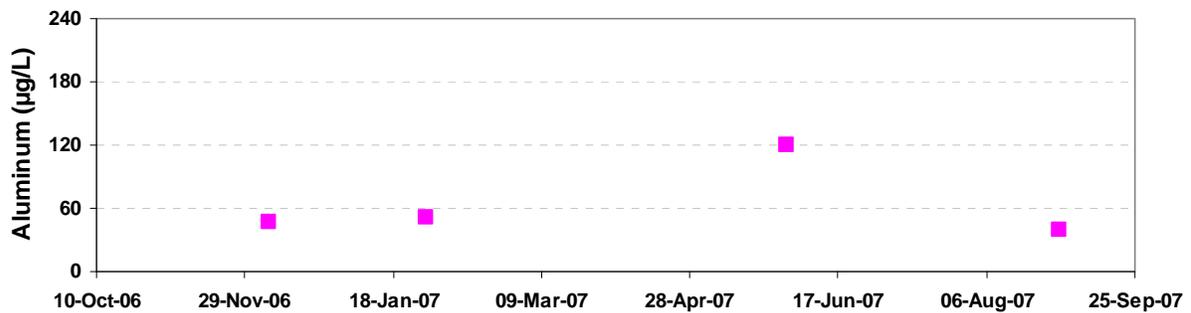


**FIGURE 3-30**  
**NITRATE RESULTS FROM SEASONAL MONITORING EVENTS AT AUBURN RAVINE BELOW AUBURN RAVINE TUNNEL OUTLET**

Nitrogen and phosphorus were measured at the Auburn WWTP in 1995 (Placer County 2002). Nitrogen and phosphorus levels in Auburn WWTP effluent averaged 0.5 mg/L, and Auburn Ravine downstream from the Auburn WWTP did not show evidence of eutrophication. However, Auburn Ravine downstream from the Lincoln WWTP has been observed to be influenced by both wastewater effluent and stormwater runoff.

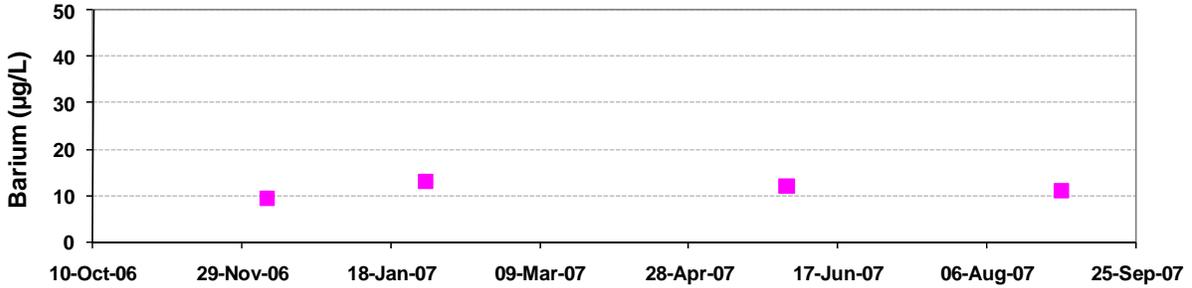
#### Trace Elements

Aluminum results at AUBRAV3 ranged from 40  $\mu\text{g/L}$  during the summer monitoring event to 120  $\mu\text{g/L}$  during the spring monitoring event (**Figure 3-31**).



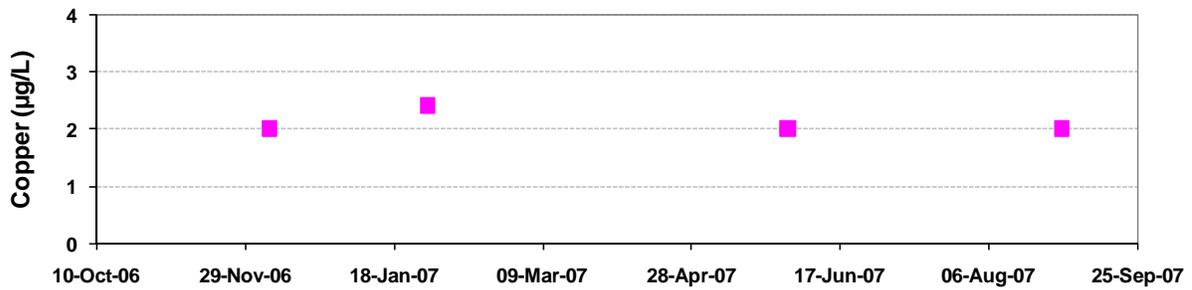
**FIGURE 3-31**  
**ALUMINUM RESULTS FROM SEASONAL MONITORING EVENTS AT AUBURN RAVINE BELOW AUBURN RAVINE TUNNEL OUTLET**

There was little variation in barium results at AUBRAV3, with concentrations ranging from 9.5  $\mu\text{g/L}$  during the fall monitoring event to 12  $\mu\text{g/L}$  during the winter monitoring event (**Figure 3-32**).

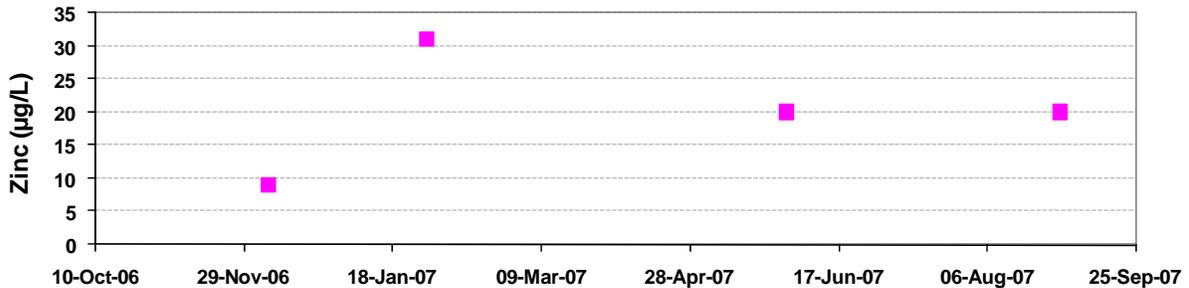


**FIGURE 3-32**  
**BARIUM RESULTS FROM SEASONAL MONITORING EVENTS AT AUBURN RAVINE BELOW AUBURN RAVINE TUNNEL OUTLET**

Cadmium and mercury concentrations measured during baseline sampling events at AUBRAV3 were below detection limits. All copper concentrations at the AUBRAV3 site were below the detection limit of 2 µg/L, except for the winter monitoring event, during which copper was measured at 2.4 µg/L (**Figure 3-33**). As shown in **Figure 3-34**, zinc concentrations ranged from 9 µg/L during the fall monitoring event to 31 µg/L during the winter monitoring event.



**FIGURE 3-33**  
**COPPER RESULTS FROM SEASONAL MONITORING EVENTS AT AUBURN RAVINE BELOW AUBURN RAVINE TUNNEL OUTLET**



**FIGURE 3-34**  
**ZINC RESULTS FROM SEASONAL MONITORING EVENTS AT AUBURN RAVINE BELOW AUBURN RAVINE TUNNEL OUTLET**

Data collected by Placer County for the Auburn Ravine/Coon Creek Ecosystem Restoration Plan in 1999 and 2000 show cadmium, copper, and zinc levels in the Auburn Ravine all exceed the CTR standards for aquatic life at various times throughout the year (Placer County 2002).

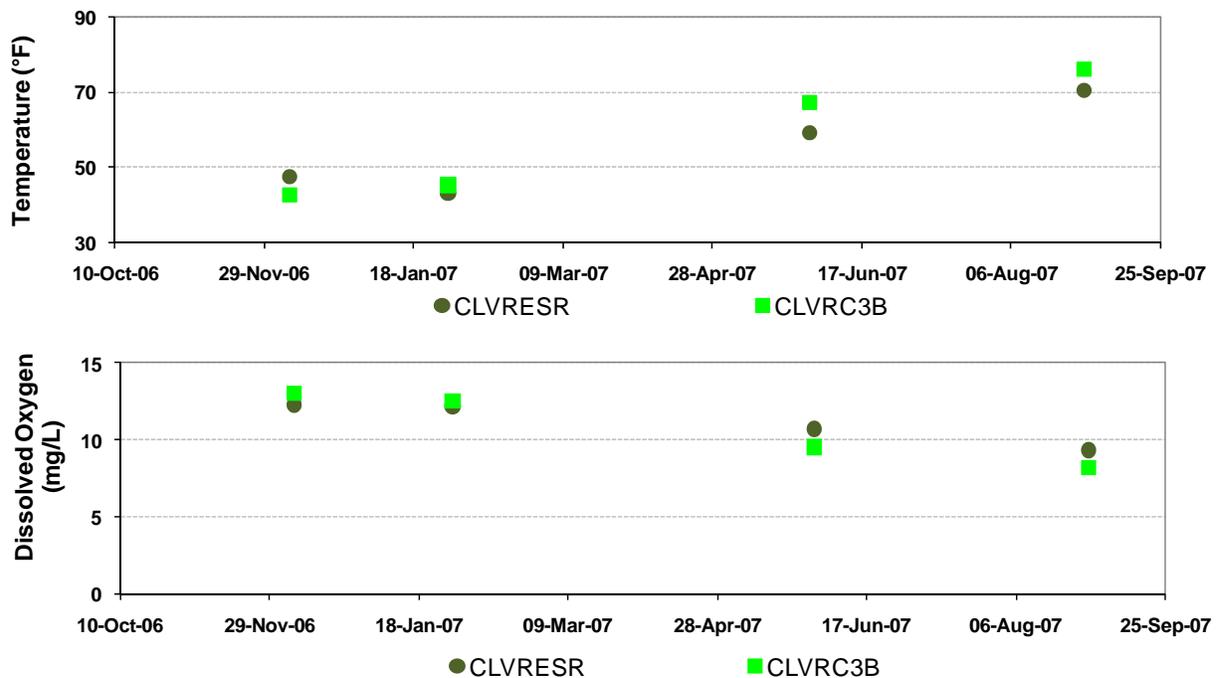
Copper exceeded CTR standards in June, July, and October 1999 and in January, February, and April 2000.

### **Clover Valley Creek Watershed**

Water quality in the Clover Valley Creek watershed was evaluated at the Clover Valley Reservoir Release to Clover Valley Creek and Antelope Canal (CLVRESR) and at Clover Valley Creek near Argonaut Avenue (CLVRC3B). The monitoring location is upstream from the Sunset Whitney Country Club on Midas Avenue in Rocklin (**Figure 3-3**). Originally, sampling was conducted at a site located at the golf course in the Sunset Whitney Country Club, but the golf course gates lock at sundown, which rendered the site inaccessible during key monitoring periods, so the alternate upstream site was selected for further monitoring.

### **Water Temperature and Dissolved Oxygen**

Water temperature and DO measurements taken at CLVRESR and CLVRC3B during baseline sampling events are shown in **Figure 3-35**. Water temperatures at the two sampling locations are similar and exhibit seasonal trends, ranging from 42°F during fall to about 76°F during summer. DO levels at the two locations are also similar, and range from 8.2 mg/L in the summer to 13 mg/L in the fall (**Figure 3-19**).

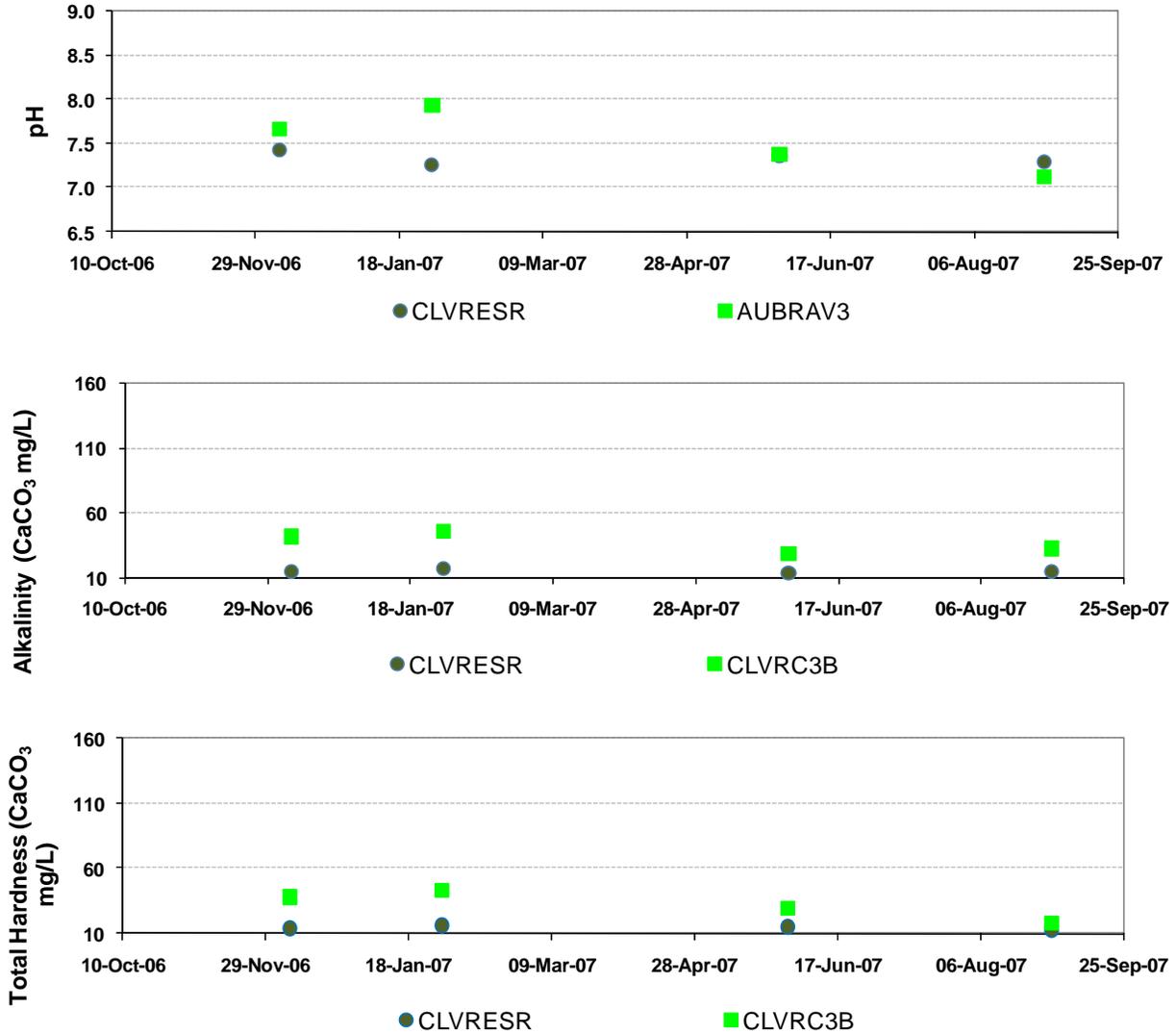


**FIGURE 3-35**  
**WATER TEMPERATURE AND DISSOLVED OXYGEN RESULTS FROM SEASONAL MONITORING EVENTS IN THE CLOVER VALLEY CREEK WATERSHED**

### **pH, Alkalinity, and Hardness**

**Figure 3-36** shows pH, alkalinity, and hardness results from baseline water quality monitoring at CLVRESR and CLVRC3B. Measured pH levels at the two locations ranged from 7.1 to 7.9.

Alkalinity results ranged from 14.0 to 45.0 mg/L CaCO<sub>3</sub>. Calculated hardness values were similar to alkalinity, ranging from 9.5 to 42.4 mg/L CaCO<sub>3</sub>.

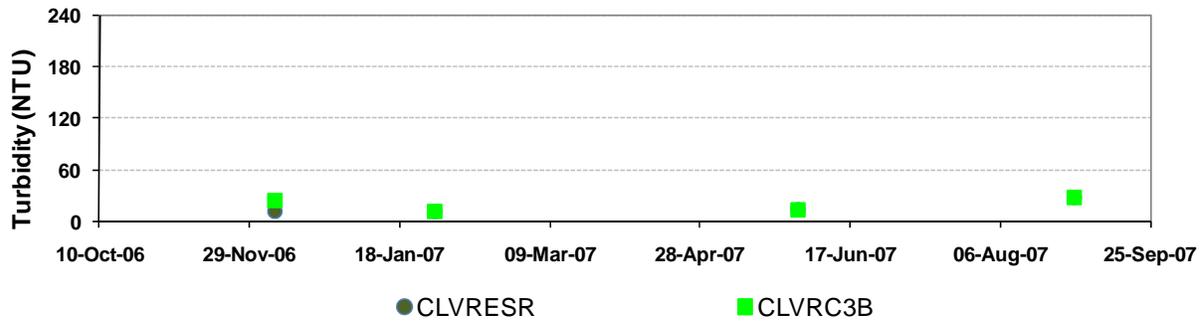


**FIGURE 3-36  
PH, ALKALINITY, AND HARDNESS RESULTS FROM SEASONAL MONITORING  
EVENTS IN THE CLOVER VALLEY CREEK WATERSHED**

Data on pH in the Clover Valley Creek watershed were collected by the DCC during a periodic “first flush” monitoring program in between 2001 and 2003. Measured pH values ranged from 7.27 in October 2002 to 7.70 in March 2002, indicating fairly stable pH levels throughout the year.

