University and Community
College System of Nevada

desert research institute

TRUCKEE CANAL SEEPAGE ANALYSIS IN THE FERNLEY/WADSWORTH AREA

Todd Mihevc
Greg Pohll
Rich Niswonger
Elizabeth Stevick

JANUARY 2002

Publication No. 41176

Prepared by

Division of Hydrologic Sciences
Desert Research Institute
University and Community College System of Nevada

Prepared for

Bureau of Reclamation
Carson City, Nevada

ABSTRACT

Leakage from the Truckee Canal in the greater Fernley area may contribute significant recharge to the aquifer in that area. Previous efforts to quantify recharge from seepage losses were plagued by uncertainty in the measurement techniques. The focus of this investigation was to estimate seepage losses by monitoring surface and subsurface temperatures. Those data are utilized in a numerical simulation that models both energy and fluid flux. The advantage of this technique is that temperatures are fairly easy to measure and they are used as input to the simulation as well as verification of how well the simulation matches the observed conditions. Six monitoring sites were chosen along the Truckee Canal in the Fernley area that reflect a range of saturation potential that was determined by an electrical resistivity survey.

The modeling effort at these six sites produced estimates of seepage losses that varied from a low of 0.6 cm/day to a high of 47.8 cm/day. By applying the seepage rates estimated by the model to the appropriate sections of canal it was estimated that the total annual loss in the Fernley area is 11,187 acre-feet (af) or 1,614 af/y/mi. of canal. This estimate compares fairly well to estimates of seepage losses in this area made by other techniques.

CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

Leakage from the Truckee Canal between Wadsworth and East Fernley may make significant contributions to the aquifer in the Fernley area. Previous efforts were plagued by uncertainty in the measurment techniques and poor conceptualization of the subsurface system. Under the guise of the DRI /Washoe County Total Dissolved Solids study (Pohll *et al.,* 2001), substantial resources have been directed towards addressing issues related to possible leakage from the Truckee Canal in the reach between Wadsworth and east Fernley. In particular, two boreholes were drilled adjacent to the canal in early 1999, with the intent of establishing depth to water at these locations. Somewhat surprisingly, water table location exceeded the depth capability of the auger rigs used for this operation (>110 ft). While this information provided new information on the location of the water table in this area, it did not allow a Darcy's Law approach for calculating fluid flux from the canal, necessitating alternate approaches and additional resources for the effort.

The primary objective of this study component was to characterize the fluid flux from the Truckee Canal and adjacent laterals into underlying aquifers. Several methods have been proposed over the past two years. This research incorporated a variation on some of these, wherein thermal-based analysis, a ponding experiment and geophysical techniques were integrated. The focus of these studies was to:

1. Determine potential zones of seepage along the Truckee Canal for proper placement of thermocouple arrays.
2. Use heat pulses as a means to quantify the seepage loss from the Truckee Canal. Multiple thermocouple arrays will be utilized to assess the spatial variability in seepage loss.
3. Perform a ponding experiment along one section of a lateral canal to both determine the seepage loss from the lateral canals and to heat pulse methodology to determine fluid flux.

SITE SELECTION

Several factors dictated where the monitoring site would be located along the Truckee Canal. The main scientific consideration was to locate monitoring sites to cover a range of soil saturation potential described by Mike Widmer (Widmer, 2000), who analyzed resistivity data collected in a geophysical survey by Ehni Enterprises. It was also important to find monitoring sites that had good spatial distribution throughout the town of Fernley. Practical considerations include the ability to get the drilling rig close to the canal to facilitate drilling the angle boreholes under the canal. Figure 1 shows the locations for the monitoring sites and the moisture potential as interpreted by Widmer (Widmer, 2000) using the resistivity survey.