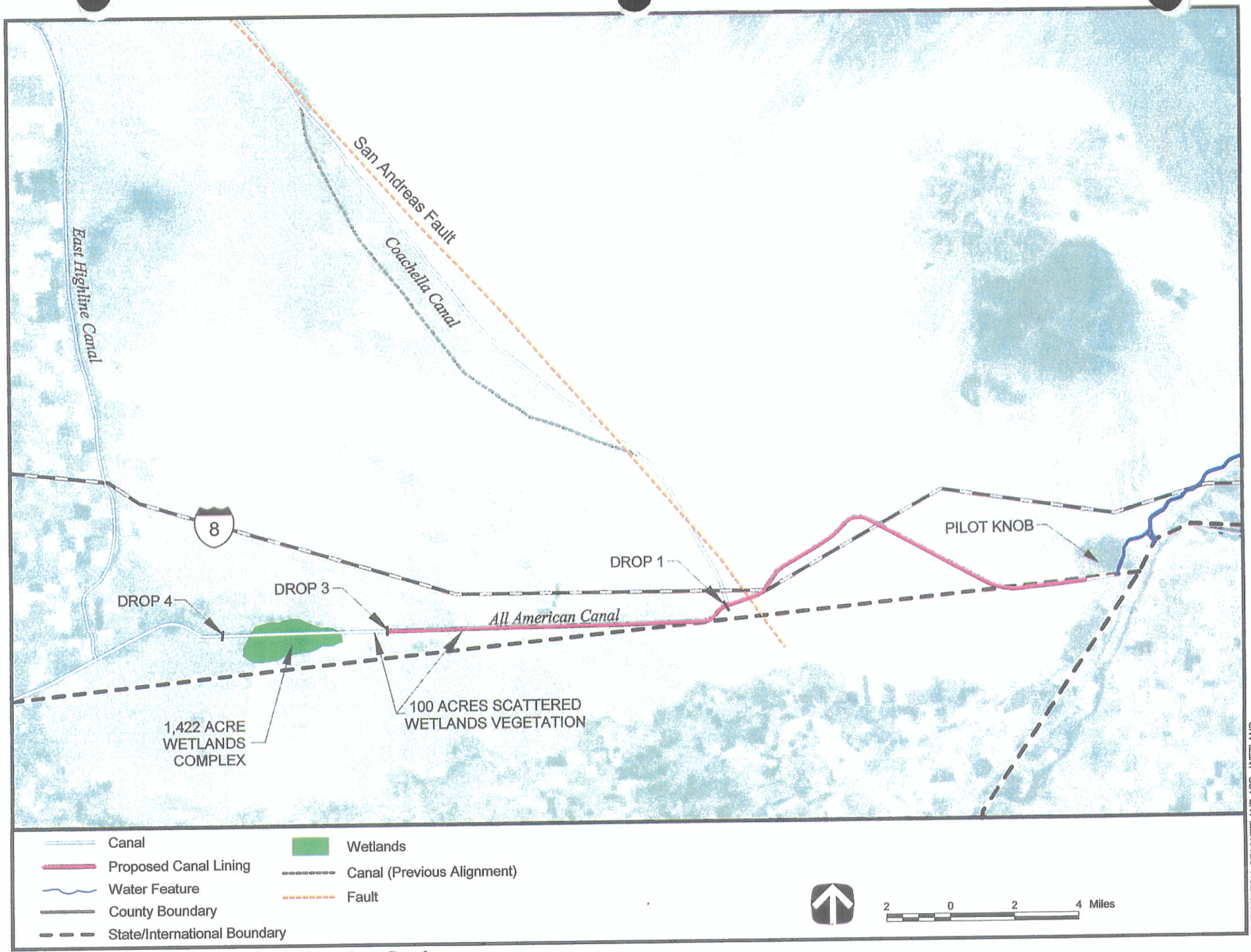

Figure 2-6b Wetlands Areas Near All American Canal