**Total Suspended Solids and Turbidity**

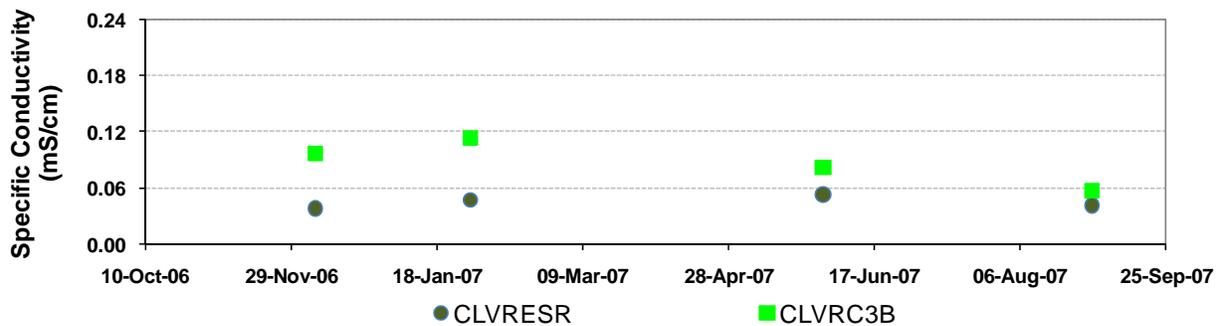
TSS values measured at the CLVRESR and CLVRC3B during baseline monitoring events were below the detection limit of 10 mg/L. As shown in **Figure 3-37**, turbidity levels at CLVRESR and CLVRC3B were also low during baseline sampling events, with all turbidity values ranging between 11.8 and 27.4 NTUs.



**FIGURE 3-37**  
**TURBIDITY RESULTS FROM SEASONAL MONITORING EVENTS IN THE CLOVER VALLEY CREEK WATERSHED**

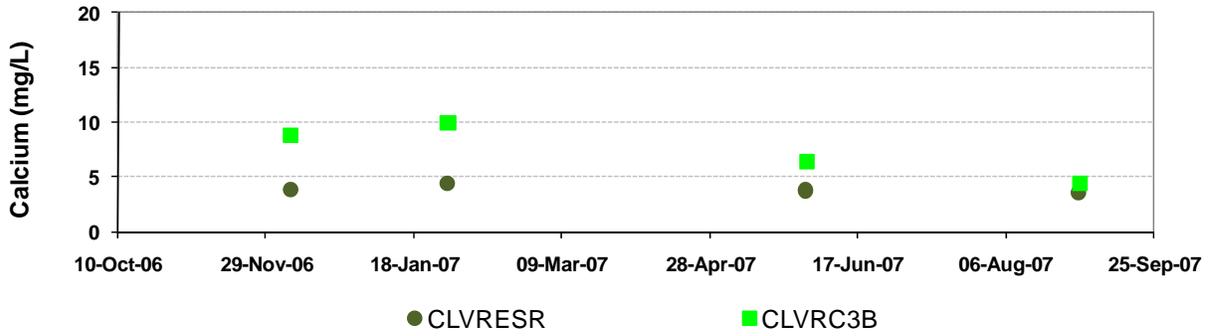
### Specific Conductivity and Ions

SC values for CLVRESR and CLVRC3B are shown in **Figure 3-38**. Although SC values measured at CLVRESR were consistently lower than CLVRC3B values, they were low at both monitoring locations, ranging from 0.04 mS/cm during the fall monitoring event to 0.11 mS/cm during the winter monitoring event.



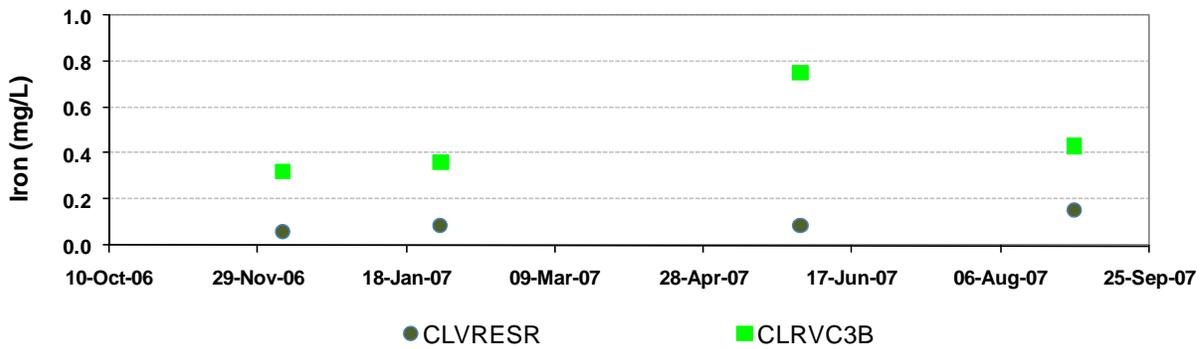
**FIGURE 3-38**  
**SPECIFIC CONDUCTIVITY RESULTS FROM SEASONAL MONITORING EVENTS IN THE CLOVER VALLEY CREEK WATERSHED**

Calcium results at CLVRESR and CLVRC3B followed similar seasonal trends as seasonal specific conductivity levels. As shown in **Figure 3-39**, calcium results ranged from 3.8 mg/L at CLVRESR during the fall monitoring event to 9.9 mg/L at CLVRC3B during the winter monitoring event.



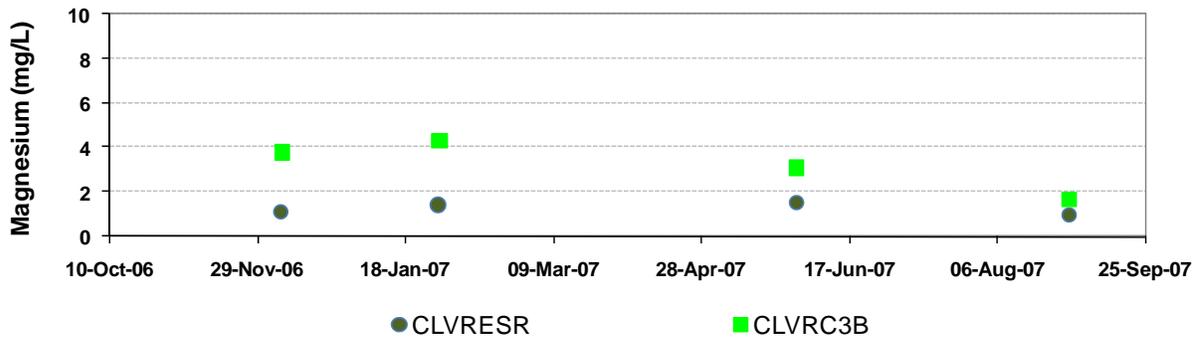
**FIGURE 3-39**  
**CALCIUM RESULTS FROM SEASONAL MONITORING EVENTS IN THE CLOVER VALLEY CREEK WATERSHED**

Iron results at CLVRESR and CLVRC3B differed most during the spring monitoring event. **Figure 3-40** shows iron values ranging from 0.06 mg/L during the fall monitoring event to 0.75 mg/L during the spring event.



**FIGURE 3-40**  
**IRON RESULTS FROM SEASONAL MONITORING EVENTS IN THE CLOVER VALLEY CREEK WATERSHED**

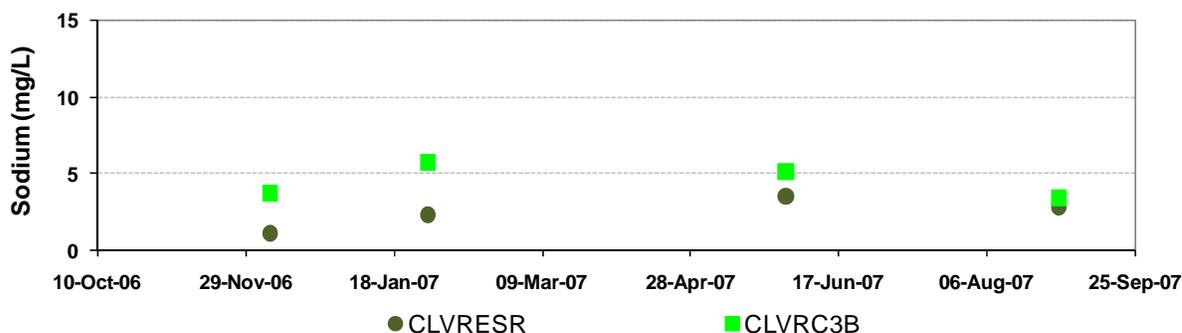
Magnesium results varied from 0.1 mg/L at CLVRESR during the summer monitoring event and 4.3 mg/L at CLVRC3B during the winter event (**Figure 3-41**).



**FIGURE 3-41**  
**MAGNESIUM RESULTS FROM SEASONAL MONITORING EVENTS IN THE CLOVER VALLEY CREEK WATERSHED**

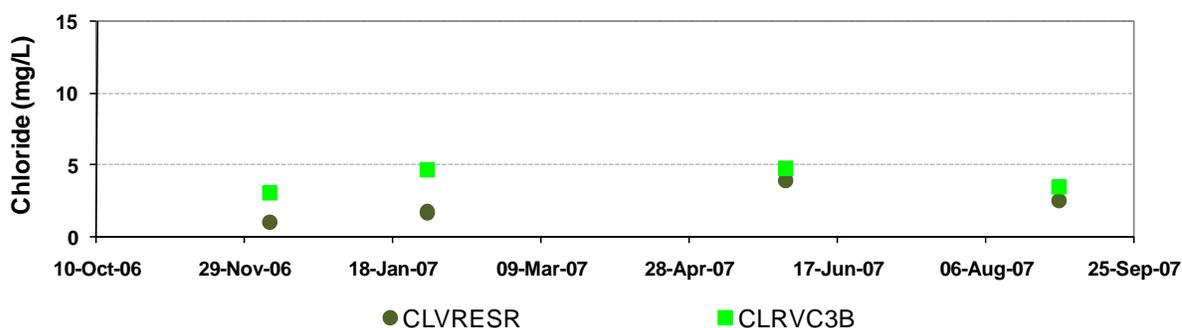
All seasonal potassium results were below the detection limit of 0.1 mg/L and 1.0 mg/L, respectively, at the CLVRC3B monitoring site.

Sodium results at CLVRESR and CLVRC3B ranged from 1.1 to 5.7 mg/L, as shown in **Figure 3-42**.



**FIGURE 3-42**  
**SODIUM RESULTS FROM SEASONAL MONITORING EVENTS IN THE CLOVER VALLEY CREEK WATERSHED**

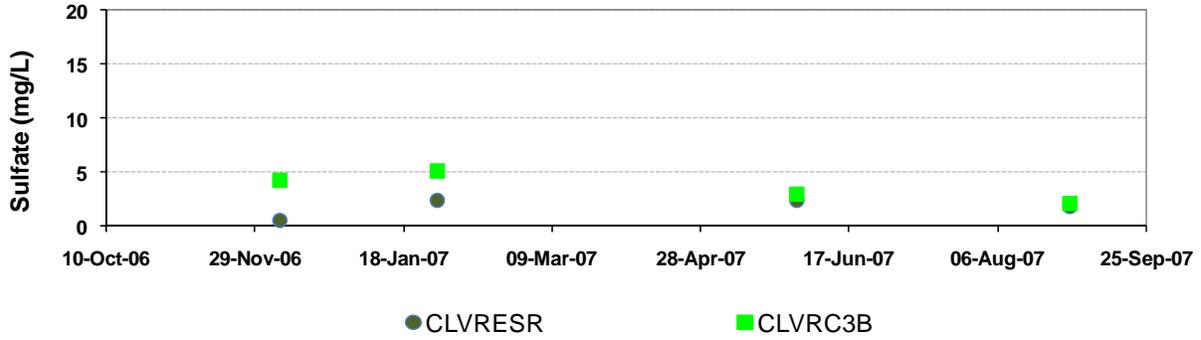
Chloride results at CLVRESR and CLVRC3B are similar to those observed for sodium, and ranged from 1.0 to 4.7 mg/L, as shown in **Figure 3-43**.



**FIGURE 3-43**  
**CHLORIDE RESULTS FROM SEASONAL MONITORING EVENTS IN THE CLOVER VALLEY CREEK WATERSHED**

Similar to potassium results, all seasonal nitrate concentrations were below the detection limit of 0.1 mg/L and 1.0 mg/L, respectively, at the CLVRC3B monitoring site.

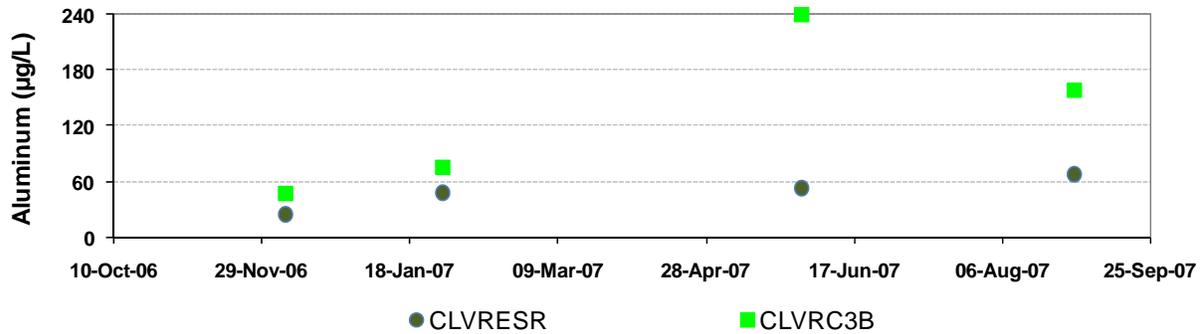
Sulfate concentrations at CLVRESR and CLVRC3B ranged from 0.5 mg/L during the fall monitoring event to 5.1 mg/L during the winter monitoring event (**Figure 3-44**).



**FIGURE 3-44**  
**SULFATE RESULTS FROM SEASONAL MONITORING EVENTS IN THE CLOVER VALLEY CREEK WATERSHED**

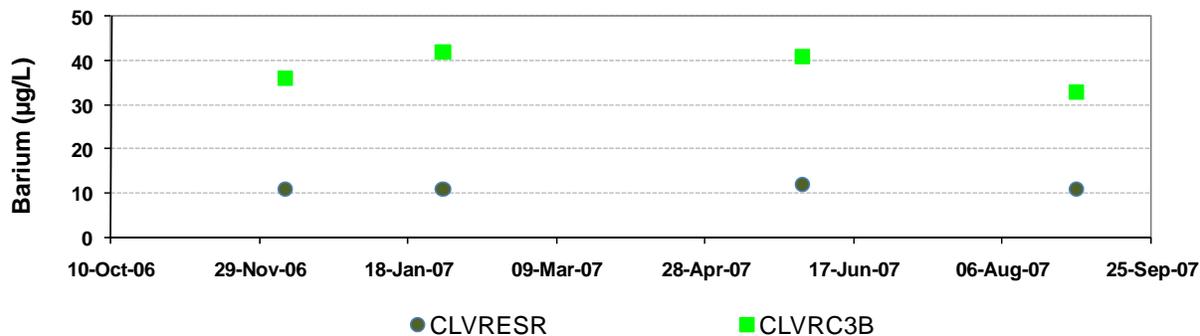
**Trace Elements**

Aluminum concentrations at CLVRESR and CLVRC3B varied considerably during the spring monitoring event. As shown in **Figure 3-45**, aluminum concentrations ranged from 25 µg/L during the fall monitoring event to 240 µg/L during the spring monitoring event.



**FIGURE 3-45**  
**ALUMINUM RESULTS FROM SEASONAL MONITORING EVENTS IN THE CLOVER VALLEY CREEK WATERSHED**

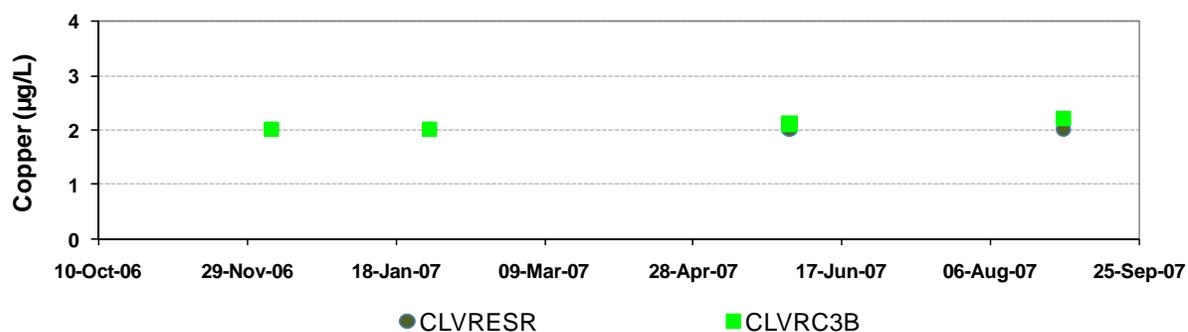
Barium concentrations at CLVRC3B were consistently higher than those at CLVRESR, and also among the highest compared to other stream sites monitored within Zone 1. As shown in **Figure 3-46**, barium values measured at these sites range from 11 µg/L at CLVRESR during fall to 42 µg/L at CLVRC3B during winter.



**FIGURE 3-46**  
**BARIUM RESULTS FROM SEASONAL MONITORING EVENTS IN THE CLOVER VALLEY CREEK WATERSHED**

Cadmium concentrations at CLVRESR and CLVC3B were below detection limits for all baseline monitoring events.

