

**Cross Valley Canal/Kern Water Bank  
Operating Guidelines during Shallow  
Groundwater Conditions (2000)**



# **CROSS VALLEY CANAL / KERN WATER BANK OPERATING GUIDELINES DURING SHALLOW GROUNDWATER CONDITIONS**

## **1 INTRODUCTION**

The Cross Valley Canal (CVC) and the Kern Water Bank (KWB), which coexist along 7 ¼ miles in the southwestern San Joaquin Valley, contribute significantly to water supply management and conservation in Kern County. The Kern County Water Agency (KCWA) and the KWB Authority (KWBA) believe it is in the best interests of both projects to develop guidelines that will allow the projects to operate to the fullest extent possible while at the same time being protective of facilities.

It should be noted that several proactive measures have already been undertaken by the CVC and KWBA. These include:

- Installing a shallow groundwater monitoring network and conducting regular monitoring and evaluation of shallow groundwater conditions;
- Raising the low-level cut-off float switch and installing a secondary low-level cut-off float switch at the forebay of CVC Pumping Plant No. 1;
- Increasing the range of the forebay level gauge for CVC Pumping Plant No. 1;
- Installing a low-level cut-off switch at the KWBA's Pool 1 Pump turnout;
- Conducting frequent inspections of the CVC's concrete liner for voids, displacement, etc. and making repairs as needed and as conditions permit;
- Expanding real-time forebay level monitoring and trending analyses capabilities;
- Increasing recharge pond setbacks
- Reducing recharge activities in the vicinity of the CVC

The implementation of the following guidelines should further these initial efforts to protect facilities and, at the same time, allow for project flexibility. It is expected that, as time goes on and additional information is developed, modifications to these operating guidelines may be made.

## **2 GROUNDWATER MONITORING PROGRAM**

The groundwater monitoring program will include the installation of additional piezometers along the CVC in areas where the CVC lining is below grade and the formalization of a monitoring and evaluation plan. Each of these aspects of the program is described below.

### **2.1 Piezometer Installation**

Several piezometers have already been installed to monitor groundwater conditions near the CVC. Approximately 32 additional piezometers will be installed at the locations shown in Figure 1 to supplement this monitoring network. Three of the piezometers will be installed to a depth of 50 feet; the remaining 29 will be installed to a depth of 20 feet. The piezometers will be

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constructed with 2- inch diameter PVC to industry standard specifications. A licensed surveyor will determine the location and elevation of each. All direct costs for the installation and monitoring of the piezometers, as well as the evaluation of the resulting data shall be shared equally between the CVC and the KWBA

## 2.2 Groundwater Monitoring Frequency

The frequency of groundwater monitoring will vary as groundwater levels change. Unless depth to groundwater is known to exceed 75 feet, the monitoring schedule will be as follows:

- During periods of adjacent recharge:
  - Groundwater > 20 feet – monitor monthly
  - Groundwater < 20 feet – monitor weekly
  
- During periods with no recharge – monitor weekly until depth to groundwater is > 20 feet, then monitor semi-annually

## 2.3 Evaluation of Groundwater Conditions

CVC and KWBA staff will jointly evaluate groundwater conditions and, as necessary, determine appropriate modifications to operations as described in these guidelines. These evaluations will be conducted according to the following schedule:

- During periods of adjacent recharge:
  - Groundwater < 50 feet – evaluate monthly
  - Groundwater < 20 feet – evaluate weekly, prepare gradient maps weekly, prepare written recommendations regarding modifications to operations and submit to KCWA/KWBA
  - Groundwater within 5 feet of design operational levels of the CVC – implement written recommendations regarding modifications to operations
  
- During periods with no recharge:
  - Groundwater < 20 feet – evaluate weekly, prepare gradient maps monthly
  - Groundwater > 20 feet – evaluate semiannually
  - Groundwater > 50 feet – no evaluations

The evaluations are expected to consist of brief teleconferences between CVC and KWBA staff unless depth to groundwater is 20 feet of ground surface or less. Under these conditions and when recharge is occurring, written evaluations and recommendations will be prepared weekly as a joint effort by CVC and KWBA staff.

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### **3 GROUNDWATER RECHARGE MANAGEMENT**

The KWBA will manage recharge operations to help ensure that groundwater gradient is away from the CVC during shallow groundwater conditions. Should groundwater conditions develop that might induce piping behind the CVC's liner, the KWBA will minimize recharge adjacent to the CVC either by reducing inflow to adjacent ponds or increasing the setbacks of adjacent ponds<sup>1</sup>. The goal of these actions will be to prevent flow into the CVC.

It is important to note that controlling groundwater levels in the vicinity of the CVC cannot be entirely achieved by managing recharge. At times, the canal has been operated at levels above the liner, thereby recharging groundwater. As a result, groundwater elevations near the CVC are maintained at or above the level of the lining. Irrespective of the foregoing, the protective measures described above will be undertaken.

### **4 CVC OPERATIONS MANAGEMENT**

The management of CVC operations will also play an important role in preventing future lining damage. During periods where shallow groundwater conditions exist, the CVC will be operated in such a manner as to maintain higher than normal pool levels, unless prohibited by delivery demands. Also, additional low-level cut-off float switches, adjustment of low-level alarms and improved monitoring of CVC forebay levels have been incorporated into CVC operations during periods where shallow groundwater conditions exist.