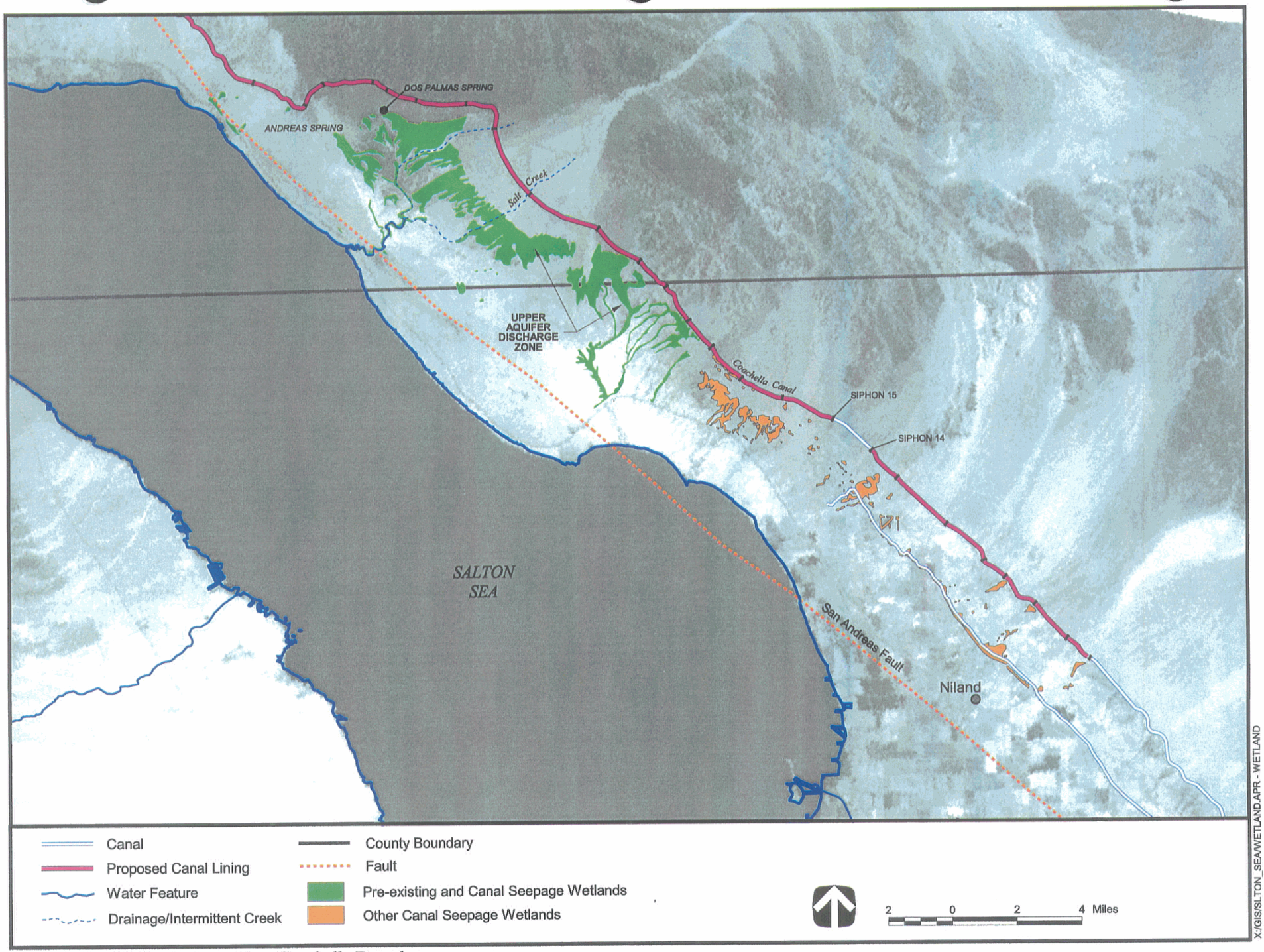

Figure 2-6c Wetlands Areas Near Coachella Branch