

## **CHAPTER 2.0 PCWA RAW WATER DISTRIBUTION SYSTEM**

The PCWA water system was established in 1968. Water is marketed through various water contracts and five zones. Currently, PCWA supplies wholesale and retail water to a resident population and employment base of more than 1 million people. A significant amount of raw water irrigates pastures, orchards, rice fields, farms, ranches, golf courses, and is used for other uses. PCWA retails treated water to customers residing in Alta, Colfax, Auburn, Loomis, Rocklin, small portions of Roseville, Penryn, Newcastle, and in the vast unincorporated areas of western Placer County. PCWA also wholesales treated water to the City of Lincoln and several smaller special districts that then retail it to their customers. Raw water is sold to the City of Roseville, San Juan Water District (for the Granite Bay area), and special districts such as the Sacramento Suburban Water District (Sacramento Suburban, formerly Northridge Water District) that provide their own treatment and then retail water to their customers.

The following sections describe sources of PCWA's water supply, PCWA's raw water distribution system, operations of the system, and maintenance activities.

### **2.1 WATER SOURCES**

PCWA's raw water distribution system is physically tied to Pacific Gas and Electric's (PG&E) Drum-Spaulding Project, through multiple power generation facilities, reservoirs, and water purchase points (buy points). PCWA holds water rights up to about 40 cubic feet per second (cfs) on Canyon Creek. Additional raw water supplies are pumped from the American River and delivered to customers in the lower Zone 1 and/or Zone 5 service areas. The following sections describe PCWA's water supply sources.

#### **2.1.1 PG&E Drum-Spaulding Project**

PG&E's Drum-Spaulding Project supply originates from the upper Yuba River Basin, augmented by Bowman Lake and Lake Spaulding on the South Yuba River and Rollins Reservoir on the Bear River. The water supply is conveyed primarily via the Drum, Bear River, and Upper Boardman canals. PG&E operates the Drum-Spaulding Project mainly for hydropower purposes. The majority of raw water deliveries to PCWA depend wholly on PG&E operations.

The 1968 PCWA-PG&E Water Supply Contract, as amended in 1996, provides for a maximum annual supply of 100,400 acre-feet of Zone 1 water at specified prices to be delivered through designated points at a total combined delivery rate not in excess of 244.8 cfs. PCWA also has a separate water supply contract with PG&E for an additional 25,000 acre-feet of water for PCWA's Zone 3 service area. PCWA is responsible for supplying reasonably adequate storage to meet the minimum essential requirements of its customers during any interruptions of service from PG&E, and PG&E is not liable for the insufficiency or interruption of water during droughts or as a result of certain natural or human causes.

The PG&E supply is purchased and delivered through the PG&E Towle, Bear River, Wise, and South canals at authorized buy points (points of delivery).

### **2.1.2 Middle Fork Project and American River Pump Station**

The Middle Fork Project (MFP) is a multipurpose project designed to conserve and control waters of the Middle Fork American River, the Rubicon River, and certain tributaries for irrigation, domestic, commercial, and recreational purposes, and for the generation of electricity.

Principal MFP features include two storage reservoirs (French Meadows and Hell Hole), five diversion dams, five hydroelectric power plants, diversion and water transmission facilities, five tunnels, and related facilities. Through its MFP storage rights, PCWA has physical control of more water than it has the right to consumptively divert.

The authorized diversion points for the PCWA MFP supply are at the Auburn Dam site on the North Fork American River and Folsom Lake. When the MFP was constructed in the 1960s, the Auburn Ravine Tunnel and a 50-cfs pumping plant on the North Fork American River were installed to enable PCWA to pump water from the American River. Modifications to the Auburn Ravine Tunnel and removal of the pumping plant occurred later in anticipation of the construction of the Auburn Dam. The current facility at Auburn Dam site is a permanent pumping station installed by the U.S. Department of Interior, Bureau of Reclamation.