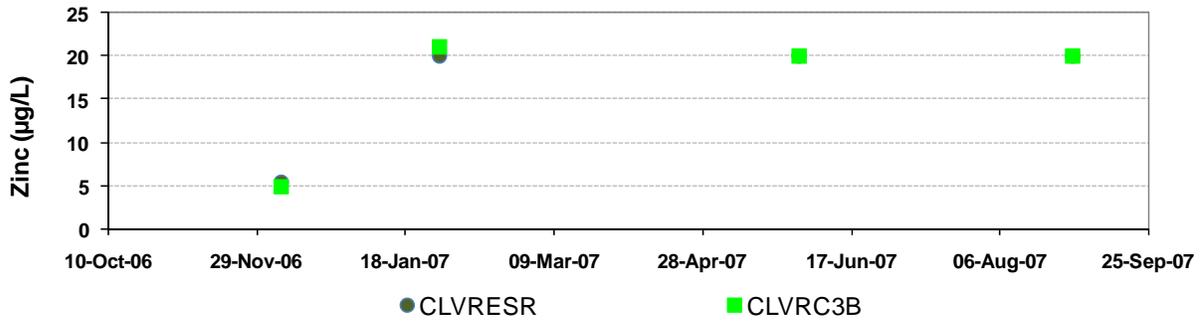
Copper levels were below the detection limit of 2 µg/L at CLVC3B during the fall and winter sampling events, and were measured at 2.1 and 2.2 µg/L during the spring and summer monitoring events, respectively (**Figure 3-47**).



**FIGURE 3-47**  
**COPPER RESULTS FROM SEASONAL MONITORING EVENTS IN THE CLOVER VALLEY CREEK WATERSHED**

Similar to cadmium results, mercury concentrations at CLVRESR and CLVC3B were below detection limits for all seasonal monitoring events.

Zinc was only detected at CLVRESR and CLVRC3B during the winter monitoring event (20 and 21 µg/L, respectively), as shown in **Figure 3-48**. According to laboratory results, the detection limits for zinc changed from 5 mg/L in the fall, 10 mg/L in the winter, and 20 mg/L in the spring and summer.



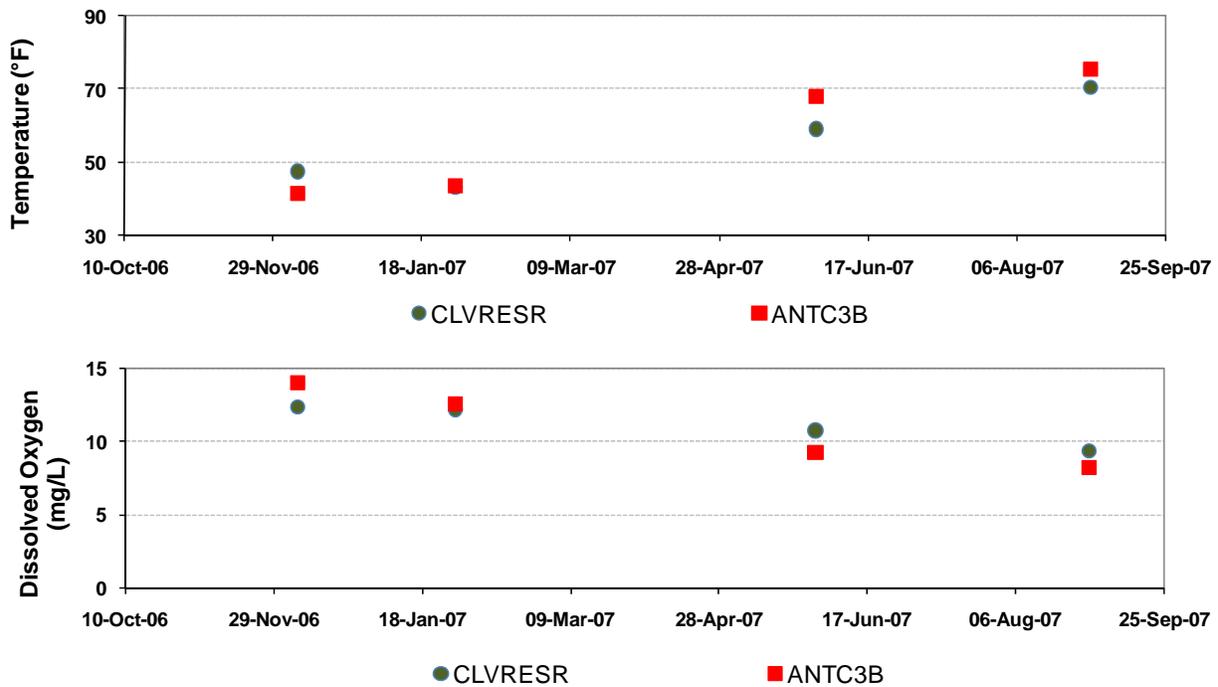
**FIGURE 3-48**  
**ZINC RESULTS FROM SEASONAL MONITORING EVENTS IN THE CLOVER VALLEY CREEK WATERSHED**

**Antelope Creek Watershed**

Water quality was evaluated within the Antelope Creek watershed at CLVRESR and Antelope Creek at Midas Avenue (ANTC3B), which is located immediately above Antelope Creek’s confluence with Clover Valley Creek.

**Water Temperature and Dissolved Oxygen**

Water temperature and DO results from monitoring at CLVRESR and ANTC3B are shown in **Figure 3-49**. Seasonal water temperatures at the two monitoring locations ranged from 41.7 to 75.4 °F. DO results ranged from 8.2 mg/L in the summer to 13.9 mg/L in the fall.

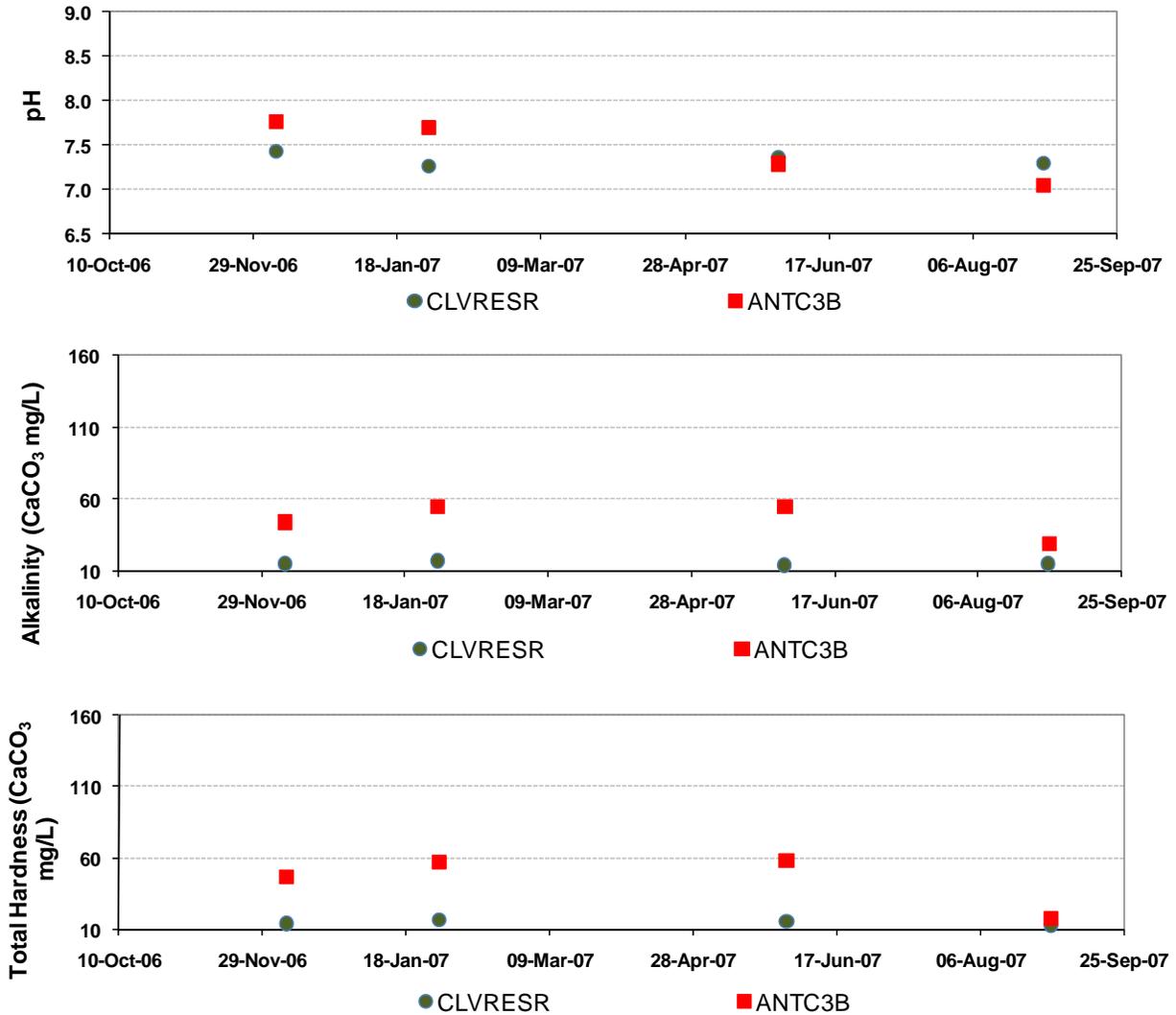


**FIGURE 3-49**  
**TEMPERATURE AND DISSOLVED OXYGEN RESULTS FROM SEASONAL MONITORING EVENTS IN THE ANTELOPE CREEK WATERSHED**

Water temperature data collected along Antelope Creek by other sources includes periodic monitoring conducted by the Central Valley RWQCB and DCC. Water temperature was recorded by the Central Valley RWQCB and DCC at Sierra College Boulevard and Sunset Boulevard between December 12, 2000, and April 8, 2003. Water temperature values measured by the Central Valley RWQCB and DCC ranged from 43 °F in January 2001 to 82 °F in June 2001 at the Sunset Boulevard site, and from 43 °F in January 2001 to 75 °F in July 2001 at the Sierra College Boulevard site (Sierra Business Council 2003). Water temperature data were collected by Bailey Environmental between April 1999 and August 2003 at Antelope Creek Drive, 311 Sunset Blvd., and the Myers residence station. Water temperatures in spring (May 29, 2003 to July 30, 2003) ranged from 63 °F to 84 °F (Sierra Business Council 2003).

#### **pH, Alkalinity, and Hardness**

Seasonal pH, alkalinity, and hardness results for baseline monitoring at CLVRESR and ANTC3B are shown in **Figure 3-50**. Results for pH indicate little seasonal variation; pH values ranged from 7.0 to 7.8. Alkalinity and hardness values are consistently lower at CLVRESR than ANTC3B. Alkalinity levels range from 14 mg/L CaCO<sub>3</sub> at CLVRESR to 55 mg/L CaCO<sub>3</sub> at ANTC3B, and calculated hardness values ranged from 12.8 mg/L CaCO<sub>3</sub> at CLVRESR to 58.3 mg/L CaCO<sub>3</sub> ANTC3B.

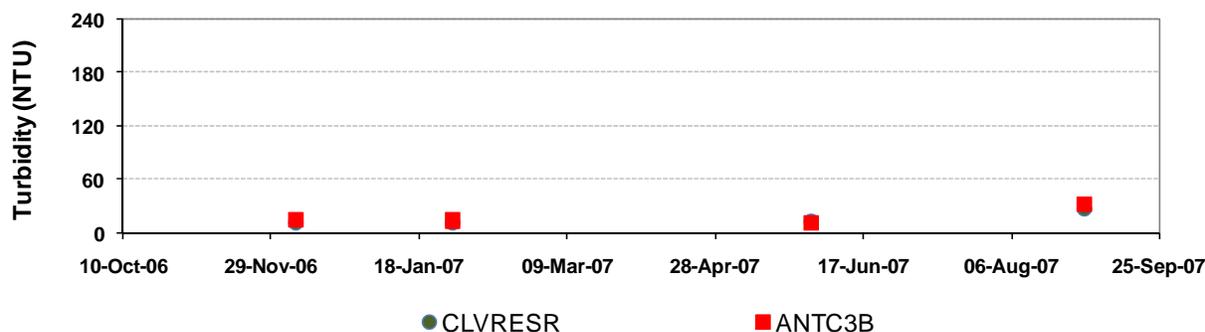


**FIGURE 3-50  
PH, ALKALINITY, AND HARDNESS RESULTS FROM SEASONAL MONITORING  
EVENTS IN THE ANTELOPE CREEK WATERSHED**

The Antelope Creek watershed was monitored by DCC for pH during “first flush” events between 2000 and 2003. Monitoring was conducted at the Sierra College Boulevard, Sunset Boulevard, and Atlantic Avenue sites. Results for pH in Antelope Creek varied widely at the Sierra College Boulevard site, at which pH values ranged from 6.70 in November 2001 to 8.16 in December 2000, and at the Sunset Boulevard site, ranging from 6.5 in February 2002 to 8.65 in July 2001 (Sierra Business Council 2003). Results from the Atlantic Avenue site ranged from 7.08 in November 2002 to 7.77 in March 2003. Although it is difficult to interpret such a limited data set, the pH result is considered relatively high for the creek (Placer County Planning Department 2003).

### Total Suspended Solids and Turbidity

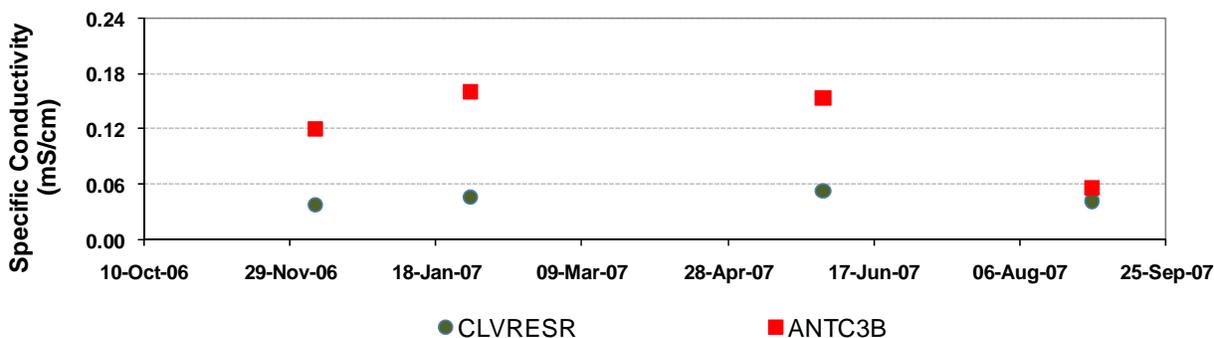
TSS values at CLVRESR and ANTC3B were below detection limits (10 mg/L) during all seasonal monitoring events, with the exception of the summer monitoring event, during which TSS was measured at 13 mg/L. As shown in **Figure 3-51**, turbidity values were very similar at the two monitoring locations were low, ranging between 12.2 and 32.9 NTUs.



**FIGURE 3-51**  
**TURBIDITY RESULTS FROM SEASONAL MONITORING EVENTS IN THE ANTELOPE CREEK WATERSHED**

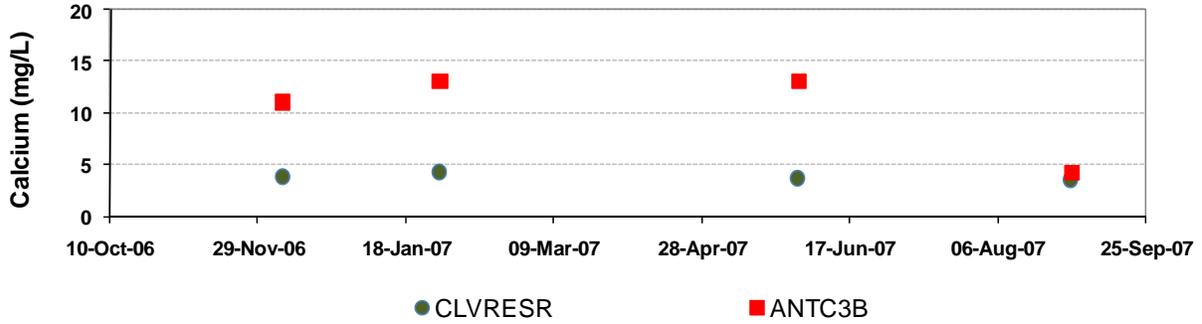
### Specific Conductivity and Ions

SC values were consistently lower at CLVRESR than at ANTC3B. Overall, SC values ranged from 0.04 mS/cm at CLVRESR during the fall monitoring event to 0.16 mS/cm at ANTC3B during the winter monitoring event (**Figure 3-52**).



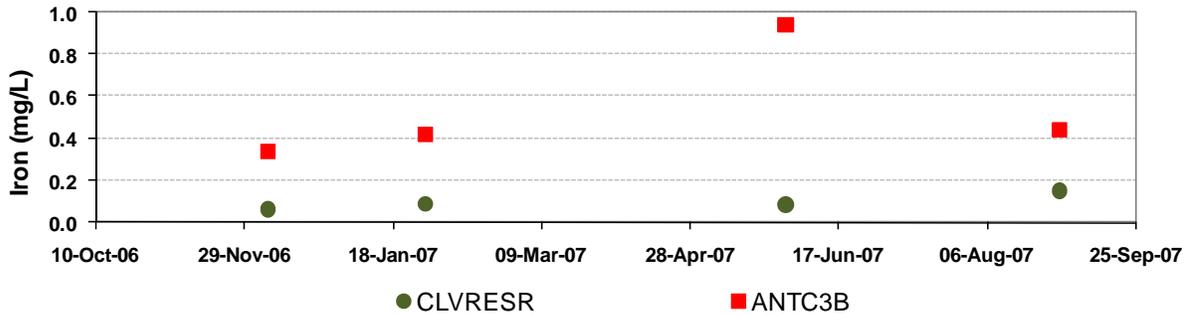
**FIGURE 3-52**  
**SPECIFIC CONDUCTIVITY RESULTS FROM SEASONAL MONITORING EVENTS IN THE ANTELOPE CREEK WATERSHED**

Calcium results at CLVRESR and ANTC3B monitoring locations follow a pattern similar to that of SC. As shown in **Figure 3-53**, calcium results ranged from 3.5 mg/L at CLVRESR during the summer sampling event to 13.0 mg/L at ANTC3B during winter and spring sampling events.



