This is a digital document from the collections of the Wyoming Water Resources Data System (WRDS) Library.

For additional information about this document and the document conversion process, please contact WRDS at wrds@uwyo.edu and include the phrase “Digital Documents” in your subject heading.

To view other documents please visit the WRDS Library online at: http://library.wrds.uwyo.edu

Mailing Address:
Water Resources Data System
University of Wyoming, Dept 3943
1000 E University Avenue
Laramie, WY 82071

Physical Address:
Wyoming Hall, Room 249
University of Wyoming
Laramie, WY 82071

Phone: (307) 766-6651
Fax: (307) 766-3785

Funding for WRDS and the creation of this electronic document was provided by the Wyoming Water Development Commission (http://wwdc.state.wy.us)
BEAVER CREEK DAM AND RESERVOIR PROJECT

EXECUTIVE SUMMARY

Prepared for: The Weston County Commission
and
The Wyoming Water Development Commission
Herschler Bldg.
Cheyenne, Wyoming 82003

Prepared by: Bearlodge Ltd., Inc.
P.O. Box 180
Sundance, WY 82729

28 August 1991
EXECUTIVE SUMMARY

Beaver Creek Dam and Reservoir Project
Level II

The Level II Beaver Creek Dam and Reservoir Project is divided into three phases. The Phase I effort addressed the hydrology of the drainage basin including estimated yield, available water supply (accounting for existing water rights), water quality, sedimentation, and flood analysis. Phase II included all tasks associated with preliminary design of the dam and associated appurtenances, preparation of the water right application, and a total cost estimate for the completion of the project. The third and final phase was to include detailed geologic and geotechnical testing and analysis, more detailed design and a comprehensive estimate of total project cost.

Upon completion of the Level II effort, the total estimated project cost was approximately $7,000,000. The project sponsor, the Weston County Commission, indicated that this amount was in excess of Weston County's ability to support and therefore requested that the project be terminated. Acting upon that request, the Wyoming Water Development Commission terminated the Level II efforts and directed that the final report be prepared. Contained herein is a summary of the information gathered and developed during the Phases I and II, Level II efforts.

States West Water Resources Inc., of Cheyenne, Wyoming, conducted all Phase I efforts. The results of those are presented in volume one of this report entitled "Beaver Creek Dam and Reservoir Project, Level II, Phase I Investigation". The hydrologic analysis of the drainage basin above the proposed dam site indicated that the mean annual flow was 4460 acre feet. After accounting for release requirements to satisfy downstream water rights and normal evaporation at the reservoir site, the analysis indicated that the construction of a reservoir having a surface area of approximately 650 acres and a volume of approximately 8000 acre feet would be possible. Additional analysis of historic flow data indicated that the normal yearly fluctuation in water level would be approximately 6 feet, and the average surface area of the proposed reservoir would be 580 acres. The water quality analysis predicted a "time-weighted" Total Dissolved Solids concentration of 1,730 mg/l. The concentration will fluctuate between approximately 1,500 mg/l and 2,000 mg/l. The sediment load developed upstream of the proposed site is quite high at 40 acre feet of sediment per year.
This translates into a decrease in storage, over a 100 year period of 4000 acre-feet. While the decrease in storage is high, it is acceptable given the recreation nature of the project. Discussions with the Wyoming Game and Fish Commission indicated that these operational parameters would be more than adequate to maintain a viable fishery in the reservoir.

An analysis of the Probable Maximum Flood (PMF) was conducted to determine the appropriate sizing for the emergency spillway. The PMF, 3/4 PMF, 1/2 PMF, and 1/4 PMF were all calculated with the results being evaluated based upon an incremental damage analysis between the proposed Reservoir site and the Wyoming-South Dakota state line. This evaluation indicated that the appropriate spillway design would be one that passes the 1/2 PMF, which was calculated to be 140,000 cubic feet per second.

The information produced for the Phase I investigation indicated that the water supply was adequate to support the proposed development. Phase II activities were initiated based on the information gained in Phase I including reservoir size, capacities of outlet works and spillways, and dam configuration. The preliminary geotechnical testing and mapping activities were initiated simultaneously.

The geotechnical activities consisted on drilling four test holes along the proposed dam axis to determine the suitability of the foundation material and the ability to construct the proposed dam with on-site materials. The testing indicated that the material along the proposed dam axis consists of from 3 feet to 24.5 feet of clay or sand soils overlying a claystone type bedrock. The sand encountered contained a great deal of clay. The engineering analysis of the materials indicated that the proposed dam could be constructed of on-site materials and that the existing clays would provide an adequate foundation for the dam. A cut-off trench excavated into the claystone bedrock for the full length of the dam is recommended as well as a drainage blanket downstream from the fill.

The recommended geometry of the embankment includes a 20 foot top width with an upstream slope of 3:1 or 3.5:1 and a downstream slope of 2.5:1. It is anticipated that adequate materials for the construction of the embankment is available on site.

The mapping information to determine the size and volume of the reservoir were conducted using aerial methods. A pattern of flight control panels were set and aerial photographs were taken in order that a topographic map could be prepared. The map was prepared with a contour interval of 5 feet and a horizontal scale of 1"=500'. The results of the mapping shows that a reservoir can be formed by the construction of a dam at the proposed location which will have a surface area of 669 acres and a volume of 7775 acre-feet, having a normal high water line of 3950 feet.
The preliminary design of the dam and appurtenances was based upon the following criteria:

**OUTLET WORKS:**

The maximum capacity of the outlet works is based on the ability to evacuate the reservoir in 30 days. The proposed outlet works consists of an 18" diameter and a 30" diameter sluice gate opening into a 54" diameter non-pressure conduit with a maximum capacity of 175 cubic feet per second.

**SERVICE SPILLWAY**

The proposed service spillway is designed to carry the 100 year storm maximum discharge of 7200 cubic feet per second. The proposed configuration of the spillway consists of an "Ogee" crest design concrete spillway 84 feet long discharging into a concrete channel which reaches to a stilling basin in the stream channel below the embankment.

**EMERGENCY SPILLWAY**

In accordance with the incremental damage analysis prepared during the Phase I investigation the emergency spillway is designed to pass the 1/2 PMF maximum discharge of 140,000 cubic feet per second. The proposed emergency spillway consists of a 1250 foot wide graded earth spillway with vegetation used as the only slope protection.

The physical dimensions and criteria for the proposed dam are as follows:

- **TOP OF DAM ELEVATION**: 3972 FEET MSL
- **MAXIMUM HEIGHT OF DAM**: 73.5 FEET
- **LENGTH OF DAM FILL**: 4500 FEET
- **TOP OF DAM WIDTH**: 20 FEET
- **UPSTREAM SLOPE**: 3:1
- **DOWNSTREAM SLOPE**: 2.5:1
- **VOLUME OF EMBANKMENT**: 750,000 CUBIC YARDS
- **NORMAL HIGH WATER LINE ELEVATION**: 3950 FEET MSL
- **WATER SURFACE AREA AT NORMAL HIGH WATER LINE**: 669 ACRES
- **RESERVOIR CAPACITY AT NORMAL HIGH WATER LINE**: 7775 ACRE FEET

The total estimated project cost for the development is $7,300,000.