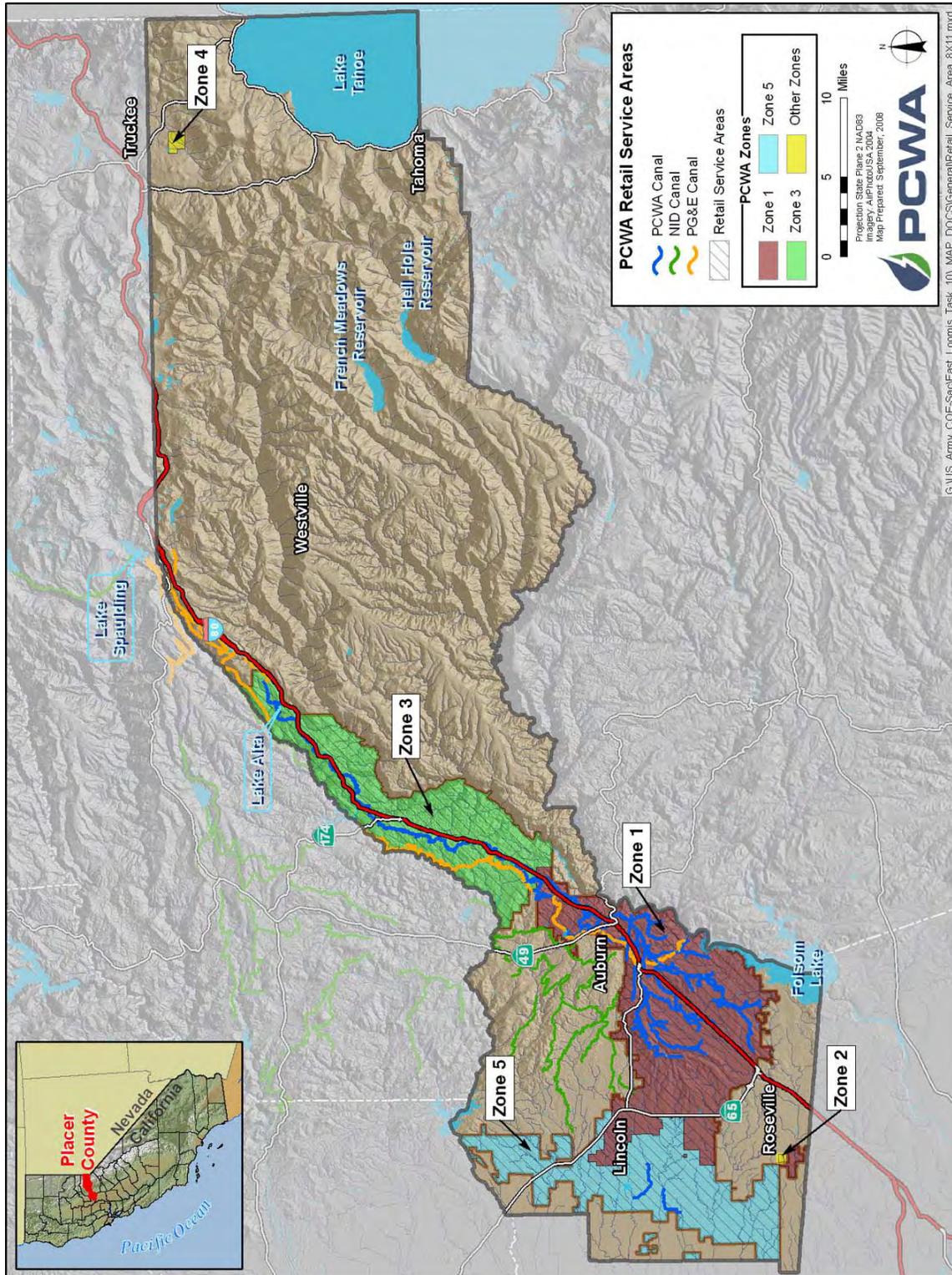
The permanent American River Pump Station (ARPS) is used to pump water from the North Fork of the American River into the Auburn Ravine Tunnel. The Auburn Ravine Tunnel discharges into the Auburn Ravine, a natural water course, to deliver raw water to the agricultural customers in the Zone 5 service area. The ARPS has a design capacity of 100 cfs, equivalent to an annual supply of 35,000 acre-feet. Water can be pumped out of the Auburn Ravine Tunnel into the PG&E South Canal through the Auburn Ravine Tunnel Pump Station (up to 100 cfs). This pumped water is mainly used to supply the Foothill Water Treatment Plant (WTP) with raw water during the annual PG&E Bear River canal maintenance, usually beginning in mid-October. Pumped water in excess of the Foothill WTP needs can be diverted for use at the PG&E buy points below Wise Powerhouse. Additional pump facilities are planned for the Auburn Ravine Tunnel Pump Station that will pump water from the Auburn Ravine Tunnel to supply the future Ophir WTP.

## **2.2 PCWA CANAL SYSTEM**

The PCWA canal system contains approximately 165 miles of canals and ditches that carry about 65,000 acre-feet annually to meet the irrigation water demands of about 4,000 customers. The canals also convey raw water to water treatment plants within PCWA service areas.

Approximately 51 miles of the entire canal system are lined with gunite, concrete, and/or are contained in pipelines. The remaining canal sections are unlined.

PCWA has established five retail zones for water delivery within Placer County (**Figure 2-1**):