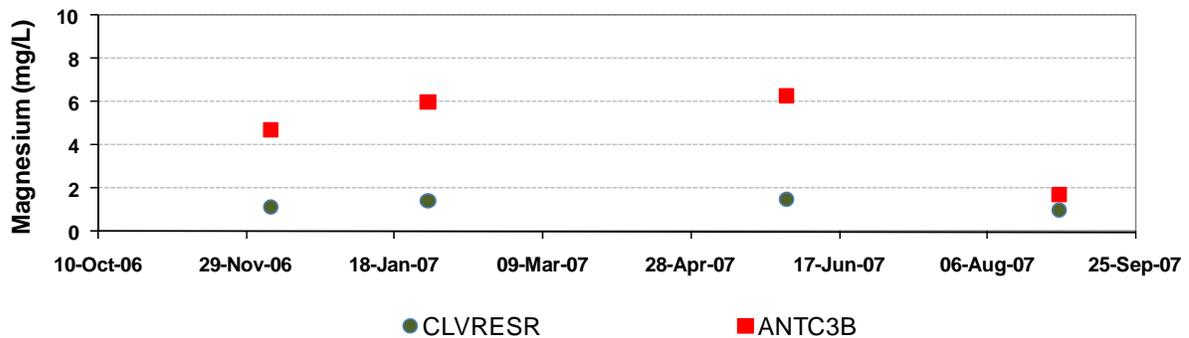
**FIGURE 3-53**  
**CALCIUM RESULTS FROM SEASONAL MONITORING EVENTS IN THE ANTELOPE CREEK WATERSHED**

Iron results were consistently higher at ANTC3B than at CLVRESR. As shown in **Figure 3-54**, iron concentrations ranged from 0.06 mg/L at CLVRESR during the fall monitoring event to 0.94 mg/L at ANTC3B during the spring monitoring event.



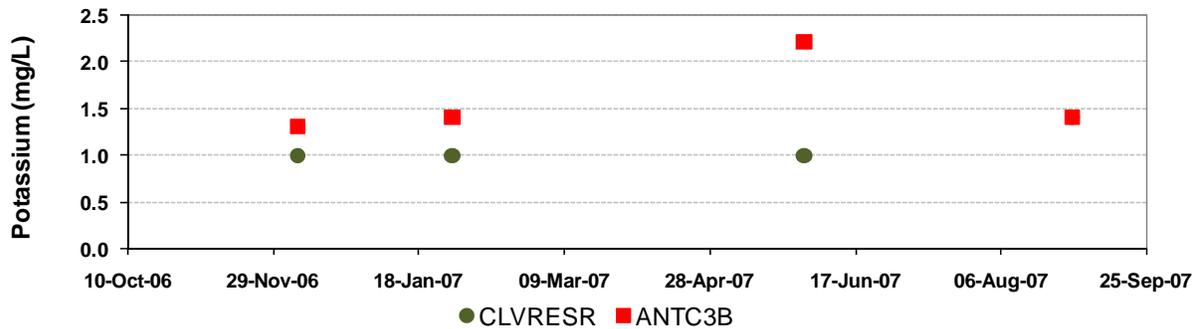
**FIGURE 3-54**  
**IRON RESULTS FROM SEASONAL MONITORING EVENTS IN THE ANTELOPE CREEK WATERSHED**

Magnesium concentrations ranged from 0.1 mg/L at CLVRESR during the summer monitoring event to 6.3 mg/L at ANTC3B during the spring monitoring event (**Figure 3-55**).



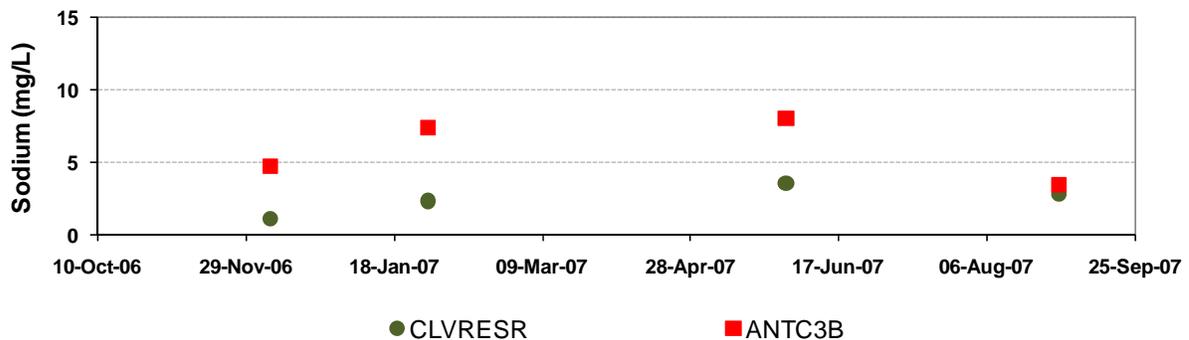
**FIGURE 3-55**  
**MAGNESIUM RESULTS FROM SEASONAL MONITORING EVENTS IN THE ANTELOPE CREEK WATERSHED**

Potassium results for CLVRESR and ANTC3B during baseline sampling events were also low, as shown in **Figure 3-56**.



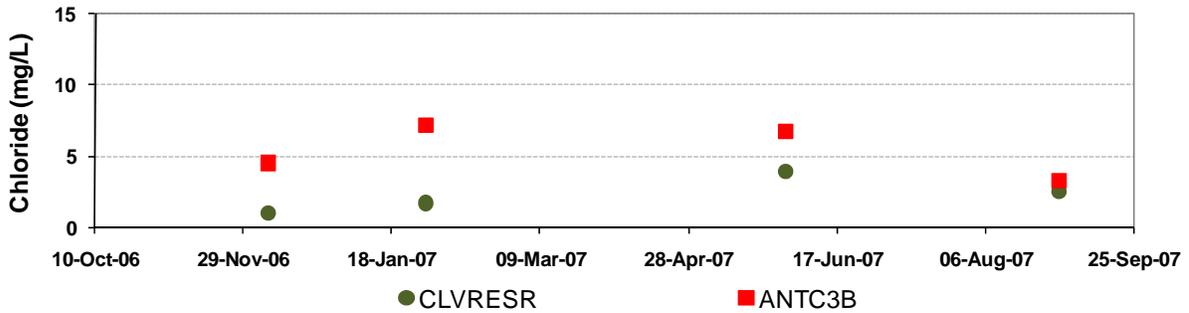
**FIGURE 3-56**  
**POTASSIUM RESULTS FROM SEASONAL MONITORING EVENTS IN THE ANTELOPE CREEK WATERSHED**

Sodium results for CLVRESR and ANTC3B display similar trends as at the other stream monitoring sites; results are higher during the winter and spring monitoring events than during the fall and summer events. **Figure 3-57** shows sodium results ranging from 1.1 mg/L at CLVRESR during the fall monitoring event to 8.0 mg/L at ANTC3B during the spring monitoring event.



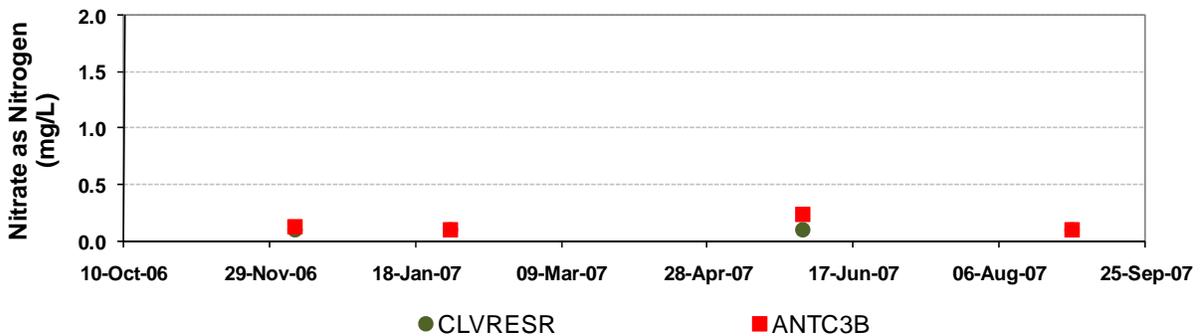
**FIGURE 3-57**  
**SODIUM RESULTS FROM SEASONAL MONITORING EVENTS IN THE ANTELOPE CREEK WATERSHED**

Chloride results ranged from 1.0 mg/L at CLVRESR during the fall monitoring event to 7.1 mg/L at ANTC3B during the winter monitoring event (**Figure 3-58**).



**FIGURE 3-58**  
**CHLORIDE RESULTS FROM SEASONAL MONITORING EVENTS IN THE ANTELOPE CREEK WATERSHED**

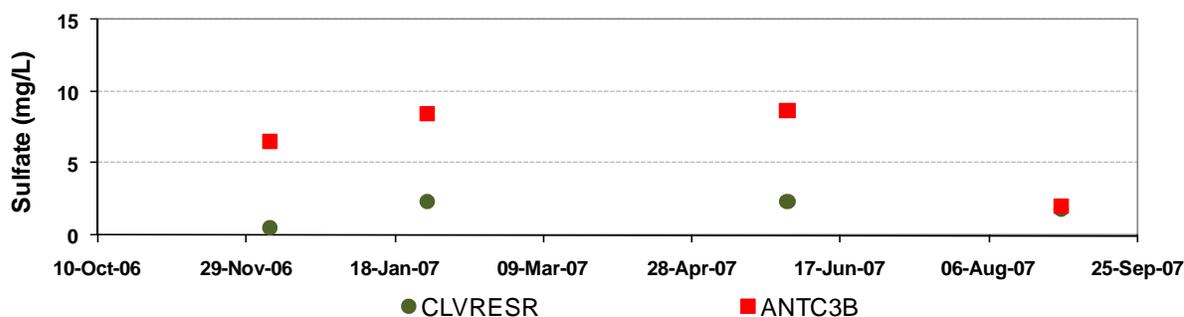
No nitrate was detected at CLVRESR and nitrate levels at ANTC3B were very low during baseline monitoring events. As shown in **Figure 3-59**, nitrate results ranged from the detection limit (0.1 mg/L) during the summer monitoring event to 0.24 mg/L during the spring monitoring event.



**FIGURE 3-59**  
**NITRATE RESULTS FROM SEASONAL MONITORING EVENTS IN THE ANTELOPE CREEK WATERSHED**

Nitrate and orthophosphate (PO<sub>4</sub>) were measured by the DCC and Central Valley RWQCB in the Antelope Creek watershed. Although overall nitrate and phosphate values were low, data suggest that the nitrate-to-phosphate ratio is lower than the biologically desirable ratio of 10:1 (Placer County Planning Department 2003).

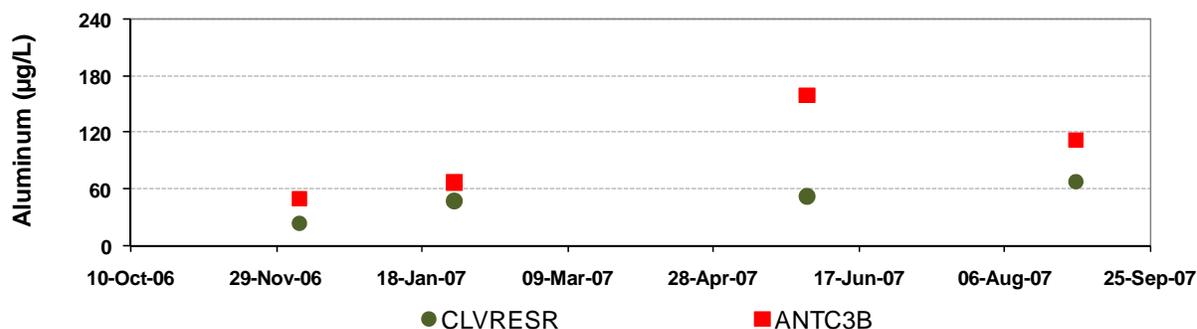
As shown in **Figure 3-60**, sulfate levels ranged from 0.5 mg/L at CLVRESR during the fall monitoring event to 8.7 mg/L at ANTC3B during the spring monitoring event.



**FIGURE 3-60**  
**SULFATE RESULTS FROM SEASONAL MONITORING EVENTS IN THE ANTELOPE CREEK WATERSHED**

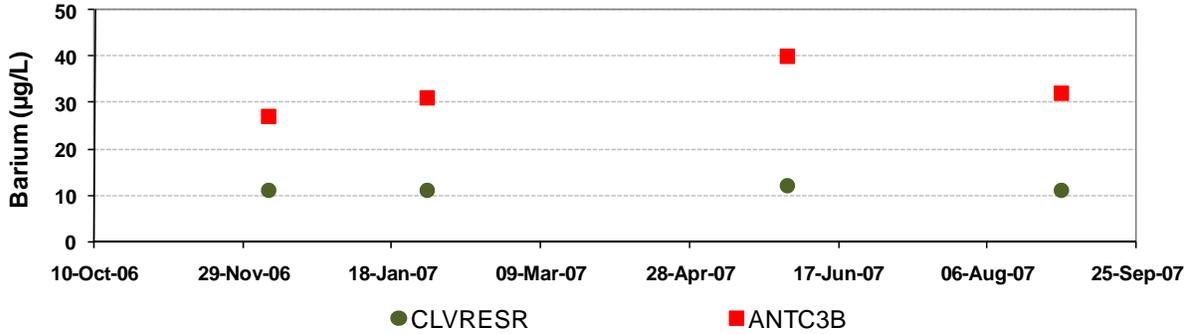
### Trace Elements

Aluminum results at ANTC3 were consistently higher compared to values measured at CLVRESR, and displayed a particularly high value during the spring monitoring event. Aluminum concentrations at both monitoring locations ranged from 25  $\mu\text{g/L}$  at CLVRESR during the fall monitoring event to 160  $\mu\text{g/L}$  during the spring monitoring event (**Figure 3-61**).



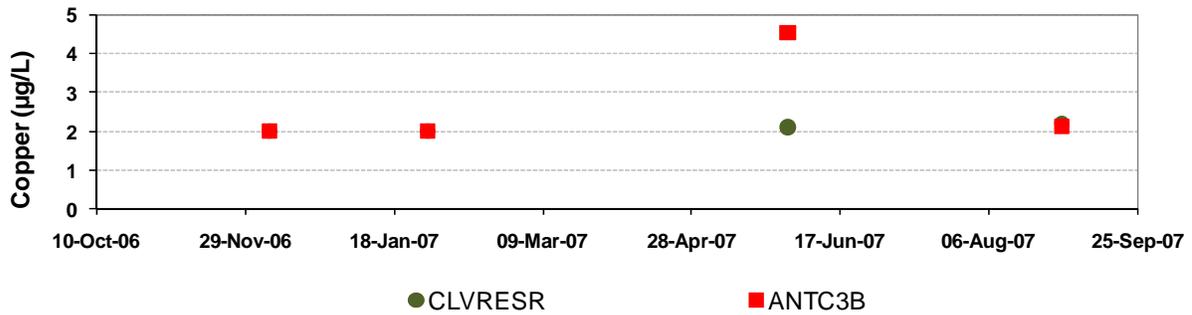
**FIGURE 3-61**  
**ALUMINUM RESULTS FROM SEASONAL MONITORING EVENTS IN THE ANTELOPE CREEK WATERSHED**

Barium concentrations at ANTC3B were consistently higher than at CLVRESR during seasonal monitoring events. As shown in **Figure 3-62**, barium results ranged from 11  $\mu\text{g/L}$  at CLVRESR during the fall, winter and summer monitoring events to 40  $\mu\text{g/L}$  at ANTC3 B during the spring monitoring event.



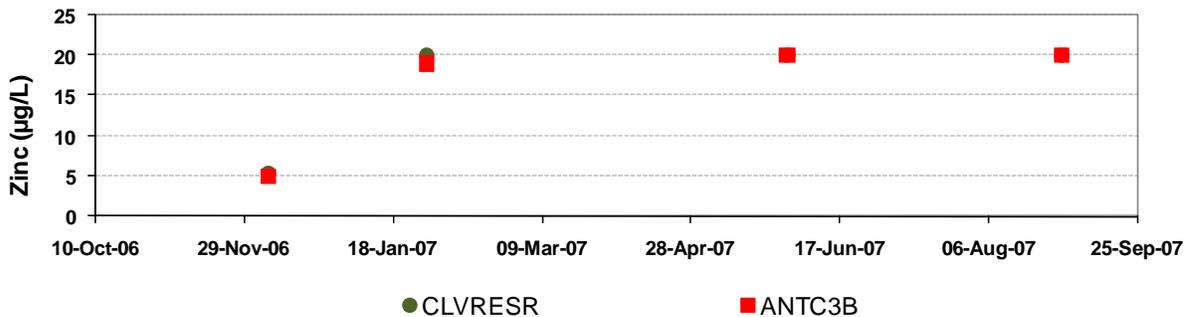
**FIGURE 3-62**  
**BARIUM RESULTS FROM SEASONAL MONITORING EVENTS IN THE ANTELOPE CREEK WATERSHED**

Cadmium concentrations at ANTC3B were below detection limits for baseline sampling events. Copper was only detected at CLVRESR and ANTC3B during the spring and summer monitoring events, and ranged from 2.1 to 4.5 µg/L (Figure 3-63).



**FIGURE 3-63**  
**COPPER RESULTS FROM SEASONAL MONITORING EVENTS IN THE ANTELOPE CREEK WATERSHED**

As shown in Figure 3-64, zinc was only detected at CLVRESR and ANTC3B during the winter monitoring event (at 20 µg/L 19 µg/L, respectively). Seasonal copper trends were similar to those of other stream monitoring sites. Mercury concentrations at ANTC3B were below detection limits for baseline sampling events.



