



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182

denr.sd.gov

**RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT
APPLICATION NO. 2751-2, City of Custer**

Pursuant to SDCL 46-2A-2, the following is the recommendation of the Chief Engineer, Water Rights Program, Department of Environment and Natural Resources concerning Water Permit Application No. 2751-2, City of Custer, c/o Mayor Jared Carson, 622 Crook Street, Custer SD 57730.

The Chief Engineer is recommending APPROVAL of Application No. 2751-2 because 1) there is reasonable probability that there is unappropriated water available for the applicant's proposed use, 2) the proposed diversion can be developed without unlawful impairment of existing rights, 3) the proposed use is a beneficial use and 4) it is in the public interest with the following qualifications:

1. Water Permit No. 2751-2 and Water Right No. 298-2, combined, authorize an impoundment with a storage capacity of 77.5 acre feet of water and sufficient water annually to maintain the water level to the outlet elevation at 5,348.0 feet mean sea level.
2. Low flows as needed for downstream domestic use, including livestock water and prior water rights must be by-passed.

See report on application for additional information.

Jeanne Goodman, Chief Engineer
June 8, 2016

REPORT ON
WATER PERMIT APPLICATION No. 2751-2
City of Custer
June 2, 2016

Water Permit Application No. 2751-2 has been filed by the City of Custer to impound an additional 47.5 acre-feet of water (77.5 acre-feet total) from runoff by reconstructing the Custer West Dam located in the NE ¼ SE ¼ of Section 27-T3S-R4E, in Custer County. The application also requests impoundment of sufficient water to maintain water at the outlet elevation of 5348 feet mean sea level (fmsl). The water will be used recreation, fish and wildlife propagation and fire suppression purposes.

Discussion:

Water Right No. 298-2 was issued to the City of Custer in 1943 for 30 ac.-ft. of storage in the Custer West Dam. It appears that the dam was originally constructed by the Department of Game, Fish and Parks for the City. The current outlet structure has been broken and the reservoir drained for several years. The capacity of the existing dam at some time was increased to approximately 60 acre-feet. The repair of the existing dam will not change the current elevation of the primary spillway and the increase in storage capacity to 77.5 acre-feet is the result of several excavated “dug out” areas in the lake bed.

The reconstructed dam will be classified as a small size, Category 1, High Hazard dam. The dam has been designed by Banner Associates, Inc. The plans and specifications have been reviewed and will be approved; however, reconstruction of the dam cannot begin until Water Permit Application No. 2751-2 is approved.

The dam will be 13 feet high with a normal storage capacity of 77.5 acre-feet with a reservoir level at the primary spillway elevation, and a maximum storage capacity of 125 acre-feet with a reservoir level at the top of dam elevation. A Category 1, High Hazard dam of this size and is required to have a minimum spillway design capable of passing 50 percent of the Probable Maximum Flood (PMF), unless (according to section 74:02:08:07 of the Safety of Dam Rules) the owner can provide information and justification to show that the proposed design flow can be stored, passed through, or passed over the dam without failure of the dam.

The dam is located on French Creek and has a drainage area of 23,280 acres or 36.4 square miles. The dam will have a 12 ft. by 8 ft. concrete drop inlet structure with an inlet elevation of 5348 fmsl and 5 feet of available freeboard, with an 8 ft. by 5 ft. box culvert barrel as the primary spillway structure. The primary spillway is designed to pass the 10 year event peak inflow of 792 cfs utilizing the 2 feet of freeboard between the primary and secondary spillways. The secondary spillway will be a 200 ft. wide concrete ogee structure with a crest elevation of 5350 fmsl. The ogee structure will also have a type III stilling basin, which is designed with energy dissipation blocks. The secondary spillway is designed to pass a 100 yr. event peak inflow of 2971 cfs utilizing 2 of the available 3 feet of freeboard between the spillway crest and top of dam elevation. The remainder of the dam, approximately 70 feet, will be designed to overtop using an anchored articulating concrete mat as the overtopping protection. The overtopping protection is designed to withstand a 50 percent PMF flood event.

The Custer West Dam is located in the SE ¼ of Section 27-T3S-R4E on French Creek. The Department of Game, Fish & Parks owns Stockade Lake Dam, which is located in Custer State Park about 5 miles downstream of the Custer West Dam. The Department of Game Fish and Parks filed a vested water right claim for Stockade Lake in 1961 seeking a 1933 priority date.

The filing states a reservoir capacity when filled of 1,560 acre feet and listed a surface area at the spillway elevation of 130 acres. The amount of water claimed is “as required to fill lake to spillway outlet – approximately 400 acre feet per year.” The calculation of the 400 acre feet annually was consistent with how GF&P filed other vested right claims at the time which was to take the surface area and multiply by 3 feet to account of the anticipated evaporation. In this case 130 surface acres time 3 feet equals 390 acre-feet which appears to have been rounded up to 400 acre feet. The Custer West Dam will have a surface area of 7.3 acres and an anticipated evaporation loss of 22 acre-feet.

The United States Geological Survey operated a gaging station on French Creek above Stockade Lake from October 1990 through September 1997. The gage was located about five miles downstream from Custer West Dam and has a drainage area of 68.4 square miles. This is a little less than double the 36.4 square mile drainage area above the Custer West Dam. While the gaging station had a limited seven years of operation it provides an indication of the annual yield that may be anticipated in French Creek in this area. Table 1 provides the average flow rates which are then converted to an annual yield in acre-feet of water from this gage. The annual yield varied from a low of 1,911 acre-feet of water in 1992 to a high of 13,173 acre-feet of water in 1995.

Table 1 Calculation based upon gage records

Year	Ave. daily CFS	Annual Volume, Ac.-Ft.
1991	8.48	6,138
1992	2.64	1,911
1993	7.67	5,552
1994	4.86	3,518
1995	18.2	13,173
1996	10.0	7,238
1997	14.7	10,640

Based on the period of record, the 25 percentile (3 out of 4 years is equal to or greater) annual volume chance of occurrence is 1,579 acre-feet of water. The 50 percentile (1 out of 2 years is equal to or greater) annual volume chance of occurrence is 5,176 acre-feet of water.

While a longer period of record is preferable, the flow records provide relative certainty that the Stockade Lake drainage area will provide the 400 acre-feet of water to satisfy Vested Right Claim No. 734-2, the existing 30 acre-feet under Water Right No. 298-2 and the additional 47.5 acre-feet of water. Therefore unappropriated water is available to satisfy this application without impairment to the downstream water right for Stockade Lake.

The two dams have co-existed since 1943 with the Custer West Dam being originally built by the Department of Game, Fish and Parks. There appears to be no conflicts of interest between the two dams, and if one would develop the Custer West Dam low level outlet could be opened to allow inflows, if any, to be bypassed.

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Conclusions:

1. Water Permit Application No. 2751-2 should be approved; however, on some years unappropriated water may not be available and the City of Custer would be required to release inflows through the low level outlet.
2. If approved, the low flow bypass requirement for domestic use and prior Water Rights should be a qualification on Water Permit Application No. 2751-2.


for Timothy G. Schaal, P.E.
Engineer IV