**FIGURE 2-1  
PCWA RETAIL SERVICE AREA ZONES**

- Zone 3 is a water system acquired from PG&E in 1982 that serves the areas along the Interstate 80 corridor extending from Alta to Bowman.
- Zone 1 was created in 1968 to finance the purchase of PG&E's Lower Drum Division Water System. This system provided water service to the communities of Auburn, Bowman, Ophir, Newcastle, Penryn, Loomis, Rocklin, and Lincoln and included five WTPs and associated storage and distribution systems. Zone 1 encompasses approximately 125 square miles. Today, Zone 1 includes territory under the land-use authorities of the Cities of Auburn, Rocklin, Lincoln, a portion of the City of Roseville, the Town of Loomis, and Placer County. Zone 1 is further broken up into Upper Zone 1 and Lower Zone 1 to delineate the higher elevation service areas of Auburn and Bowman from the remaining lower elevation areas.
- Zone 5 was created in 1999 and assumed the boundaries of Placer County Zone 29. It was created to reduce reliance on groundwater supplies by providing surface water for commercial agriculture in the westernmost section of Placer County. Zone 5 is served entirely by raw surface water supplies.
- Zone 2 was created in 1979 and provides retail water service to a small residential development of 47 units located southwest of the City of Roseville. Before 2003, Zone 2 was supplied groundwater by two wells. Zone 2 was connected to the City of Roseville's water supply pipeline in 2003, and now receives water supplies conveyed from Zone 1. Zone 2 is under the land-use authority of Placer County.
- Zone 4 was created in 1996 and is located in the unincorporated Martis Valley portion of eastern Placer County. Zone 4 is served entirely by groundwater.

Since Zone 2 is served by pipeline from Zone 1, and Zone 4 is served entirely by groundwater; these zones are not described or discussed further in this management plan. The remaining zones, described below, receive raw surface water supplies through open canals and pipes, which are mainly gravity fed, and which run from Alta to western Placer County.

### 2.2.1 Zone 3

PCWA's Zone 3, shown in **Figure 2-2**, is located at the northeastern end of the canal system. The Zone 3 water system consists of a series of ditches, canals, and pipelines that extend approximately 35 miles above PCWA's Lake Theodore to PG&E's Alta Powerhouse. PCWA acquired these facilities from PG&E in 1982. The Boardman Canal is the main conveyance facility in the Zone 3 system.

### 2.2.2 Zone 1

**Figures 2-3** and **2-4** show PCWA's Zone 1 service area. In addition to the PCWA supplies entering Zone 1 from Zone 3, PCWA obtains water supplies to meet customer demands in Zone 1 through purchases from PG&E just above Halsey forebay, and from Rock Creek Reservoir, Wise Canal, and South Canal. A portion of the raw water supply conveyed through Zone 1 is delivered to the Auburn, Bowman, Foothill, and Sunset WTPs for treatment and delivery to retail treated water customers, and the City of Lincoln, a wholesale treated water customer. Water for Zone 5 can be purchased at the designated PG&E buy point Yuba-Bear (YB) 136, below Wise Powerhouse, and diverted into Auburn Ravine for use by customers.

Raw water customers throughout the Zone 1 area are predominantly serviced through the Boardman, Caperton, Antelope, and Dutch Ravine canals, and numerous other canals fed from the Boardman Canal, including the Fiddler-Green, Greeley, Banvard, Sugarloaf, Red Ravine, Barton, Perry, and several other canals. The Dutch Ravine Canal, which receives flows from PG&E's South Canal, may either convey raw water to customers below in Zone 1, or during rare instances, supplement flows in Auburn Ravine for deliveries to raw water customers in the Zone 5 service area. The Auburn Ravine area within lower Zone 1 is shown in greater detail in **Figure 2-5**.

PCWA operates two regulating reservoirs within Zone 1 to manage deliveries to raw water customers. The Clover Valley Reservoir, which receives water flows from the Antelope Canal, releases water to the lower Antelope Canal, as well as the Antelope Stub Canal. Mammoth Reservoir receives water flows from the Boardman Canal, and releases to the Boardman Canal downstream. Several canals receive water flows from the Boardman Canal downstream from Mammoth Reservoir and make deliveries to raw water customers, including the Turner, Yankee Hill, Ferguson, Stallman, and Baughman canals.

The terminus of PCWA's raw water canal system in Zone 1 is the end of the Boardman Canal, located in northeastern Roseville.