**FIGURE 3-64**  
**ZINC RESULTS FROM SEASONAL MONITORING EVENTS IN THE ANTELOPE CREEK WATERSHED**

DCC and the Central Valley RWQCB measured trace elements at three different locations in the Antelope Creek watershed in 2001. Barium results ranged from 50 to 60  $\mu\text{g/L}$  and zinc levels ranged from 7 to 3.9  $\mu\text{g/L}$  (Sierra Business Council 2003). Copper levels were detected at 7  $\mu\text{g/L}$ , which is above the CTR chronic water quality standard of 5  $\mu\text{g/L}$ .

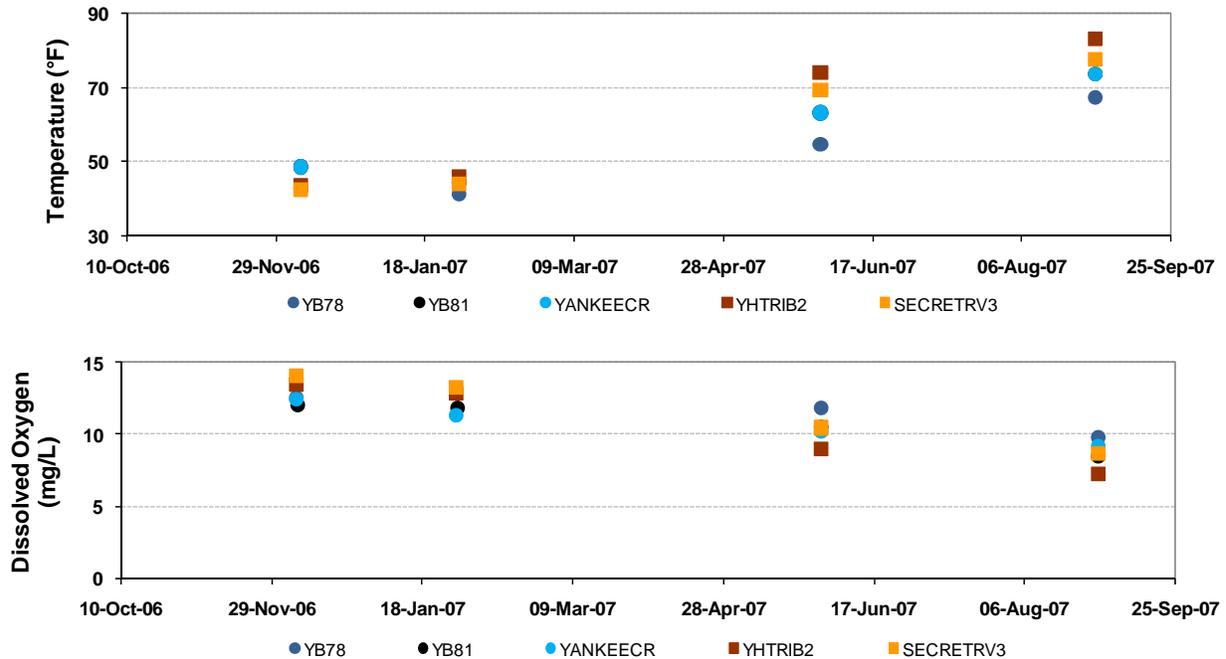
### **Secret Ravine**

Five baseline water quality monitoring sites were evaluated within the Secret Ravine watershed:

- **Boardman Canal at Powerhouse Road (YB78):** Located near the town of Auburn at an elevation of 1,300 feet. This site is the next monitoring location downstream from Boardman Canal below Lake Alta (YB96).
- **Boardman Canal below Mammoth Reservoir (YB81):** PCWA regulates flow releases from Mammoth Reservoir to the Boardman Canal, and lower portions of the PCWA raw water distribution system (East Loomis basin).
- **Yankee Hill Canal Outlet Release (YANKEE CR):** A canal south of Mammoth Reservoir that stems from the Boardman Canal to the northwest. Unregulated releases from this canal flow into an unnamed tributary that contributes flows to Secret Ravine.
- **Tributary to Secret Ravine from Yankee Hill Canal (YHTRIB2):** Located along the unnamed tributary receiving unregulated releases from the Yankee Hill Canal outlet YHTRIB2 near Barton Road, upstream from its confluence with Secret Ravine. The site is at the downstream edge of Indian Creek Country Club.
- **Secret Ravine at Rocklin Road (SECRET RV3):** Located just east of Interstate 80. This site has been monitored by DCC for the past few years.

### **Water Temperature and Dissolved Oxygen**

**Figure 3-65** shows water temperature and DO results from water quality monitoring at the five sites during baseline sampling events. Water temperature results exhibited a broad seasonal range at the locations, ranging from 41.2 °F at YB78 in the winter to 83.1 °F at YHTRIB2 during the summer monitoring event. DO levels also ranged seasonally from 7.2 mg/L at YHTRIB2 in the summer to 14.1 mg/L at SECRET RV3 in the fall.



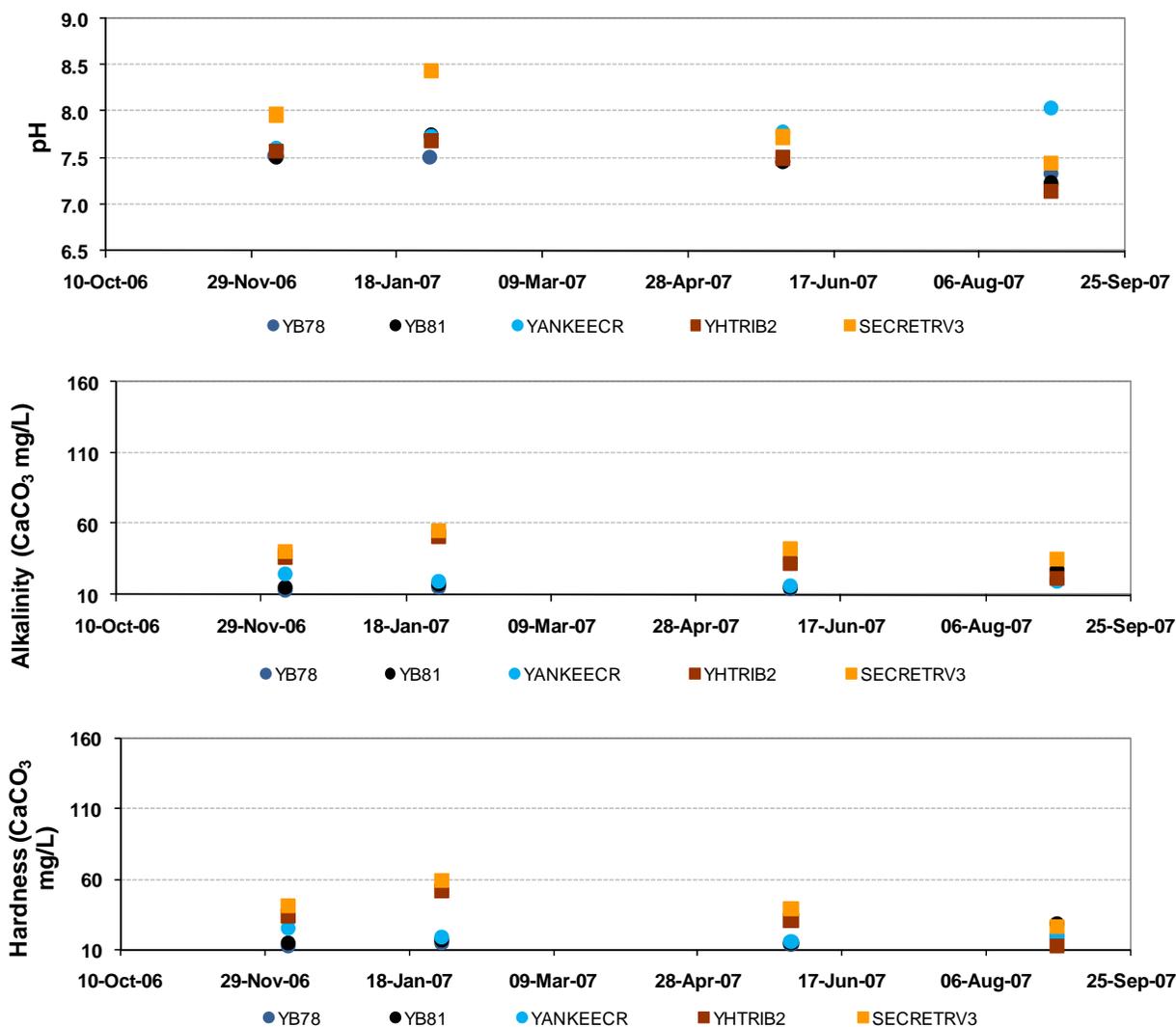
**FIGURE 3-65**  
**TEMPERATURE AND DISSOLVED OXYGEN RESULTS FROM SEASONAL MONITORING EVENTS IN SECRET RAVINE WATERSHED**

DCC collected temperature data at multiple locations along Secret Ravine between 2001 and 2005 (Sierra Business Council 2003). Water temperature results from DCC studies found average summer water temperatures ranged from 57 °F to 84 °F and average winter water temperatures ranged from 45 °F to 64 °F. Water temperatures were recorded by the DFG in 1984 at two monitoring locations on Secret Ravine: Rocklin Road and Brace Road. Water temperatures ranged from 50 °F in February 1984 to 64 °F in late May 1984. The Central Valley RWQCB collected water quality information at Loomis Basin Park on a monthly basis from December 2000 through February 2002 (Sierra Business Council 2003). Water temperature results from the Central Valley RWQCB study found average summer temperatures ranged from 54 °F to 86 °F and average winter water temperatures ranged from 41 °F to 66 °F.

DO data were collected by DCC during a periodic “first flush” and/or quarterly monitoring program upstream from Rocklin Road at the Secret Ravine confluence with Miners Ravine. DO levels measured during this program in 2002 and 2003 were within a reasonable range of expected values and did not raise concerns (Sierra Business Council 2003).

**pH, Alkalinity, and Hardness**

Figure 3-66 shows baseline pH, alkalinity, and hardness results for sites monitored in the Secret Ravine watershed. Consistently higher pH values were observed at SECRETRV3 compared to the other monitoring locations, with the exception of YANKEECR during the summer baseline monitoring event. Overall, pH results for all sites ranged from 7.1 to 8.4.

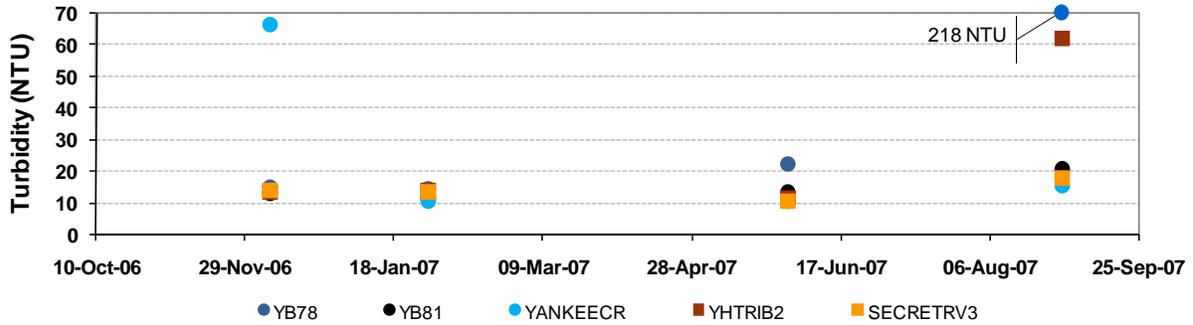


**FIGURE 3-66**  
**PH, HARDNESS, AND ALKALINITY RESULTS FROM SEASONAL MONITORING**  
**EVENTS IN THE SECRET RAVINE WATERSHED**

Wide fluctuations in pH values were found during sampling conducted by the Central Valley RWQCB. Although the total magnitude of annual change is within an acceptable range for water quality considerations, the fluctuations occur rapidly, particularly during the fall. Monthly sampling between December 2000 and February 2002 at Loomis Basin Park ranged from 8.3 in December 2000 to 6.7 in November 2001 (Sierra Business Council 2003).

#### Total Suspended Solids and Turbidity

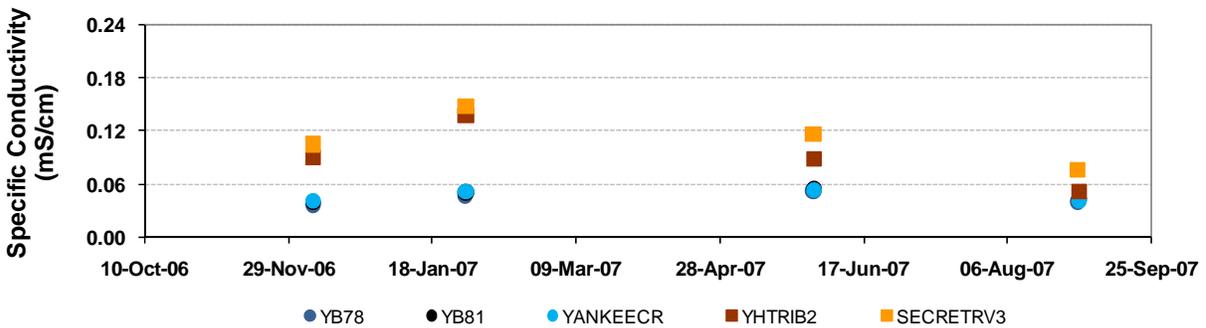
TSS values were below detection limits (10 mg/L) at all locations in the Secret Ravine watershed during all baseline monitoring events. Turbidity values at the five monitoring locations, shown in **Figure 3-67**, ranged between 10.2 and 65.9 NTUs during seasonal monitoring events, with the exception of a measured value of 218 NTU at YB78, which may be an outlier due to sampling procedures or a large object in the water affecting the signal of the optical turbidity sensor.



**FIGURE 3-67**  
**TURBIDITY RESULTS FROM SEASONAL MONITORING EVENTS IN THE SECRET RAVINE WATERSHED**

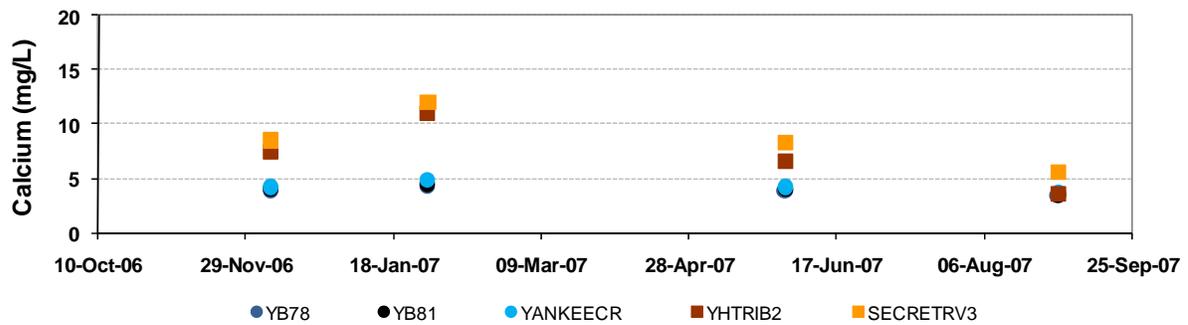
**Specific Conductivity and Ions**

Values for SC at YHTRIB2 and SECRETRV3 ranged from 0.05 and 0.08 mS/cm, whereas they ranged from 0.04 and 0.05 mS/cm at canal locations monitored within the Secret Ravine watershed (Figure 3-68).



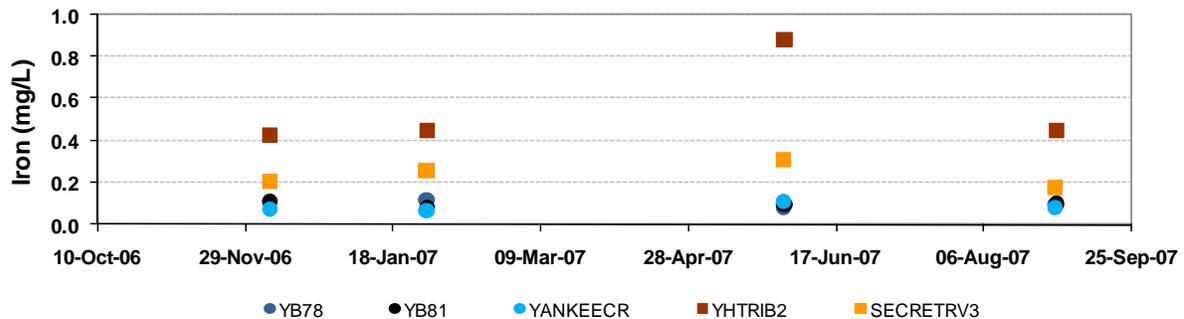
**FIGURE 3-68**  
**SPECIFIC CONDUCTIVITY RESULTS FROM SEASONAL MONITORING EVENTS IN THE SECRET RAVINE WATERSHED**

Similar to trends observed for SCs, calcium concentrations at YHTRIB2 and SECRETRV3 were consistently higher than at the canal monitoring locations. Calcium values ranged from 3.6 to 12 mg/L at YHTRIB2 and SECRETRV3, and from 3.6 to 3.8 mg/L at canal sites (Figure 3-69).



