State Water Plan
Application Form

Applicant	Proposed Funding Package	
	Requested Funding	$103,000
Address:	Other West Dakota WDD	$150,000
	Other Rapid City	$100,000
	Other BH flyfisher	$10,000
Phone Number:		
	TOTAL	$363,000

Project Title: Canyon Lake Sediment Removal

Description: (Include present monthly utility rate and whether a reserve fund has been established for the utility to benefit from the project.)

The sediment removal project is in addition to the dam restoration project addressing structural deficiencies and safety concerns. While the lake is drained, it provides an ideal opportunity to remove sediment. Over the past 15 years the lake has experienced excessive sediment build up. Sediment depths vary from 8-12 in. in the recreational area to 3 ft. in the deeper reaches. Sediment decreases the lake's holding capacity, creates an environment for weed growth and potential safety issues for recreational use. Estimated cost for complete sediment removal is approximately $415,000 (City of RC, FMG Eng.). The proposed funding above includes $60,000 (West Dakota WDD and BH Flyfishers) in matching funds in effort to encourage local sponsorship.
This is an essential project for adequate restoration of the lake, improved flood control, recreation and water quality. In addition there are immeasurable economic and social impacts to keeping Canyon Lake magnificently maintained.

The Applicant Certifies That:

I declare and affirm under the penalties of perjury that this application has been examined by me and, to the best of my knowledge and belief, is in all things true and correct.

Sam Kookier, Mayor of Rapid City

Name and Title of Authorized Signatory (Typed) | Signature | Date

Application Prepared By:

Denise Livingston	(605) 791-2299	RCAC
Name and Title (Typed)	Phone #	Representing
Name of Engineer/Architect	Phone #	Representing

Additional Comments:

Please note that existing funding will be used on priority one (blue) and two (yellow) areas of the attached map. If funding is received from the State consolidated grant program, the use of grant dollars will go to continued efforts in area 2 (yellow) and the white area. The blue and white areas would yield the most fiscally sound sediment removal however, the inlet and yellow areas are the primary recreational zones and will result in relieving safety concerns.

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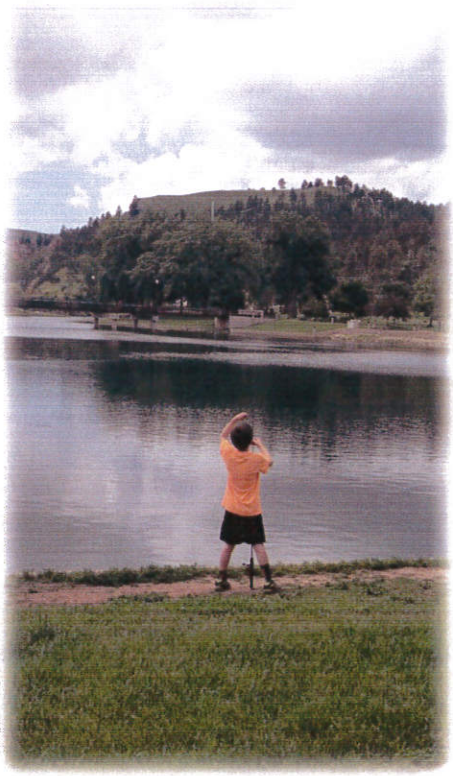
CITY OF RAPID CITY

CANYON LAKE

SEDIMENTATION REMOVAL PROJECT

JULY 2014



southern portion of the fuse plug slab and embankment after replacement of the north abutment wall, no modifications are planned for the fuse plug spillway.

Weir Wall Structure

During previous site inspections, it was observed that several joints in the weir wall structure located downstream of the spillway were leaking water. This is likely because the joint filler has been shed over time. During construction, open joints will be refilled with new joint filler and expansive waterstop materials and be sealed with steel plates on surface.

Optional Items

General

At the fifty percent design level there are optional items that the City may choose to include as part of the Canyon Lake Dam Reconstruction project. These items were evaluated and preliminary costs were estimated during development of the fifty percent design to assist the City in decision making. Appendix C contains exhibits showing an overall plan layout of the optional items and sections and elevations of some of the features.

