CHESTER MORSE LAKE OUTLET CHANNEL ALTERNATIVES EVALUATION

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Abstract: Chester Morse Lake is a naturally formed reservoir located on the western slope of the Cascade Mountains in King County, Washington. The Chester Morse Lake Outlet Channel (CMLOC) connects Chester Morse Lake to the downstream Masonry Pool reservoir. The reservoir system, operated by Seattle Public Utilities, stores two-thirds of the regional supply water for the 1.3 million people in the Seattle metropolitan area. At high Masonry Pool stages, water backwaters into Chester Morse Lake, inundating the CMLOC. Under normal operating conditions the stage in Chester Morse Lake is maintained at a higher elevation than the Masonry Pool by a control structure located at the downstream limit of the CMLOC. Under drought conditions, water must be pumped from the available dead storage within Chester Morse Lake to the upstream inlet of the CMLOC. A Discharge Dike was constructed to a crest elevation of 1535 feet at the upstream inlet to the CMLOC as a head wall for the pump discharge lines in 1992.

Sedimentation in the CMLOC, as measured in 2002, has resulted in a channel bottom elevation up to five feet higher as compared to 10 years earlier. Consequently, the geometry of the channel reduces the flow capacity of the channel and dictates the water surface elevations at the Discharge Dike that are capable of providing sufficient flow by gravity along the CMLOC. A minimum flow capacity along the channel of 279 cfs (180 mgd) is required and a high flow capacity of 371 cfs (240 mgd) is desired. To achieve the desired flow capacity, a portion of the channel was deepened in December 2002 and construction was completed on a new Discharge Dike with a crest elevation of about 1538 ft at the pump discharge location.

Hydraulic modeling, using channel surveys conducted in 2004, showed that sedimentation has again significantly reduced the flow capacity of the CMLOC. With continued uncertainties regarding the channel discharge capacity, various channel improvement alternatives were proposed. This paper will review the CMLOC discharge capacity under drought conditions and discuss the associated hydraulic uncertainties. More importantly, this paper will present the results of our investigation of the hydraulic and sediment transport characteristics of five proposed channel improvement alternatives to ensure adequate discharge capacity of the CMLOC.