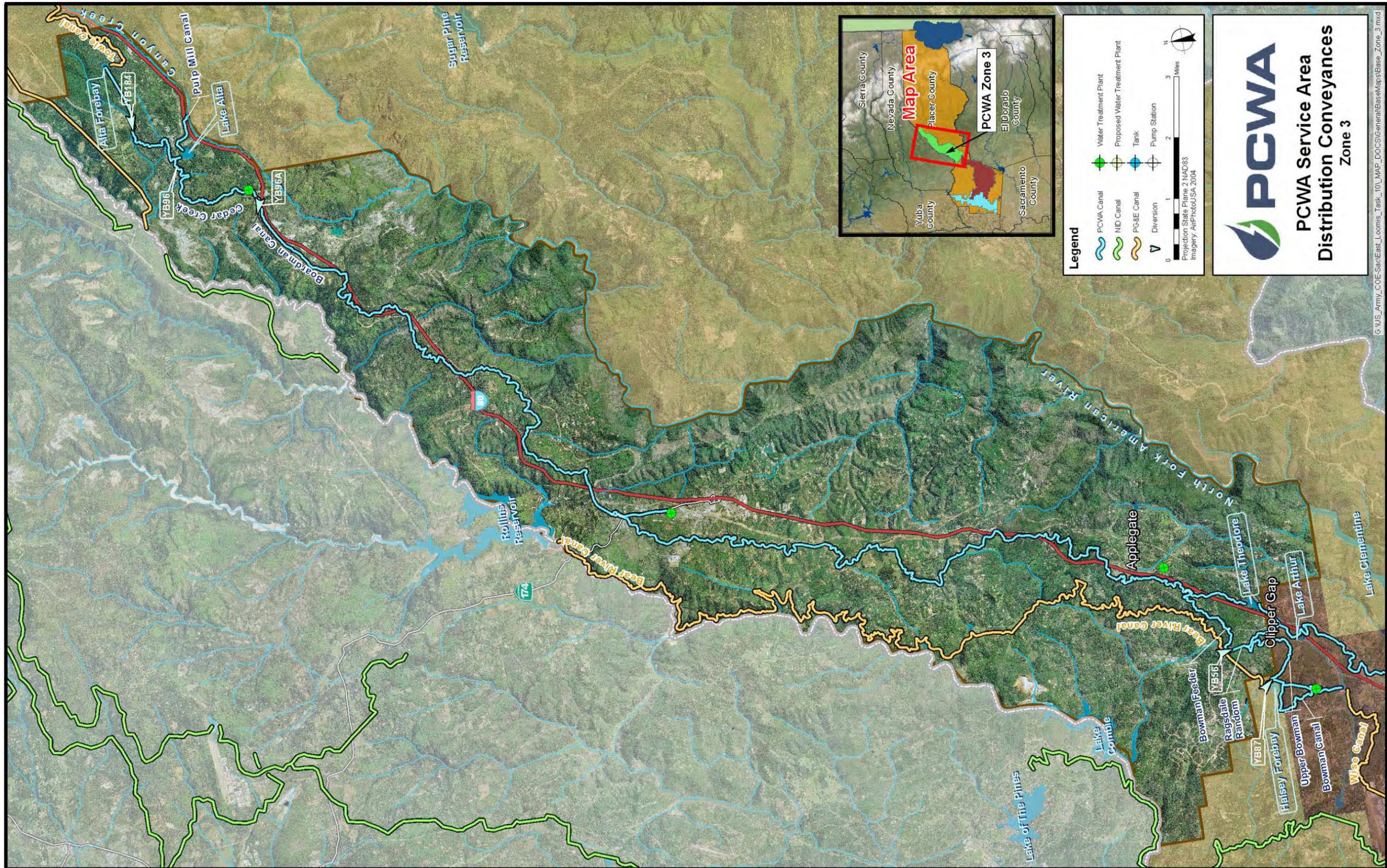
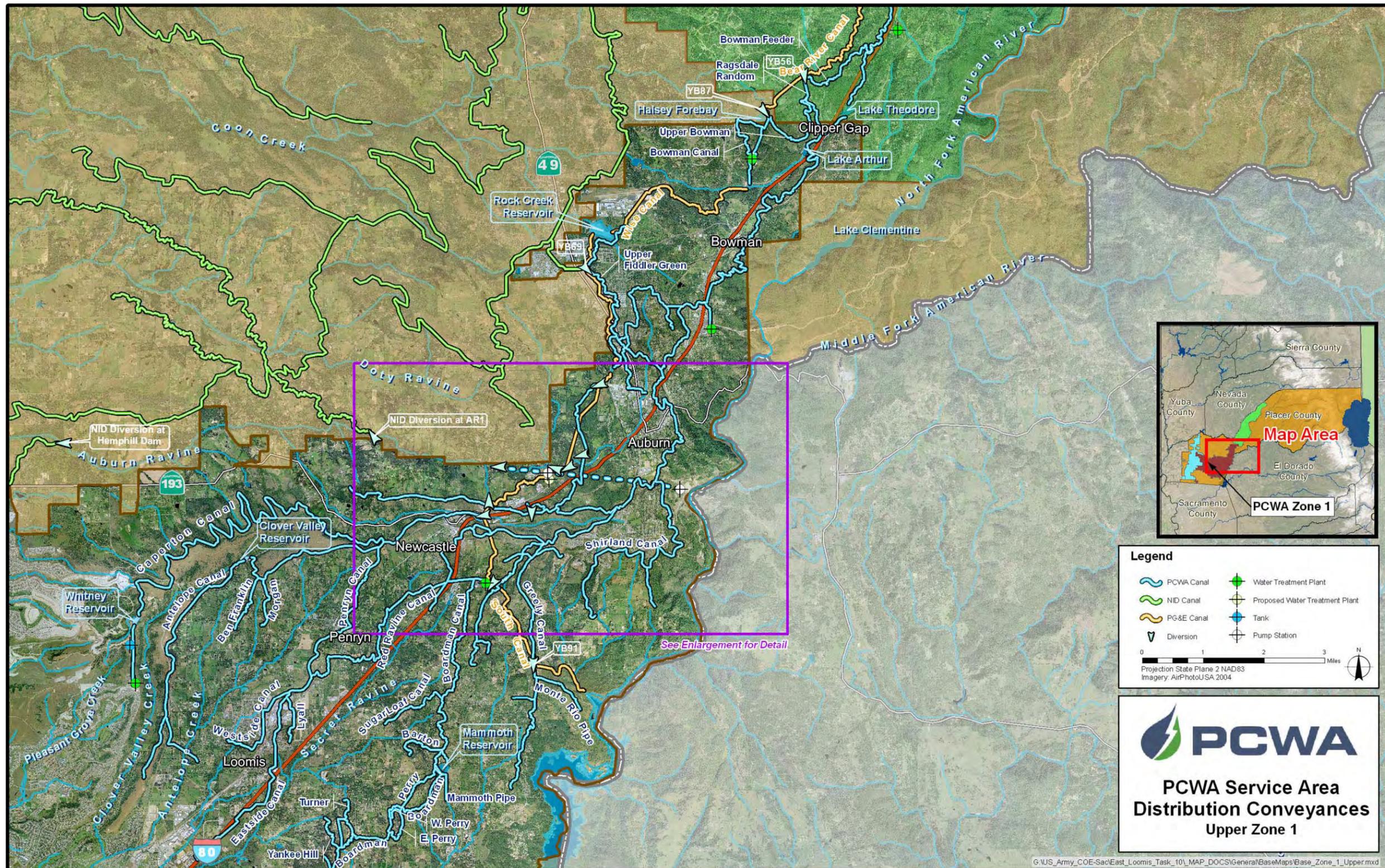
