IMPROVING EFFICIENCY AT EL PASO WATER CANAL PLANT

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Dedication

This document is dedicated to all the hard workers who have come and gone through the doors at Canal Plant to make sure our City has a safe and reliable water supply.

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by

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THESIS

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Abstract

This project focused on the savings associated with filter backwash and rewash water at the Canal plant. Canal plant is a conventional surface water plant owned and operated by El Paso Water. Approximately 330,000 gallons of backwash water and 84,500 gallons of rewash water are lost daily during normal operational conditions. The combined 414,500 gallons of water are equivalent to 1.27 acre feet per day. During a full eight-month surface water season, this is 305 acre feet.

With the goal of optimizing the plant, residuals waste streams can be recycled to the head of the treatment plant. However, there is concern that pathogens such as Giardia and Cryptosporidium cysts may be present in these waste streams. This project collected rewash water to analyze for the presence of Giardia and Cryptosporidium during a three month operating period. In addition, filter operating data was collected and analyzed to determine the total number of backwashes, what criteria triggers a backwash, and the total volume of backwash and rewash water.

Rewash samples were collected during this project and none were detected for the presence of Giardia or Cryptosporidium. When the backwash and rewash data were analyzed, it was determined that 194,700 gallons of water per day which is equivalent to 143 acre feet per year based on a full eight month operating season could be saved by increasing the filter run time from 100 to 190 hours.

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Chapter 1: Introduction

For most of the 20th century, surface water levels in the Elephant Butte and Caballo reservoirs were relatively full. Every year, the melting snowpack from the Rio Grande water shed would replenish the water level in the reservoirs.

As of the last 8 years though, the reservoir levels have reached new low capacity, and this has created additional dependence on existing groundwater supplies from the local aquifers. This scenario puts a strain on the number of groundwater wells that are needed to pump water for the public water supply in El Paso.

As such, surface water supplies are increasingly becoming more valuable to the City, especially during the hot weather months of June, July, and August. It is important to El Paso Water to understand how to optimize the existing surface water plants. The oldest surface water plant in operation for El Paso Water is Canal plant. Canal plant is the combination of two plants that are located on the same site. Plant 1 (W.E. Robertson) was constructed in 1943. Plant 2 (Elwood Umbenhauer) was constructed in 1967. Each plant produces 20 MGD of potable water. These two plants are hereafter referred as Canal plant. Canal plant has been in operation for more than 75 years. This plant supplies a maximum of 40 million gallons per day (MGD). Canal plant's service area reaches as far northwest as Executive Center Boulevard and east to the Paisano and Interstate 10 freeway area. The Canal plant service area includes the following areas of town:

- downtown district
- medical district
- UTEP campus

Canal plant is a conventional surface water treatment plant. Below is a schematic diagram of the treatment process used at the plant:

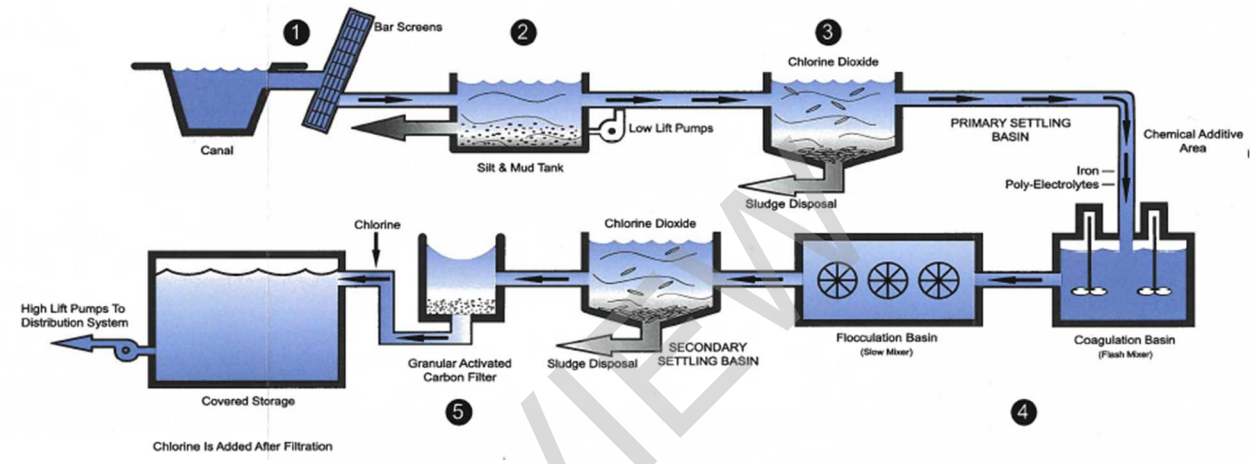

Figure 1: Canal plant treatment process

*Ultraviolet disinfection reactors were added after the clearwell in station 1 to improve the resiliency of the treatment plant. Filtration is an important unit process during surface water treatment. Filtration polishes the water in order to remove particles and turbidity. This process is essential for effective disinfection in the clearwell. In order to optimize the Canal plant, a study of the filters was conducted to examine how the filters operate and how they are backwashed.

Filter Backwashing Criteria

Canal plant has two sets of filters for each plant. Plant 1 operates 6 filters and Plant 2 operates 3 filters. The filters in Plant 1 are "24 ft x 24 ft" and the filters in Plant 2 are "35.5 ft x 33 ft". Both filters use granular activated carbon, GAC as the filter media. The filter bed depth in both plants is 4.5 feet.

The filters are operated based on the historical experience of the plant. Once the filters have treated water, they eventually need to be placed into a backwash cycle in order to detach the filtered particles that have been collected in the filter media. These detached particles are removed from the filter media by sending treated water back up through the bottom of the filter. This backwash water typically contains entrapped particles, chemical precipitants, and microorganisms that were all collected by the filter media. After backwashing is complete, a filter to waste cycle (filter rewash) is started to ripen the filter so that it can be placed on line again with an acceptable filter effluent turbidity. Rewash water is settled water that is passed from the top of the filter. Both of these residuals streams are returned to the Franklin canal downstream of the Canal plant's raw water intake screens.

The criteria for filter backwashing is:

- filter run time
- filter headloss
- filter effluent turbidity

Filter run time is typically 100 hours. This is the time measured after the last backwash was completed. If all other filter parameters are within operational parameters, then the operator knows that the filter can be put back into operation until the 100 hours of run time are met.

Filter headloss is 6 feet. The clean bed headloss is the headloss at the start of the filter cycle. However, as time passes, the head loss above the filter increases as the treated water experiences more friction loss as it passes through the filter.

Filter effluent turbidity is 0.10 NTU. Most of the granular activated carbon (GAC) filters at Canal plant can successfully operate within this parameter. Once a filter is placed back on line after a backwash is done, the filter effluent turbidity is typically under 0.15 NTU and the turbidity will drop as the filter continues to operate. This phenomenon is likely related to an increase in the straining ability of the filter, even though the GAC filters are primarily removing particles due to adsorption.