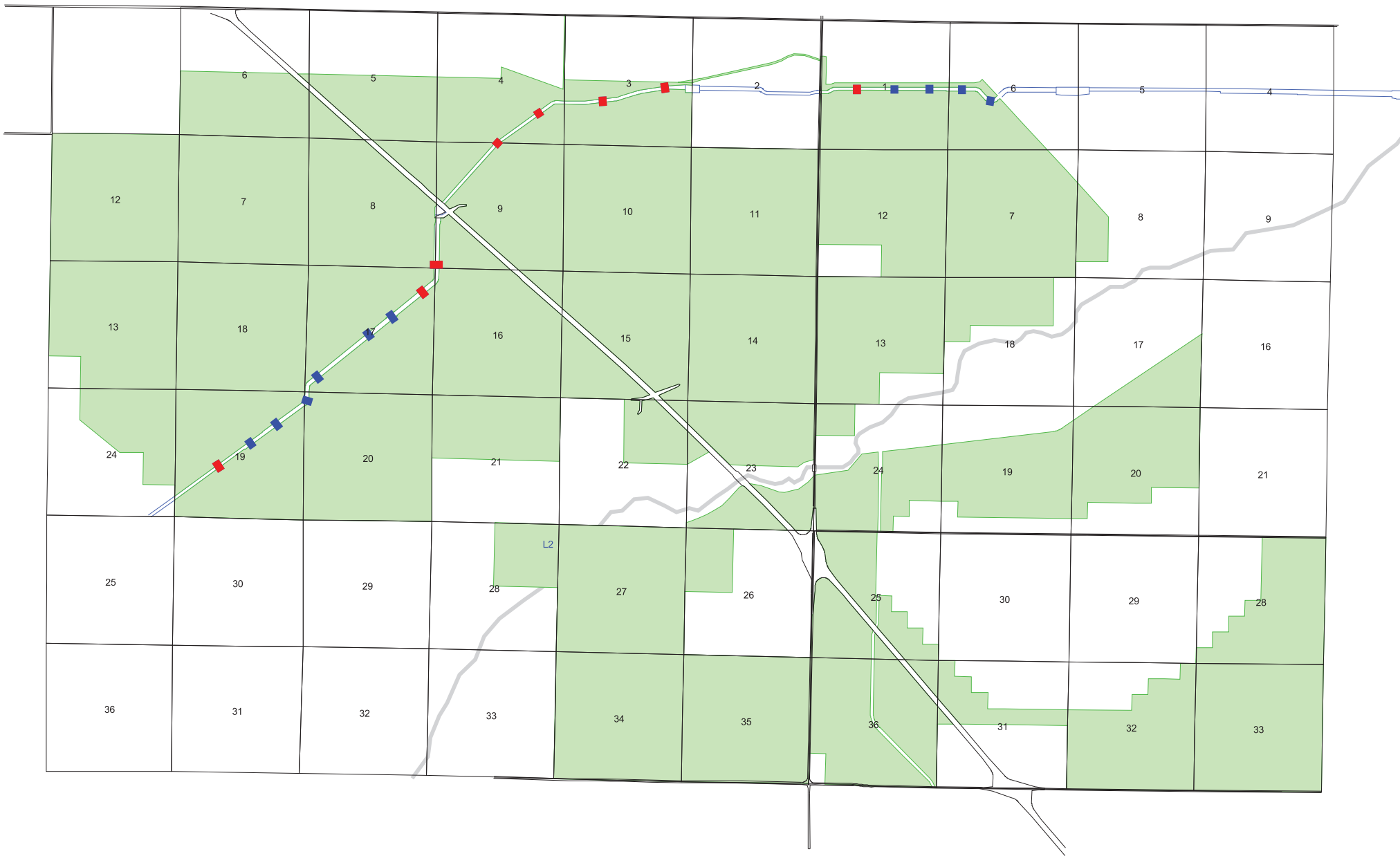
In addition to the above, regular inspections of the CVC's concrete liner will continue to be conducted, and any observed voids will be repaired promptly.


### **5 CONCLUSION**

CVC and KWBA staff have developed these operating guidelines to maximize the flexibility of their respective projects while preventing structural damage to facilities. Both projects will work together to ensure that the goals of the guidelines are met. It is expected that these guidelines may be modified in response to structural changes to the CVC (e.g. liner modifications) and as more knowledge is gained regarding the behavior of the shallow aquifer.

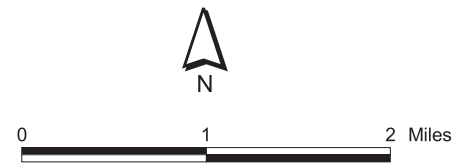
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<sup>1</sup> The current setback is 20:1. CVC and KWBA staff have considered engaging a consultant to determine a "safe" setback. However, given the varying soil conditions present on the KWB and CVC properties, determining a single "safe" setback would be very difficult to achieve.




 Proposed Piezometer Transect  
 Exiting Piezometer Transect  
 KWB Canal

# KWB - CVC Piezometers



KERN WATER BANK AUTHORITY