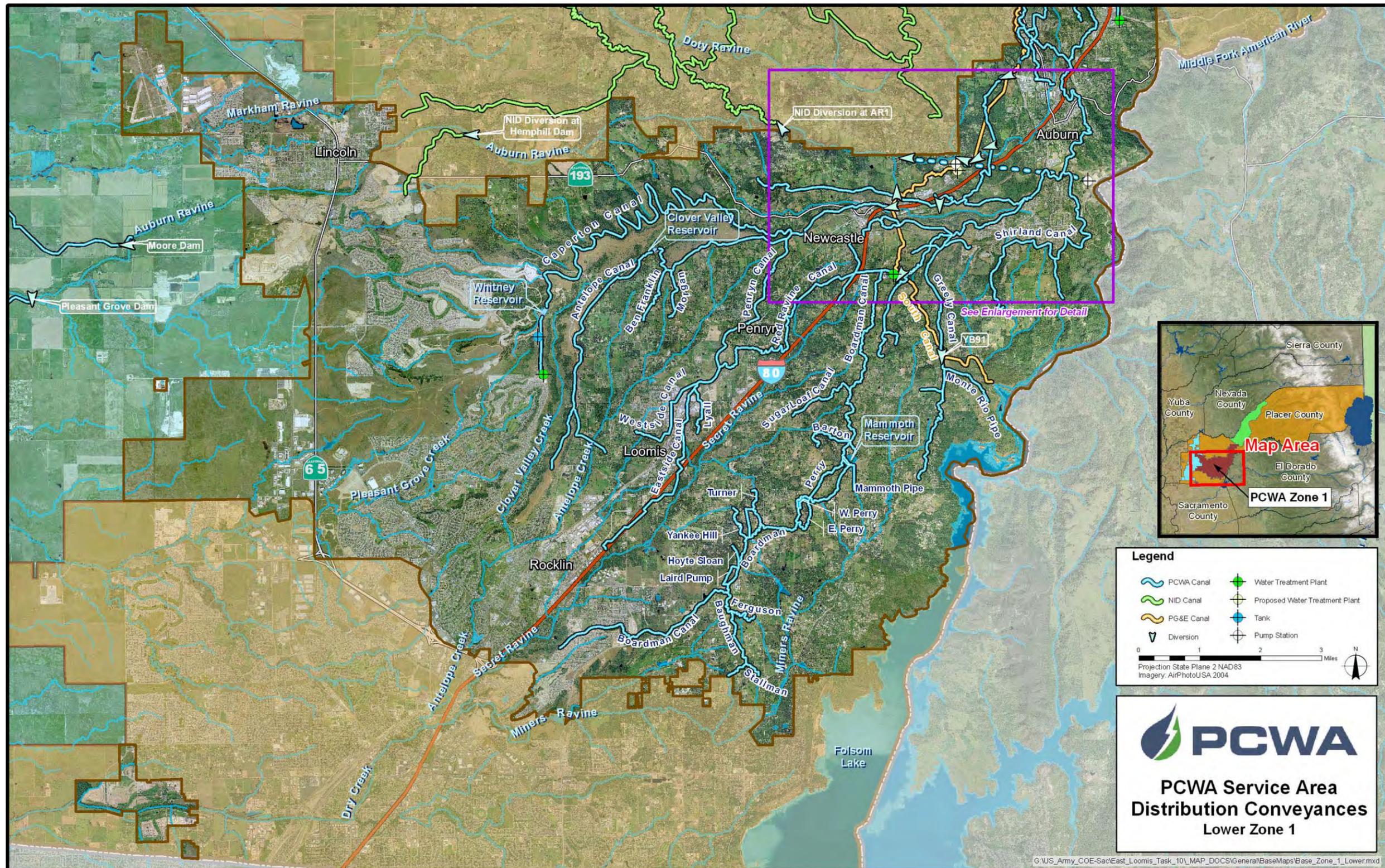