Lake Dredging

The City indicated that Canyon Lake was last dredged in 1995. The dredge volume for that project was approximately 47,000 cubic yards. FMG, Inc. completed a survey of the silt depths in Canyon Lake in April 2011. Silt depths were taken at points spaced fifty feet for the entire lake area. Silt depths were estimated by forcing a survey rod into the lake bottom until harder material was encountered. The depth of silt varied from zero to three feet with most depths being between six inches and one foot.

The City expressed an interest in removing silt in areas where depths generally exceeded one foot. Exhibits 3 and 4 in Appendix C provide a topographic map of silt depths and a proposed silt removal area for Canyon Lake. The total silt removal volume (based on the removal area shown on Exhibits 3 and 4) was estimated to be in the range of 15,000 to 20,000 cubic yards.

Silt removal would be done while Canyon Lake is drained. Given the dewatered condition and relatively shallow depth of silt it was assumed removal would be carried out using standard grading equipment (i.e. bulldozers, backhoes, and dump trucks). Disposal will be a significant portion of the silt removal cost. A haul route of ten miles (round trip) was assumed for cost estimating purposes. The cost of silt removal/disposal was estimated to be

approximately $300,000. This cost does not include cofferdams, erosion control, and dewatering, which are considered to be part of the spillway reconstruction project.

Shoreline Stabilization

There is a section of unprotected shoreline that extends approximately five hundred feet upstream from the north abutment wall that is showing signs of active erosion and slough from wave action, ice, and fluctuations in water level. The shoreline upstream of the unprotected section has been stabilized using stone blocks, but over time some of the blocks have loosened and tumbled into the lake. This was likely due to the sand bedding material originally placed under the blocks washing out. Three options were considered for stabilizing the unprotected shoreline:

- 12-inch layer of Stone Riprap = $22/SF
- Articulated Concrete Revetment Mat = $46/SF
- Stone Blocks (with geotextile and sand layer to add durability) = $48/SF

The width of the shoreline stabilization will be approximately eight feet, giving a total area of 4,000 square feet. The two to three foot vertical "lip" of the eroded bank will be graded to allow for proper material placement. Once the subgrade is prepared, a geotextile will be placed and anchored on the slope. The stabilization materials will then be placed. Given its location near the spillway and proposed silt removal area, the shoreline stabilization work could be done concurrently with the spillway and silt removal construction tasks.

Each of the shoreline stabilization methods has its advantages and disadvantages. Riprap is fairly cheap, easily procured, easily installed, and relatively robust; however, it is bulky and would make fishing near shoreline more difficult. Although better bedding methods would be used, straight-edged and non-anchored \concrete or stone blocks have the potential to heave or move over time more noticeably than the other two options, thus possibly requiring additional maintenance. Articulated concrete revetment mats are more expensive but have superior durability and reduced maintenance needs. The revetment mats are laid on top of a woven monofilament geotextile. These mats are available in both "open" and "closed" cell form. If the open cell form is used, small rock or gravel is placed in the voids and eventually, vegetation appears, making the revetment somewhat invisible. Also available, are precast interlocking blocks that add durability when compared to square blocks. A brochure from