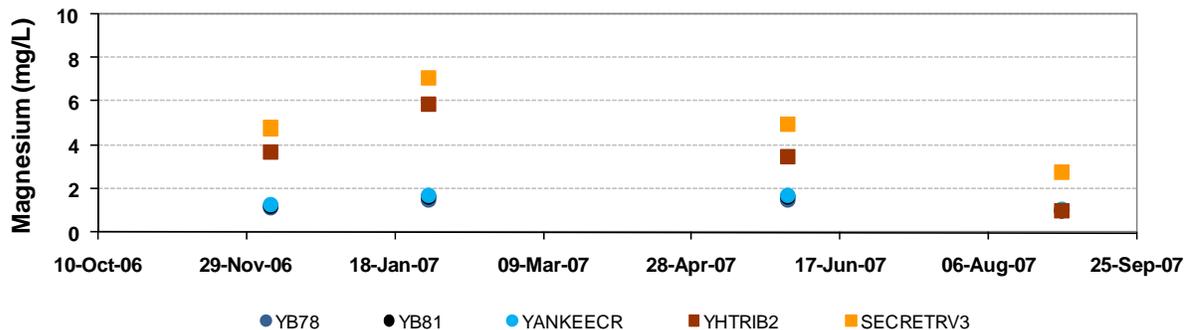
**FIGURE 3-69**  
**CALCIUM RESULTS FROM SEASONAL MONITORING EVENTS IN THE SECRET RAVINE WATERSHED**

Iron concentrations at the two stream sites monitored within the Secret Ravine watershed, YHTRIB2 and SECRETRV3, display a greater range than those at canal sites. As shown in **Figure 3-70**, iron concentrations at YHTRIB2 and SECRETRV3 ranged from 0.18 mg/L to 0.88 mg/L, whereas iron levels at canal monitoring locations ranged from 0.74 to 0.81 mg/L.



**FIGURE 3-70**  
**IRON RESULTS FROM SEASONAL MONITORING EVENTS IN THE SECRET RAVINE WATERSHED**

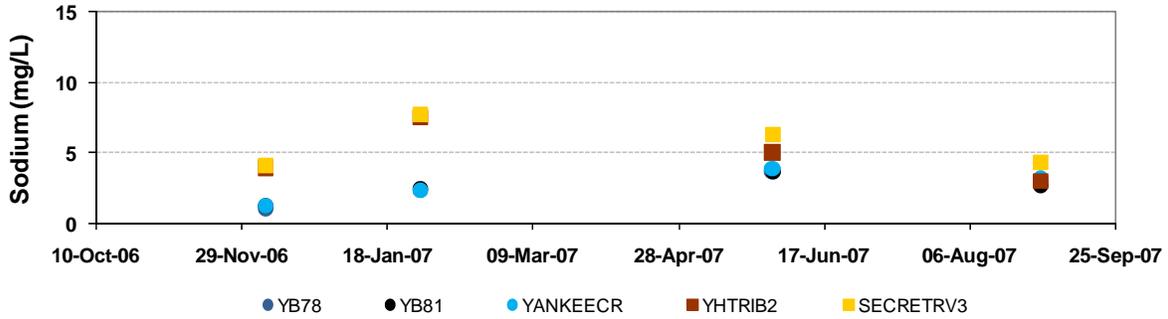
Magnesium concentrations followed the same trend exhibited by SC and calcium results (**Figure 3-71**).



**FIGURE 3-71**  
**MAGNESIUM RESULTS FROM SEASONAL MONITORING EVENTS IN THE SECRET RAVINE WATERSHED**

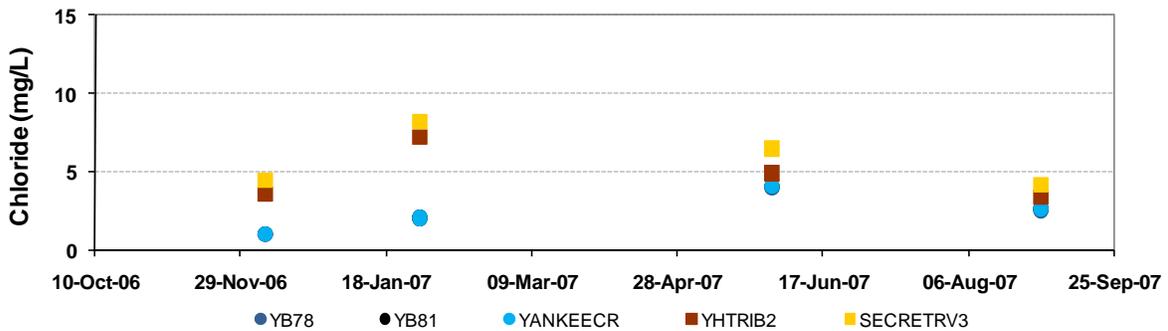
Potassium was not detected at canal monitoring locations during baseline sampling events. Potassium results at YHTRIB2 and SECRETRV3 during baseline sampling events were either just above (1.1 mg/L), at, or below the detection limit of 1.0 mg/L.

Sodium results also were consistently higher at YHTRIB2 and SECRETRV3 than at canal monitoring locations. Sodium values at YHTRIB2 and SECRETRV3 ranged from 3.0 mg/L to 7.7 mg/L and ranged from 1.2 to 3.8 mg/L at canal monitoring locations (**Figure 3-72**).



**FIGURE 3-72**  
**SODIUM RESULTS FROM SEASONAL MONITORING EVENTS IN THE SECRET RAVINE WATERSHED**

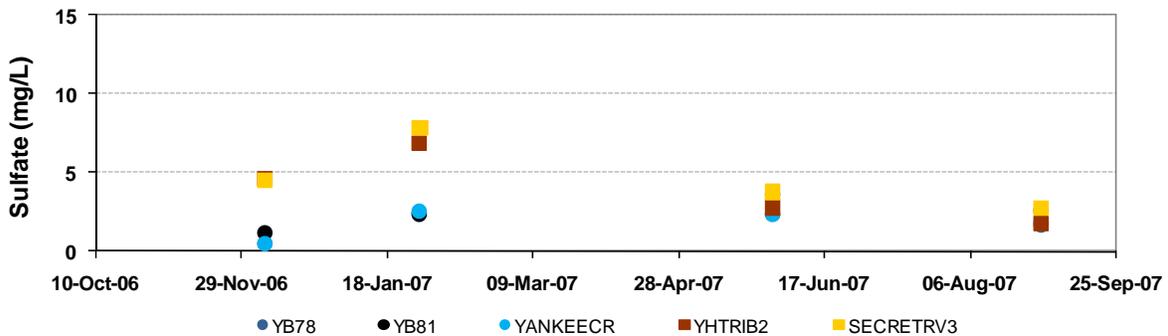
Chloride concentrations at YHTRIB2 and SECRETRV3 ranged from 3.4 to 8.2 mg/L, and from 1.0 to 4.0 mg/L at canal monitoring locations (**Figure 3-73**).



**FIGURE 3-73**  
**CHLORIDE RESULTS FROM SEASONAL MONITORING EVENTS IN THE SECRET RAVINE WATERSHED**

Nitrate results were at or below the detection limit of 0.1 mg/L at Secret Ravine watershed monitoring sites during baseline sampling events.

Sulfate concentrations at the five monitoring sites exhibited trends similar to SC and several other ions. Across all the sites, sulfate results ranged from 0.5 mg/L to 7.8 mg/L (**Figure 3-74**).

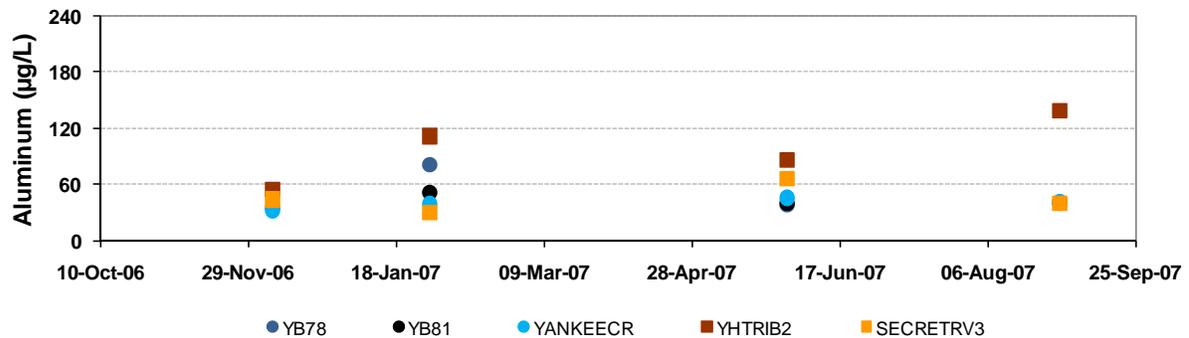


**FIGURE 3-74**  
**SULFATE RESULTS FROM SEASONAL MONITORING EVENTS IN THE SECRET RAVINE WATERSHED**

The 2001 to 2005 DCC study collected nitrate data at various locations along Secret Ravine. Nitrate results from this study ranged from 0.09 to 0.20 mg/L during the summer and 0.05 to 0.08 mg/L during winter (Sierra Business Council 2003).

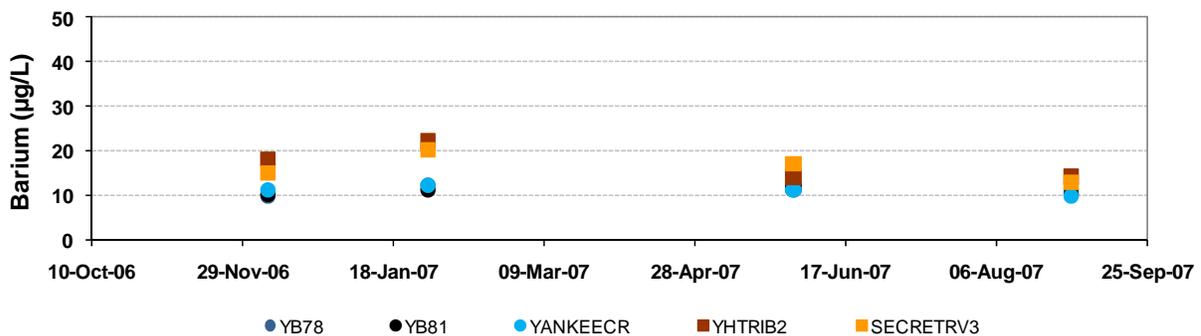
### Trace Elements

As shown in **Figure 3-75**, no specific trend was noted with aluminum results at the five monitoring sites. Aluminum concentrations varied at the sites from below the detection limit of 40 µg/L to 137 µg/L.



**FIGURE 3-75**  
**ALUMINUM RESULTS FROM SEASONAL MONITORING EVENTS IN THE SECRET RAVINE WATERSHED**

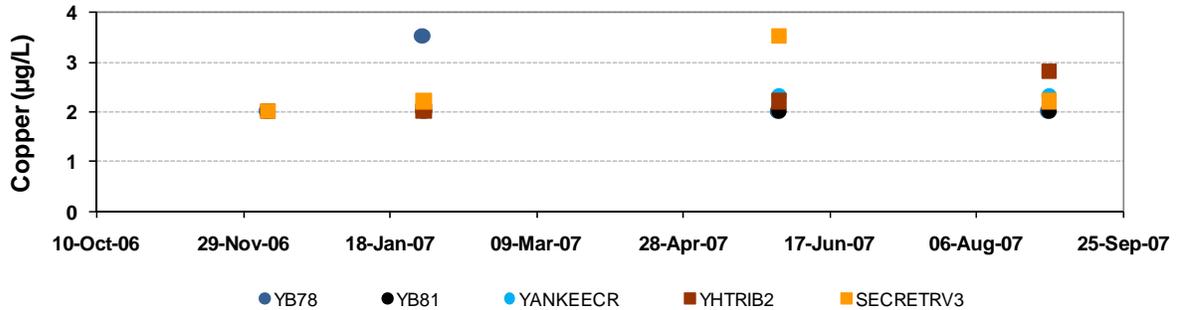
Barium results at the YHTRIB2 and SECRETRV3 monitoring sites were consistently higher compared to those at the canal monitoring sites. As shown in **Figure 3-76**, barium levels ranged from 9.7 to 22.0 µg/L at the five monitoring locations.



**FIGURE 3-76**  
**BARIUM RESULTS FROM SEASONAL MONITORING EVENTS IN THE SECRET RAVINE WATERSHED**

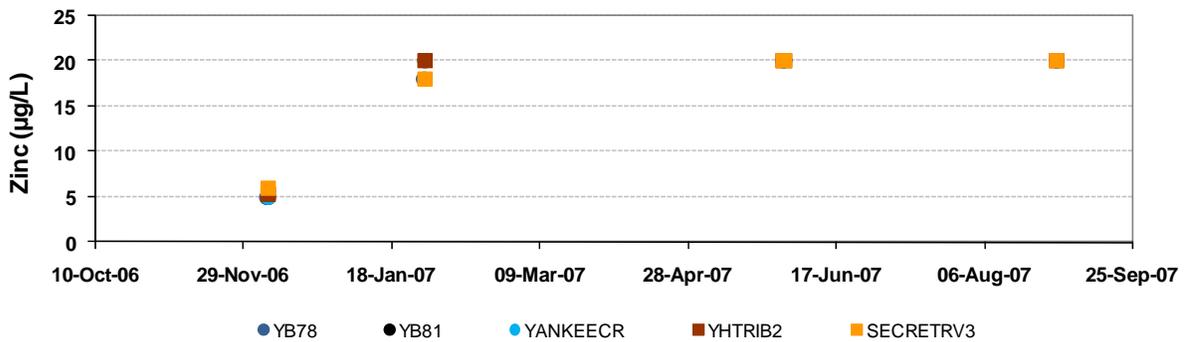
Cadmium concentrations at sites monitored in the Secret Ravine watershed were below detection limits for baseline sampling events. Copper concentrations were below the detection limit during the fall monitoring event at the five monitoring locations. During the other seasons, concentrations of copper remained fairly low, with the highest copper concentration measured at 3.5 µg/L at SECRETRV3 during the spring monitoring event and at YB78 during the winter

monitoring event (**Figure 3-77**). Similar to cadmium results, mercury concentrations at sites monitored in the Secret Ravine watershed were below detection limits for baseline sampling events.



**FIGURE 3-77**  
**COPPER RESULTS FROM SEASONAL MONITORING EVENTS IN THE SECRET RAVINE WATERSHED**

Measured zinc concentrations were similar at all sites, with detections only during the fall and winter monitoring events at YHTRIB2 and SECRETRV3 sites (**Figure 3-78**). Concentrations of zinc during the spring and summer monitoring events were below the detection limit (20 µg/L).



**FIGURE 3-78**  
**ZINC RESULTS FROM SEASONAL MONITORING EVENTS IN THE SECRET RAVINE WATERSHED**

The Central Valley RWQCB collected data on cadmium, copper, and zinc from Secret Ravine at Loomis Basin Park on a monthly basis from December 2000 through February 2002. Copper, cadmium, and zinc levels exceeded standards of the CTR in November 2002, with reported levels of 12 µg/L, 0.010 mg/L, and 70.0 µg/L, respectively, at the confluence with Miners Ravine (Sierra Business Council 2003).

### **Miners Ravine**

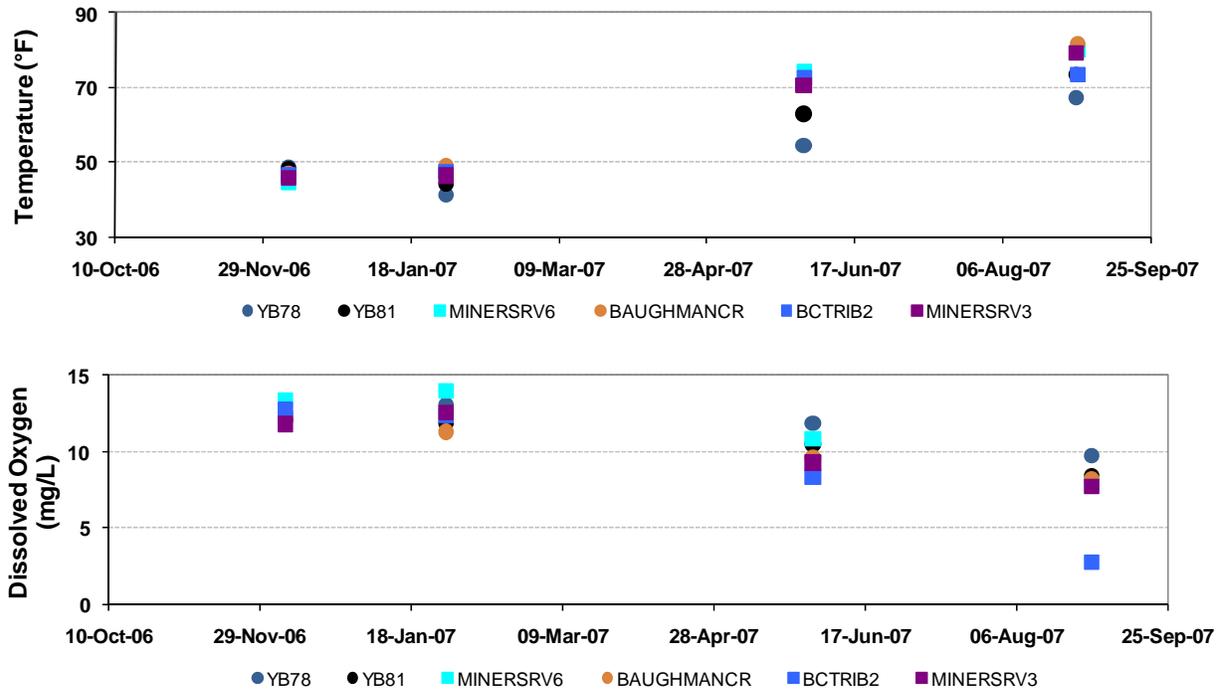
Miners Ravine, similar to Secret Ravine, contributes to flows in Dry Creek. Miners Ravine has topography similar to Secret Ravine; its upper reaches are distinguished by higher elevation steep terrain, and lower reaches consist of flat valleys. Also similar to Secret Ravine, canal system contributions comprise most of the dry weather flows in Miners Ravine. These contributions include customer return flows and unregulated releases from multiple canals. Various tributaries also contribute flows to Miners Ravine. Land uses in the watershed include agricultural, residential, commercial, industrial, and open space (Placer County Planning Department 2007).