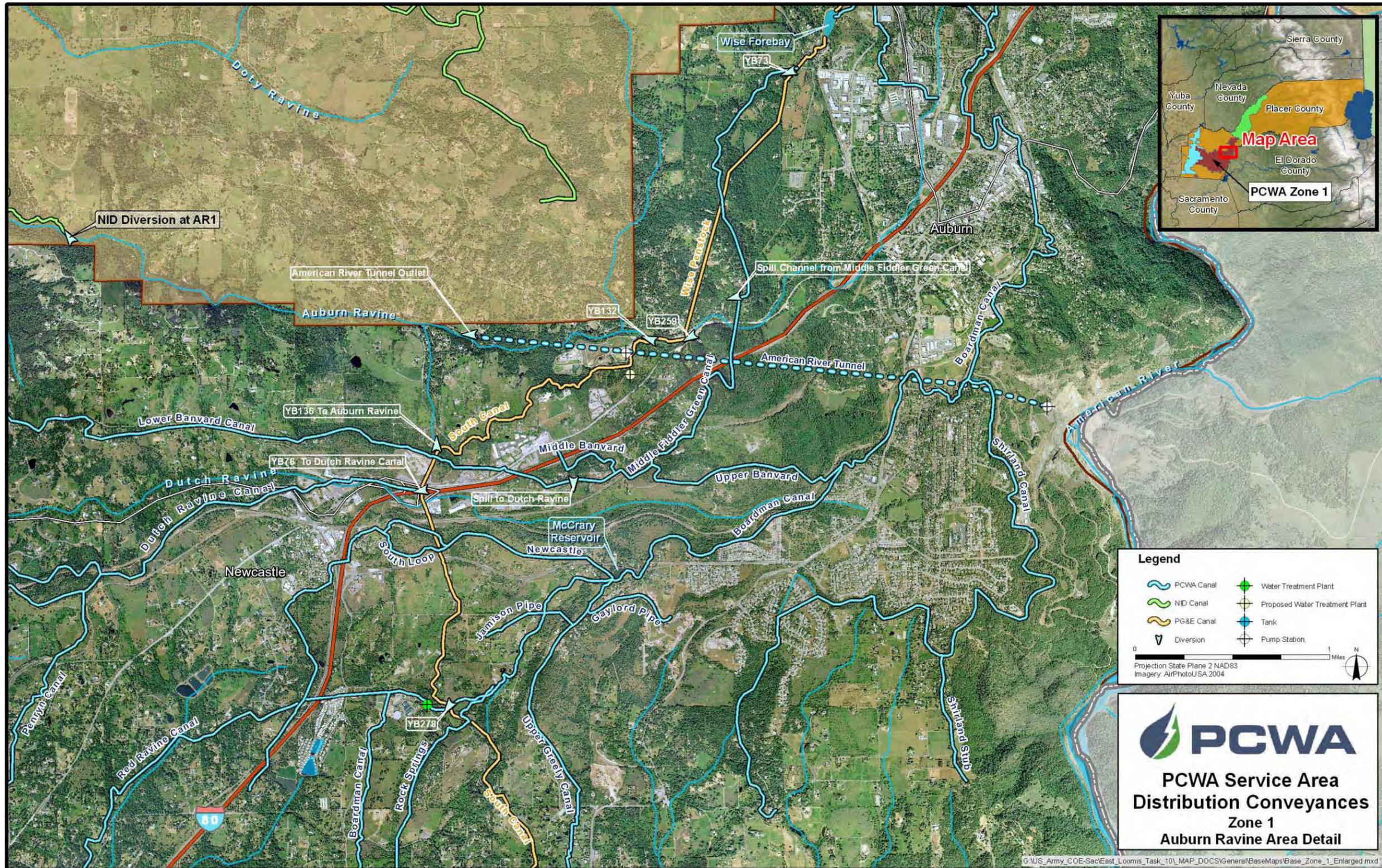
FIGURE 2-2  
 PCWA ZONE 3 SERVICE AREA AND DISTRIBUTION CONVEYANCES



**FIGURE 2-3**  
**PCWA UPPER ZONE 1 SERVICE AREA AND DISTRIBUTION CONVEYANCES**



**FIGURE 2-4**  
**PCWA LOWER ZONE 1 SERVICE AREA AND DISTRIBUTION CONVEYANCES**



**FIGURE 2-5**  
**PCWA LOWER ZONE 1 AUBURN RAVINE AREA DISTRIBUTION CONVEYANCES**

### 2.2.3 Zone 5

The Zone 5 service area, shown in **Figure 2-6**, receives water deliveries from PG&E conveyed through Auburn Ravine, and delivered to customers along Auburn Ravine and canals used by the PCWA downstream. PCWA water supplies originating from either the South Fork Yuba and/or Bear River watersheds are purchased from PG&E and diverted to Auburn Ravine at a few locations downstream from PG&E Wise Penstock to meet raw water delivery demands in Zone 5. These diversions include the Dutch Ravine Canal, which receives flows from PG&E's South Canal and YB 136. PCWA may also deliver water to Zone 5 customers pumped from the North Fork of the American River through the ARPS and conveyed through the Auburn Ravine. The Nevada Irrigation District (NID) purchases water from PG&E below the Wise Powerhouse for release into Auburn Ravine. NID also releases water to Auburn Ravine from their North Canal, especially during the yearly PG&E outage.