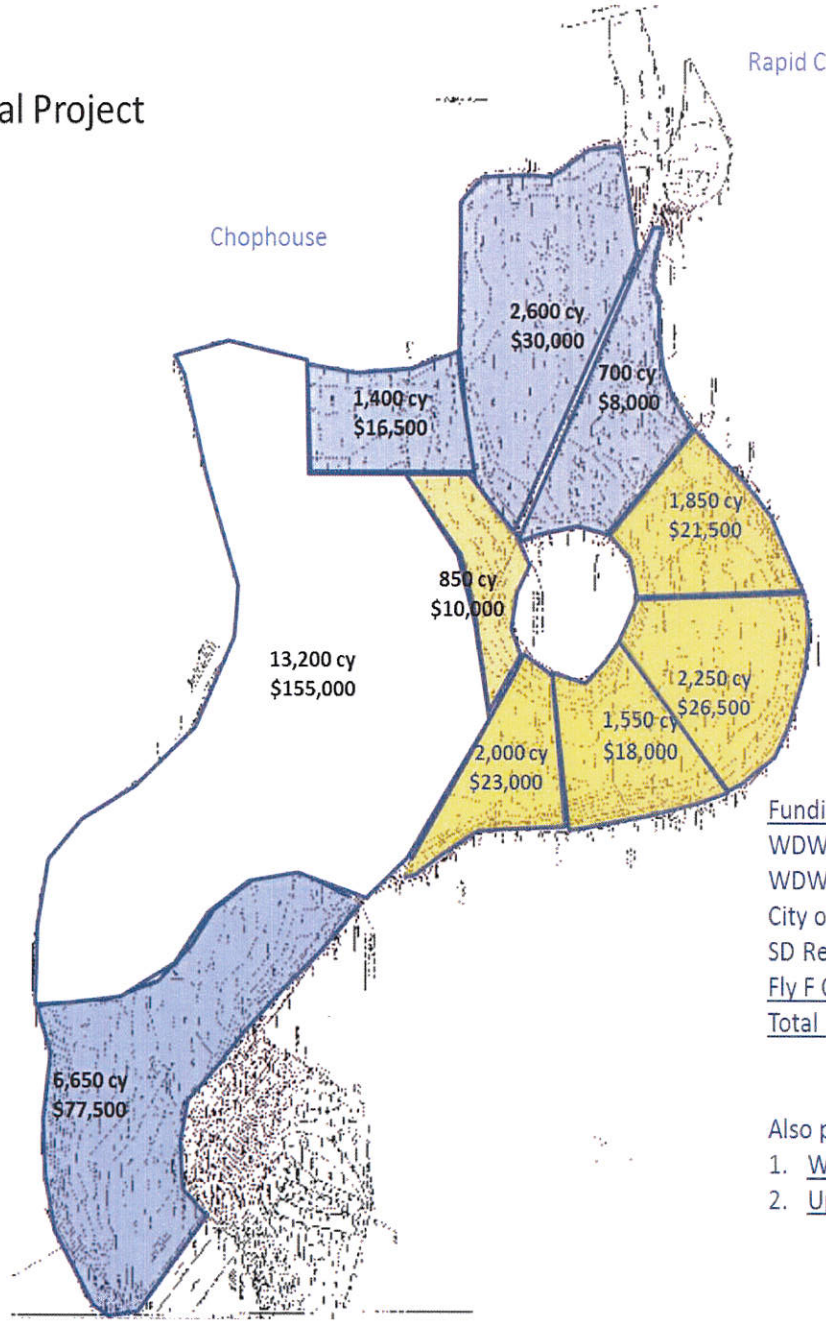
Canyon Lake
Sediment Removal Project

Priority Areas 1 (blue)	
1,400 cy	$16,500
2,600 cy	$30,000
700 cy	$8,000
6,650 cy	$77,500
11,350 cy	$132,000

Priority Areas 2 (yellow)	
1,850 cy	$21,500
2,250 cy	$26,500
1550 cy	$18,000
2000 cy	$23,000
850 cy	$10,000
8,500 cy	$99,000

Priority Areas 3 (white)	
13,200 cy	$155,000
13,200 cy	$155,000

Total Project Cost	
19,850 cy	386,000
Adjusted	$415,000



Mobilization	Sept 1st – Sept 15th
SWPPP Protection	Sept 1st – 15th
Traffic Control	Sept 15th
De-watering activity &Top Cofferdam	Sept 15th – 30th
Main Cofferdam	Sept 16th – Oct. 3rd.
Canyon Lake pumping into ponds	Sept 16th – ongoing
Down Stream rock check	Sept 15th – 30th.
Demo Spillway	Oct 6 – Nov 7th.
Install Sheet pile	Oct 6th – 24th
Foundation Grouting	Oct 24th – Jan 20th
Spillway reconstruct	Nov 8th – Feb 1st.
Canyon Lake silt removal	Jan 1st – Mar 10th
Concrete block wall	Jan 1st – Feb 1st
Rip Rap Install	Jan 15th – Feb 1st.
Pond silt removal	Mar 1st – 15th
Remove parking lots	Apr 1st – Apr 15th
All work complete in Canyon Lake	Apr 25th
Prep and place Sidewalk	Apr 15th May 15th
Asphalt replacement	June 1st – 10th
Landscaping	June 1st – 18th
Final site punch and clean-up	June 15th – 30th

Funding	
WDWDD C	$100,000
WDWDD P	$50,000 (match)
City of RC	$? ($100,000)
SD Revolving F	$? ($103,000)
Fly F Club	$10,000 (match)
Total	$363,000

Also plan to seek funds for

1. Weed control maintenance
2. Up/down stream enhancement