Water quality monitoring was conducted at several canal and stream sites within the Miners Ravine watershed:

- **Boardman Canal at Powerhouse Road (YB78):** Located near the town of Auburn at an elevation of 1,300 feet. This site is the next monitoring location downstream from Boardman Canal below Lake Alta (YB96).
- **Boardman Canal below Mammoth Reservoir (YB81):** PCWA regulates flow releases from Mammoth Reservoir to the Boardman Canal, and lower portions of the PCWA raw water distribution system (East Loomis basin).
- **Baughman Canal Outlet Release (BAUGHMANCR):** A canal south of Mammoth Reservoir that stems from the Boardman Canal to the north. Unregulated releases from this canal flow into an unnamed tributary that contributes flows to Miners Ravine.
- **Miners Ravine at Dick Cook Road (MINERSRV6):** Located in the Town of Loomis upstream from two other monitoring locations for baseline sampling in the Miners Ravine watershed. The site is just south of the Placer County SMD No. 3. Plant.
- **Tributary to Miners Ravine from Baughman Canal (BCTRIB1):** Located along the unnamed tributary receiving unregulated releases from the Baughman Canal Outlet near Cavitt-Stallman Road, immediately upstream from its confluence with Miners Ravine.
- **Miners Ravine at North Sunrise Avenue (MINERSRV3):** Located near a bike path bridge, upstream from the confluence with Secret Ravine.

### **Water Temperature and Dissolved Oxygen**

Water temperature and DO data for the six baseline monitoring sites in the Miners Ravine watershed are shown in **Figure 3-79**. Seasonal water temperature results for all the sites ranged from 41.2 °F during the winter monitoring event to 81.5°F during summer. DO levels follow an inverse trend compared to water temperature. DO levels at the six sites ranged from 2.7 mg/L during summer to 14.0 in the winter.



**FIGURE 3-79**  
**TEMPERATURE AND DISSOLVED OXYGEN RESULTS FROM SEASONAL MONITORING EVENTS IN MINERS RAVINE WATERSHED**

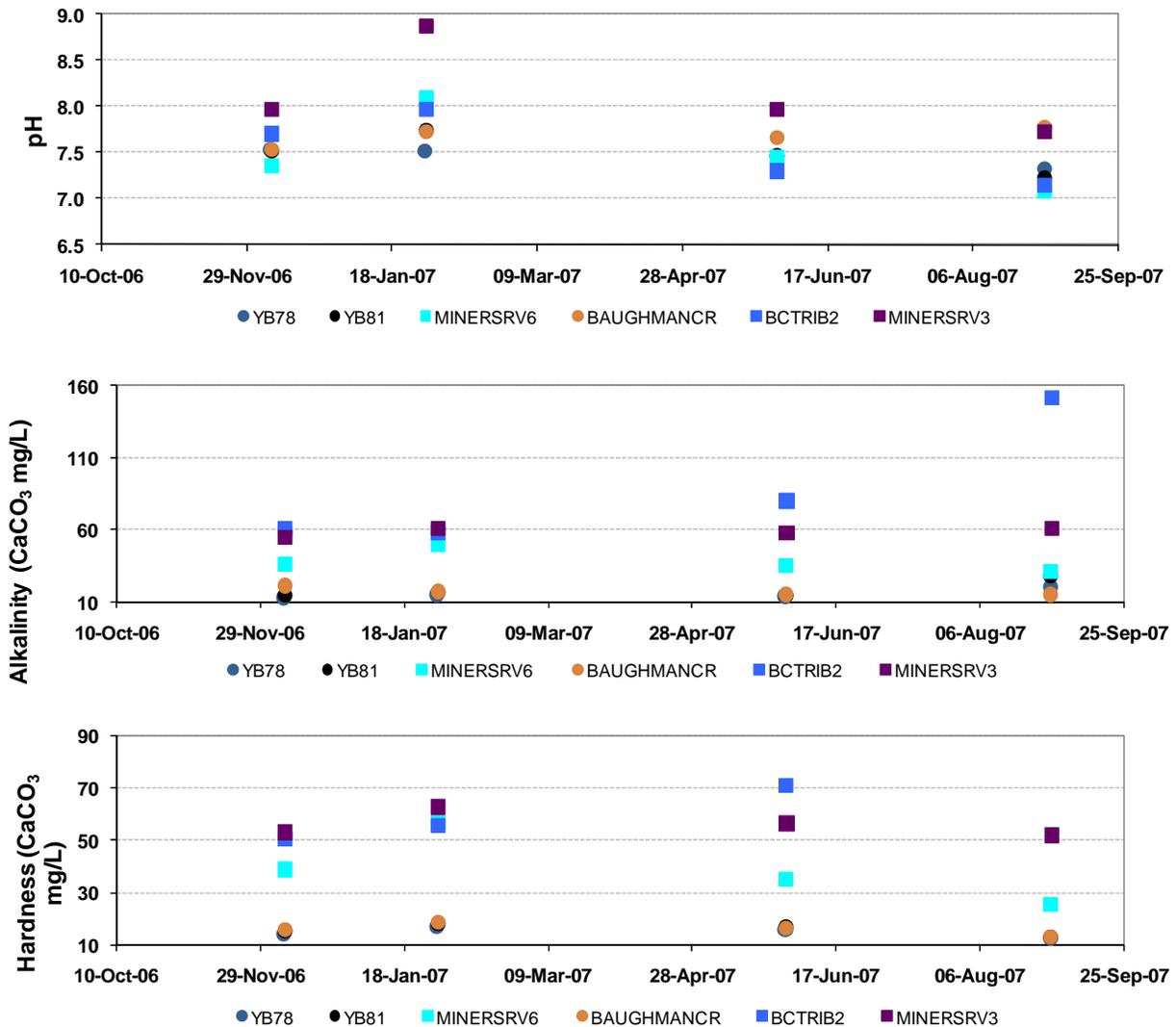
Hourly water temperature data was collected by Bailey Environmental from May to August 2003 at the Miner Ravine Road crossing, Barton Road crossing, Cavitt-Stallman Road crossing, and the Olympus Point development in Roseville behind the United Artists complex (Sierra Business Council 2003). Water temperatures collected at Miner Ravine Road crossing between May 31 and August 5, 2003, ranged from 54 °F in late June 2003 to 86 °F in late July 2003. At Barton Road crossing, water temperatures ranged from 64 °F in mid-June 2003 to 81 °F in late July 2003, and between 66 °F in mid-June 2003 to 84 °F in mid-July 2003 at Cavitt-Stallman Road crossing. Finally, water temperatures at the Olympus Pointe site between June 18 and July 24, 2003, ranged from 68 °F in late June to 86 °F in late July 2003. DFG collected water temperature data from 1999 to 2003 at a monitoring site near Dick Cook Road (Sierra Business Council 2003) Water temperatures measured in the fall (September 1 to December 31, 2002) ranged from 80 °F to 43 °F, in the winter (January 1 to April 27, 2003) ranged from 42 °F to 67 °F, and in the summer (May 1 to August 25, 2003) ranged from 54 °F to almost 88 °F (Sierra Business Council 2003).

DO results from a 2000 to 2002 Central Valley RWQCB study at Miners Ravine ranged from 5.4 mg/L to 8.5 mg/L during the summer and 3.4 mg/L to 6.9 mg/L during the winter (Placer and Sacramento Counties 2003).

**pH, Alkalinity, and Hardness**

Baseline water quality results for pH, alkalinity, and hardness from sites monitored in the Miners Ravine watershed are shown in **Figure 3-80**. Results for pH at MINERSRV3 were consistently

higher compared to the other five monitoring locations. Overall, pH results ranged at the six sites from 7.1 to 8.9. Measured alkalinity and calculated hardness values were consistently higher at the stream sites than the canal sites. Alkalinity levels ranged from 31.0 to 151.0 mg/L CaCO<sub>3</sub> at the stream sites and ranged from 15.0 to 20.0 mg/L CaCO<sub>3</sub> at the canal sites. Hardness ranged from 25.4 to 70.4 mg/L CaCO<sub>3</sub> at the stream sites and 14.0 to 16.1 mg/L CaCO<sub>3</sub> at the canal sites.

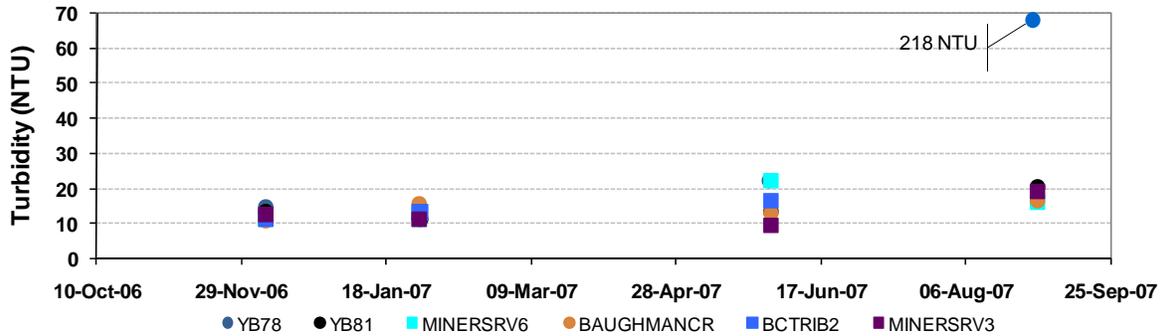


**FIGURE 3-80  
PH, ALKALINITY, AND HARDNESS RESULTS FROM SEASONAL MONITORING  
EVENTS IN THE MINERS RAVINE WATERSHED**

A 2000 to 2002 Central Valley RWQCB study found pH values ranging from 6.2 to 7.8 during summer and 6.2 to 8.2 during winter within the Miners Ravine watershed (Sierra Business Council 2003). An Administrative Civil Liability (ACL) complaint and fine were recently issued to Placer County SMD No. 3 by the Central Valley RWQCB for violations in effluent limitations to Miners Ravine for pH from January 2000 to December 2007 (RWQCB 2008).

**Total Suspended Solids and Turbidity**

TSS values were below detection limits (10 mg/L) at locations monitored in the Miners Ravine watershed during baseline monitoring events, with three exceptions: 13 mg/L at MINERSRV6 during the spring monitoring event, and 17 mg/L at BCTTRIB1, and 218 mg/L at YB78 during the summer monitoring event. As shown in **Figure 3-81**, turbidity values at the six sites were similar, ranging between 9.4 and 21.9 NTUs, with the exception of a measurement of 218 NTUs at YB78, which may be an outlier due to sampling procedures or a large object signaling the optical turbidity probe.

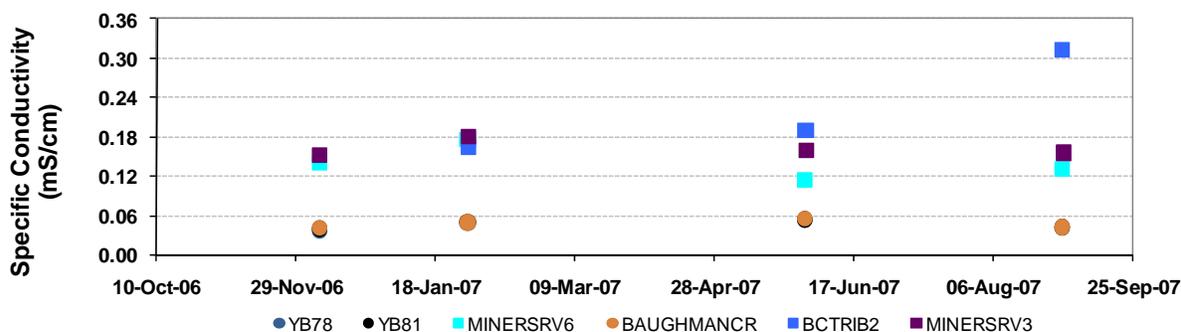


**FIGURE 3-81  
TURBIDITY RESULTS FROM SEASONAL MONITORING EVENTS IN THE MINERS RAVINE WATERSHED**

The 2000 to 2002 Central Valley RWQCB study found turbidity values ranging from 3.7 to 5.5 NTUs during summer and 3.4 to 6.9 NTUs during winter within the Miners Ravine watershed (Placer and Sacramento Counties 2003). The Central Valley RWQCB recently issued an ACL complaint and fine to Placer County SMD No. 3 for violations in effluent limitations to Miners Ravine for turbidity from January 2000 to December 2007 (RWQCB 2008).

**Specific Conductivity and Ions**

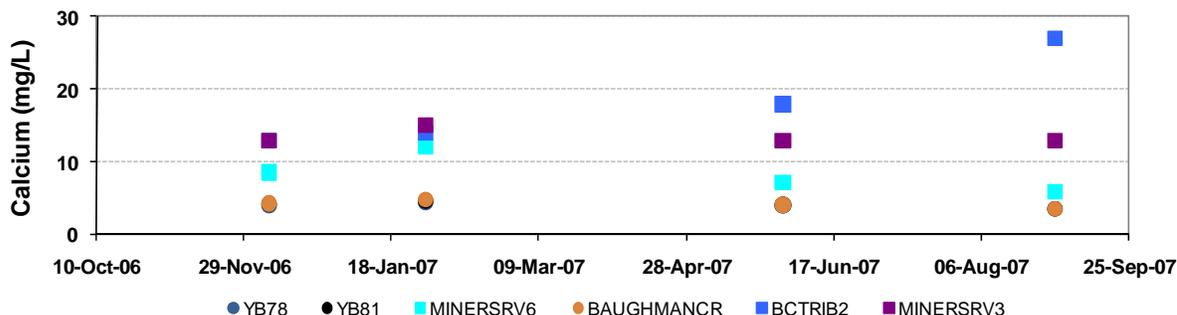
SC results at stream monitoring sites in the Miners Ravine watershed (MINERSRV6, BCTTRIB1, and MINERSRV3) are higher than those at the canal monitoring sites, and among the highest levels compared to other stream monitoring sites. As shown in **Figure 3-82**, the greatest SC value among the stream sites was measured at 0.31 mg/L at the BCTTRIB1 site during the summer monitoring event, and the lowest value (0.1 mg/L) occurred at MINERSRV6. SC values at the canal monitoring locations were similar across sites, and ranged from 0.04 to 0.05 mg/L.



**FIGURE 3-82**  
**SPECIFIC CONDUCTIVITY RESULTS FROM SEASONAL MONITORING EVENTS IN THE MINERS RAVINE WATERSHED**

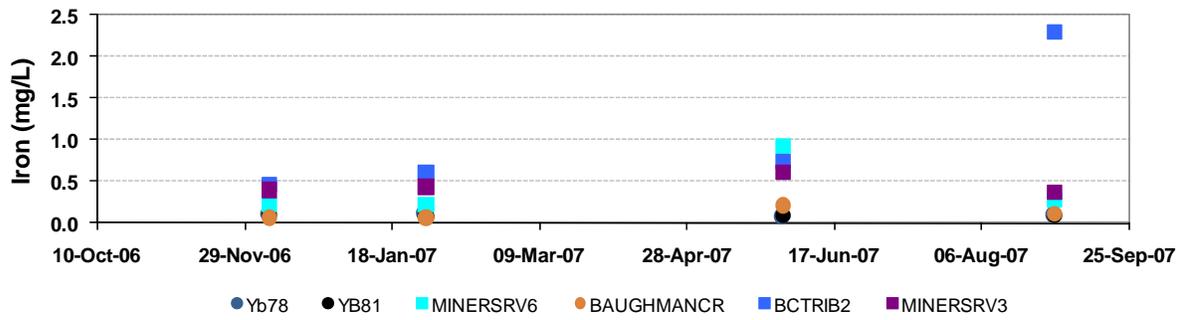
The 2000 to 2002 Central Valley RWQCB study found SC values ranging from 0.075 to 0.145 mS/cm during the summer and 30.2 to 0.200 mS/cm during the winter within the Miners Ravine watershed (Placer and Sacramento Counties 2003).

Trends in calcium baseline water quality monitoring were very similar to those described for specific conductivity (**Figure 3-83**). The highest concentrations of calcium were observed during the summer monitoring event at BCTRIB1.



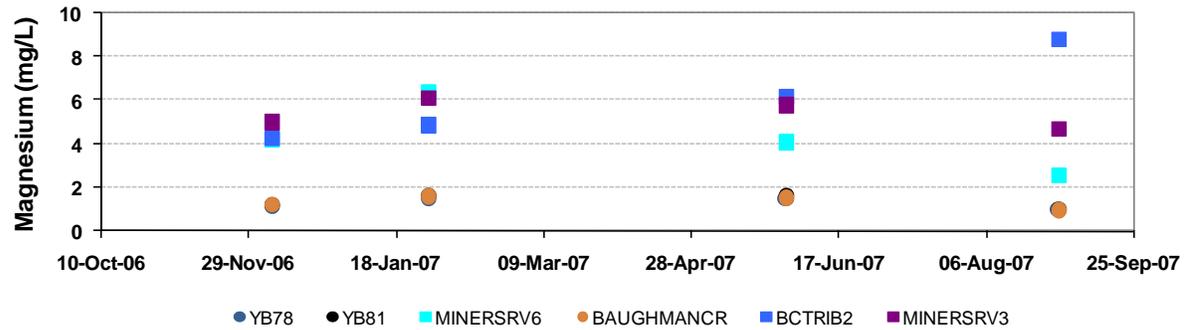
**FIGURE 3-83**  
**CALCIUM RESULTS FROM SEASONAL MONITORING EVENTS IN THE MINERS RAVINE WATERSHED**

Iron results for baseline water quality monitoring at sites in Miners Ravine watershed are shown in **Figure 3-84**. BCTRIB1 had an iron concentration of 2.3 mg/L during the summer monitoring event, which is particularly high compared to all other monitoring sites during seasonal monitoring events.