Auburn Ravine is seasonally dammed at Moore Dam, where flows are diverted to Moore Canal for deliveries to PCWA Zone 5 customers. Further downstream, flows are diverted from Auburn Ravine for deliveries to PCWA Zone 5 customers at the Pleasant Grove Dam to the Pleasant Grove Canal. Several NID canals divert flows from Auburn Ravine with temporary and permanent control structures for deliveries to NID customers.

## 2.3 PCWA RAW WATER DISTRIBUTION SYSTEM OPERATIONS

The majority of the PCWA raw water distribution area is serviced by gravity flow through the canal system, as described above. Reservoirs provide flexibility in operations, allowing capture and storage of flow from portions of the upper system for release, as needed, to portions of the lower system. PCWA monitors regulating gates and staff gages throughout the system, and uses information collected to make decisions on purchase quantities from PG&E at either of the buy points described above, and adjusts deliveries in accordance with water demands and meteorological conditions.

### 2.3.1 Deliveries

PCWA's delivery schedules are for an entire year, or an irrigation season. The irrigation season is identified as April 15 to October 15. Water is sold to raw water customers by the miner's inch. One miner's inch equates to the flow of water through a 1-inch-square orifice with 6 inches of head, as shown in **Figure 2-7**. The purchase of 1 miner's inch of water for the irrigation season entitles the purchaser to 0.025 cfs, 24 hours a day, from April 15 to October 15. Most PCWA raw water customers receive their water from a service pipe that goes through the canal berm to their service box. Water deliveries to these customers equals the customer's real time raw water demand, with the number of miner's inches purchased being the maximum rate of delivery. Consequently, the actual delivery quantities through the service boxes are typically less than the quantity purchased.

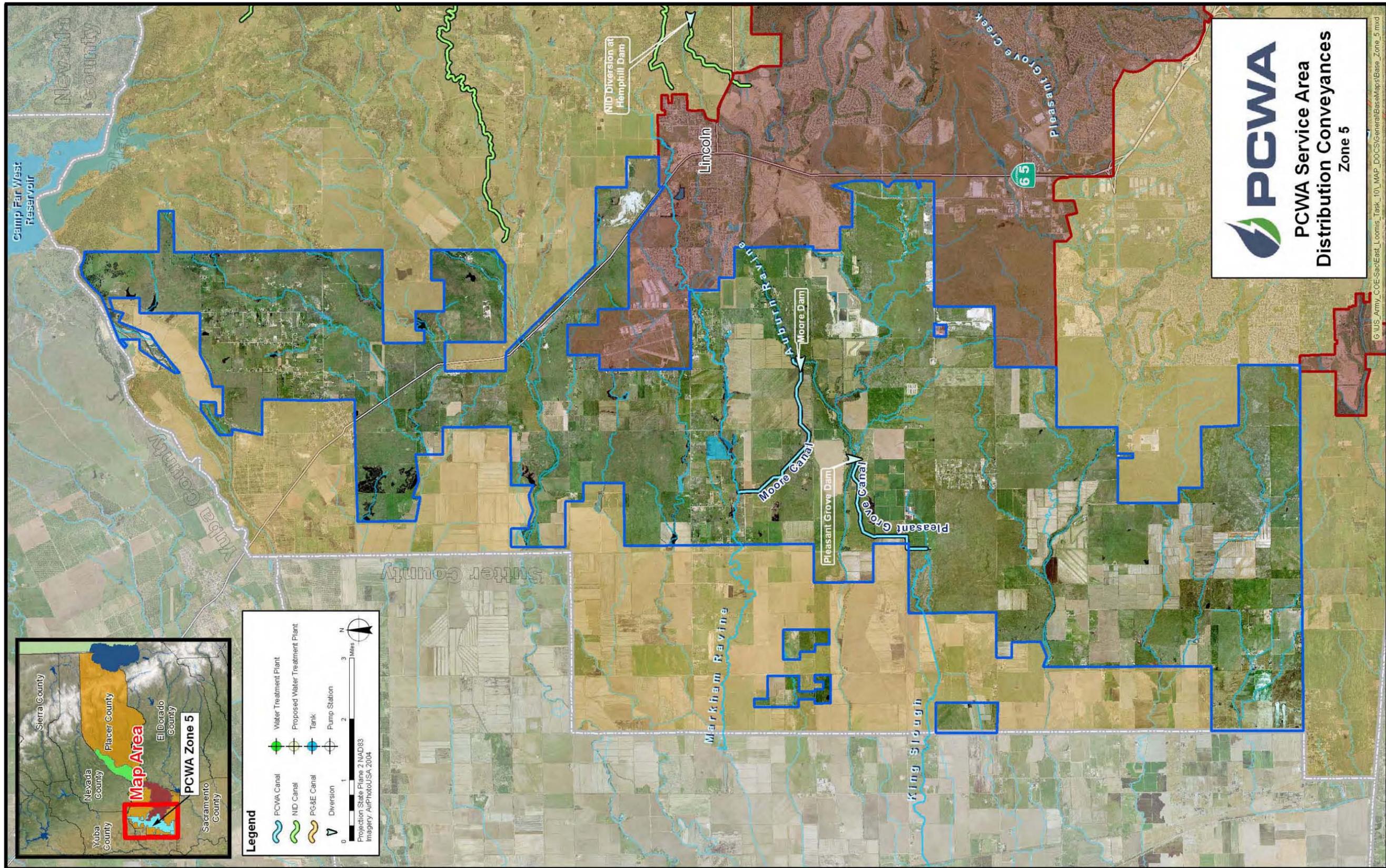
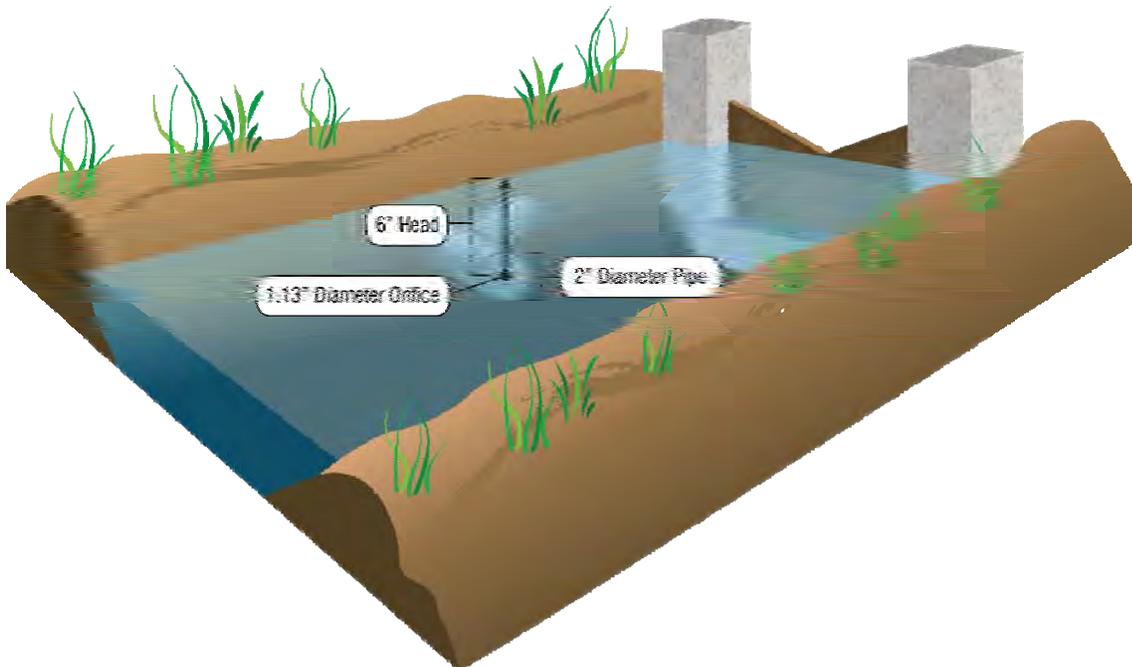


FIGURE 2-6  
PCWA ZONE 5 SERVICE AREA AND DISTRIBUTION CONVEYANCES

Orifices at delivery points may be intentionally or inadvertently removed or replaced, and/or enlarged at locations. Adjusting the size of the delivery orifice alters the rate of flow delivery at the location. Debris accumulation at a delivery orifice also affects the rate of flow, and may lead to decreases in raw water delivery quantities.

Raw water delivery purchases are associated with parcels. New customers in the PCWA service area are permitted to purchase a maximum of 0.5 miner's inch, or 0.0055 cfs, of raw water during the irrigation season, only. If a parcel is sold and service to that parcel is terminated, the new parcel owner is only permitted to purchase 0.5 miner's inch, or 0.0055 cfs, of raw water during the irrigation season.



**FIGURE 2-7**  
**DELIVERY OF 1 MINER'S INCH TO PCWA CANAL SYSTEM CUSTOMERS**

### 2.3.2 Operations

PCWA's raw water distribution is governed by customer demand and the availability of supplies. Regular operations activities occur on a yearly, seasonal, or more routine basis.

#### 2.3.2.1 Yearly

PG&E implements an annual water delivery outage to PCWA while PG&E conducts maintenance on its system. The outage typically takes place from mid-October to mid-November, reducing water available to PCWA's Zone 1 customers from PG&E's Wise, Bear, and South canals. The amount of water available for raw water delivery depends on customer demands for treated water from PCWA's WTPs. Generally, treated water needs are met before raw water needs. During the PG&E outage, PCWA relies on stored water in surface reservoirs,