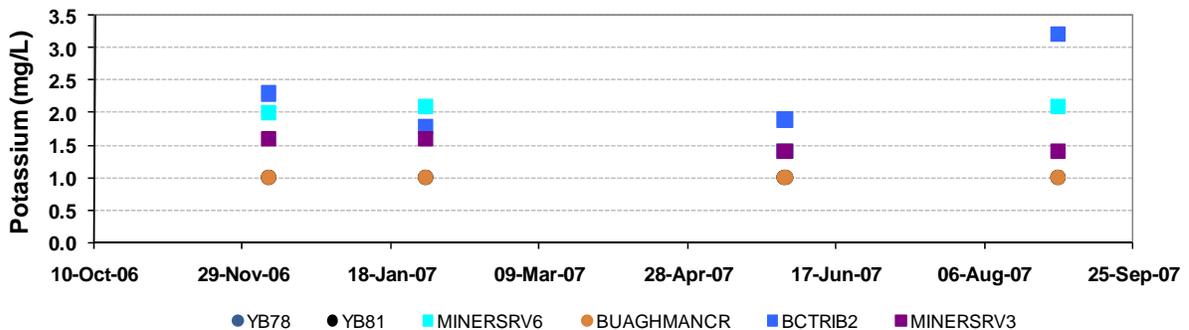
**FIGURE 3-84**  
**IRON RESULTS FROM SEASONAL MONITORING EVENTS IN THE MINERS RAVINE WATERSHED**

Trends in seasonal magnesium concentrations were similar to those described for SC and calcium (Figure 3-85).



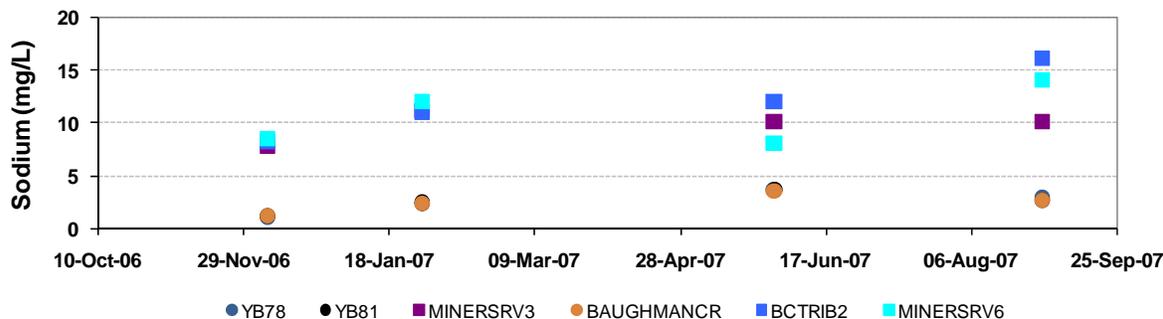
**FIGURE 3-85**  
**MAGNESIUM RESULTS FROM SEASONAL MONITORING EVENTS IN THE MINERS RAVINE WATERSHED**

Potassium levels were consistently higher at stream sites than at canal monitoring sites. No notable seasonal trends were observed in potassium concentrations at baseline sampling sites in the Miners Ravine watershed (Figure 3-86).



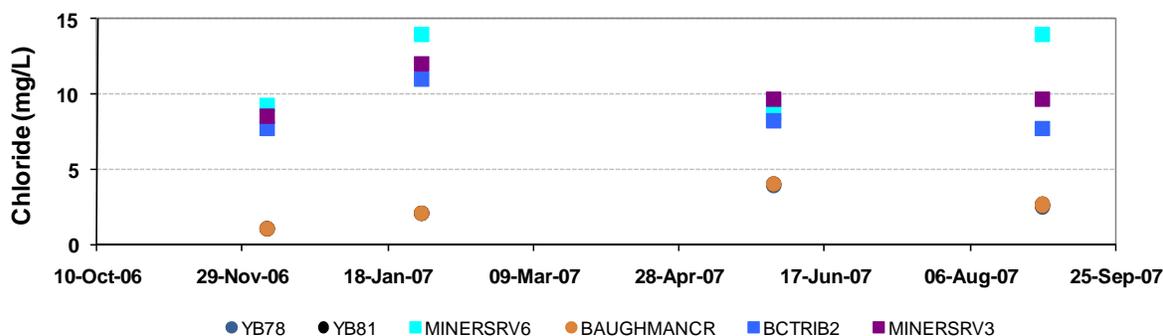
**FIGURE 3-86**  
**POTASSIUM RESULTS FROM SEASONAL MONITORING EVENTS IN THE MINERS RAVINE WATERSHED**

Sodium concentrations in the Miners Ravine watershed displayed similar seasonal trends as those observed for SC, calcium, and magnesium, in which the BCTRIB1 monitoring location had the highest values during the spring and summer monitoring events (**Figure 3-87**). In addition, most variation across sites occurred during the summer monitoring event.



**FIGURE 3-87**  
**SODIUM RESULTS FROM SEASONAL MONITORING EVENTS IN THE MINERS RAVINE WATERSHED**

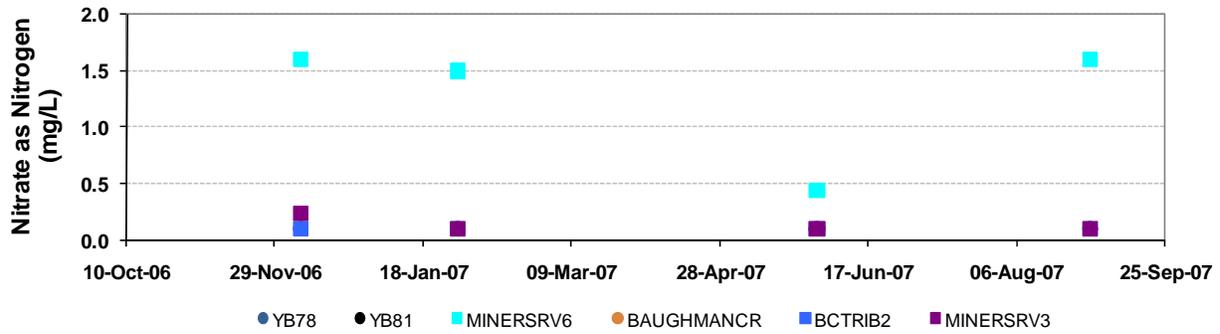
Although chloride results at stream monitoring locations are consistently higher than those at canal monitoring sites, as with other ions, chloride was not consistently high at BCTRIB1. As shown in **Figure 3-88**, chloride results varied from 7.7 to 14.0 mg/L at stream monitoring sites and from 1.0 to 4.0 mg/L at canal monitoring locations.



**FIGURE 3-88**  
**CHLORIDE RESULTS FROM SEASONAL MONITORING EVENTS IN THE MINERS RAVINE WATERSHED**

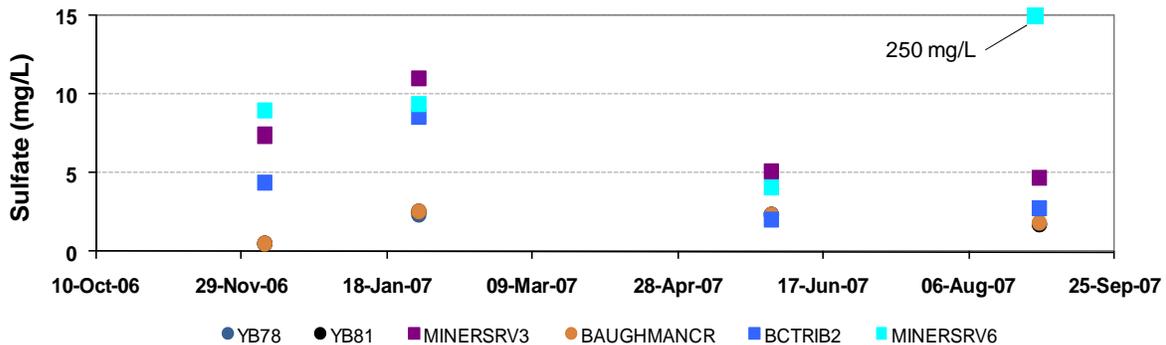
An ACL complaint and fine were recently issued to Placer County SMD No. 3 by the Central Valley RWQCB for violations in effluent limitations to Miners Ravine for chlorine residual from January 2000 to December 2007 (RWQCB 2008).

Nitrate concentrations at MINERSRV6 were consistently higher than at other monitoring locations (**Figure 3-89**). MINERSRV6 is downstream from the Placer County SMD No. 3 WWTP. The Central Valley RWQCB recently issued an ACL complaint and fine to Placer County SMD No. 3 for violations in effluent limitations to Miners Ravine for nitrate from January 2000 to December 2007 (RWQCB 2008).



**FIGURE 3-89**  
**NITRATE RESULTS FROM SEASONAL MONITORING EVENTS IN THE MINERS RAVINE WATERSHED**

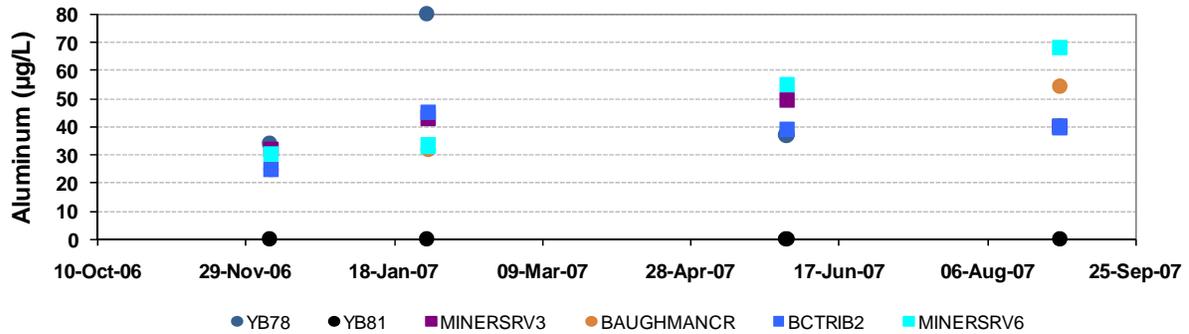
Sulfate results for Miners Ravine watershed sites during baseline sampling events were generally higher at the stream sites than at the canal sites, and higher streams in other watersheds monitored. Sulfate was measured at 250 mg/L at MINERSRV6 during the summer monitoring event (**Figure 3-90**). This data point is likely an outlying result that is due to potential changes in analytical methods, or a temporary source of increased sulfate upstream from MINERSRV6, such as wastewater discharges from Placer County SMD No. 3. Data on nitrate and phosphate were also collected during the 2001 to 2005 DCC study. While overall nitrate and phosphorus concentrations were not very high, no nutrients were measured during summer, when nutrient loads are typically highest. The data indicate that the biologically desirable 10:1 ratio of nitrate to phosphate was met only certain times of the year.



**FIGURE 3-90**  
**SULFATE RESULTS FROM SEASONAL MONITORING EVENTS IN THE MINERS RAVINE WATERSHED**

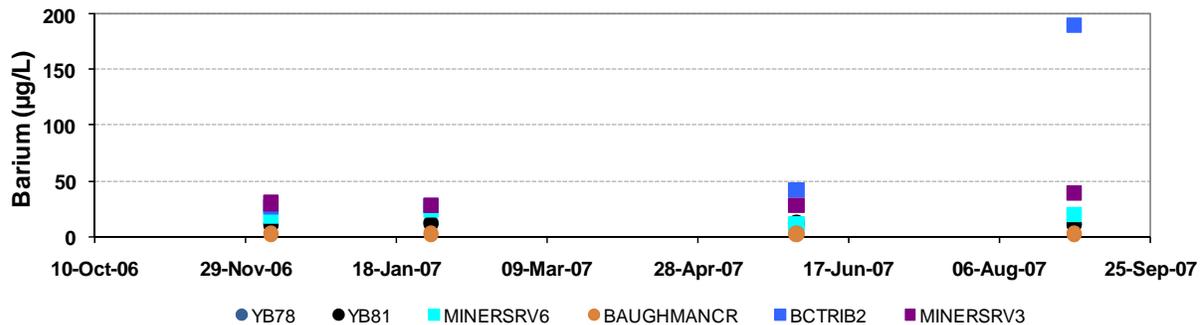
**Trace Elements**

Aluminum concentrations were low at sites evaluated in the Miners Ravine watershed compared to monitoring sites in other watersheds. As shown in **Figure 3-91**, aluminum results at all six monitoring sites ranged from the detection limit (25 µg/L) during the fall monitoring event to 80 µg/L during the summer monitoring event.



**FIGURE 3-91**  
**ALUMINUM RESULTS FROM SEASONAL MONITORING EVENTS IN THE MINERS RAVINE WATERSHED**

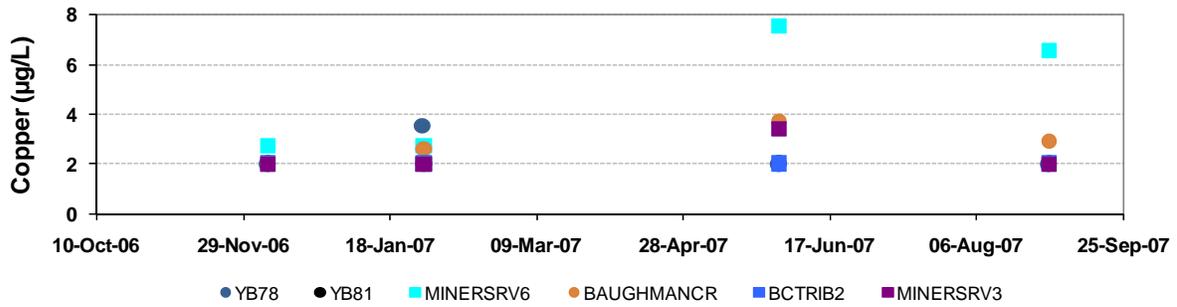
**Figure 3-92** shows barium concentrations from sites monitored within the Miners Ravine watershed during seasonal baseline sampling events. Barium levels at canal monitoring sites were consistently lower compared to those at stream sites, and ranged from below the detection limit of 2 µg/L to 11 µg/L. Barium results at the stream sites ranged from 11 to 42 µg/L, with the exception of one very high value (190 µg/L) measured at BCTTRIB1 during the summer monitoring event.



**FIGURE 3-92**  
**BARIUM RESULTS FROM SEASONAL MONITORING EVENTS IN THE MINERS RAVINE WATERSHED**

Cadmium concentrations at sites monitored in the Miners Ravine watershed were below detection limits for baseline sampling events.

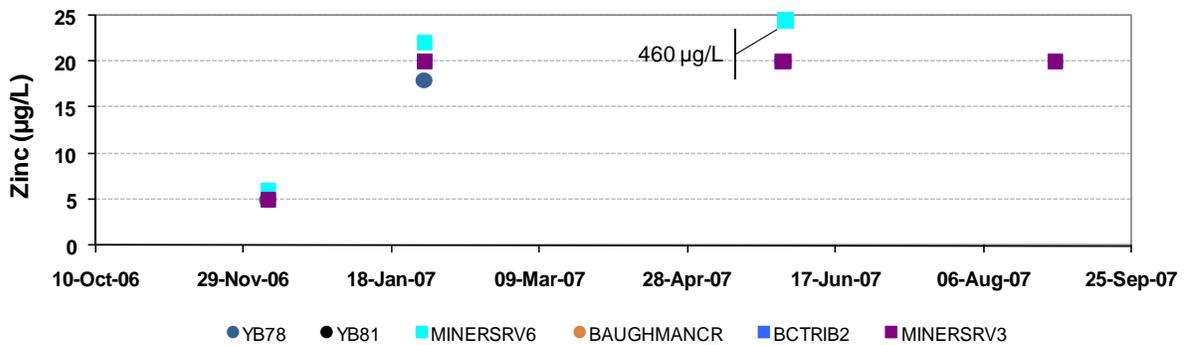
Copper concentrations at the six sites range from below the detection limit of 2 µg/L to 7.5 µg/L (**Figure 3-93**). The 2000 to 2002 Central Valley RWQCB study measured a copper value of 11 µg/L and a zinc value of 1.0 µg/L within the Miners Ravine watershed (Sierra Business Council 2003). Copper exceeded the CTR at 8.0 µg/L at Dick Cook Road during November 2001 (Sierra Business Council 2003).



**FIGURE 3-93**  
**COPPER RESULTS FROM SEASONAL MONITORING EVENTS IN THE MINERS RAVINE WATERSHED**

Mercury concentrations at sites monitored in the Miners Ravine watershed were below detection limits for baseline sampling events. CVCWA monitored methylmercury from August 2004 through April 2005 at Miners Ravine below the discharge of the Placer County SMD No. 3 WWTP. Methylmercury levels at this site ranged from 0.01 grams per year (grams/year) to 1.29 grams/year, averaging 0.23 grams/year. Mercury pollution in California watersheds originates primarily from historical mining operations and from atmospheric deposition (CVCWA 2005).

Zinc concentrations for seasonal baseline monitoring events at the six monitoring sites are shown in **Figure 3-94**. In general, zinc concentrations were measured close to or below the detection limits during monitoring events, except during the spring monitoring event. Zinc was measured to be 460 µg/L at MINERSRV6 during the spring monitoring event. This is likely an outlier due to methodological errors or a temporary source of increased zinc concentrations during sampling at that location.



**FIGURE 3-94**  
**ZINC RESULTS FROM SEASONAL MONITORING EVENTS IN THE MINERS RAVINE WATERSHED**