Colorado Water Conservation Board Loan Application

Stabilization of the Elephant Buttress Tunnel on Silver Lake Ditch

Sponsored by the Silver Lake Ditch & Reservoir Company

August 1, 2024

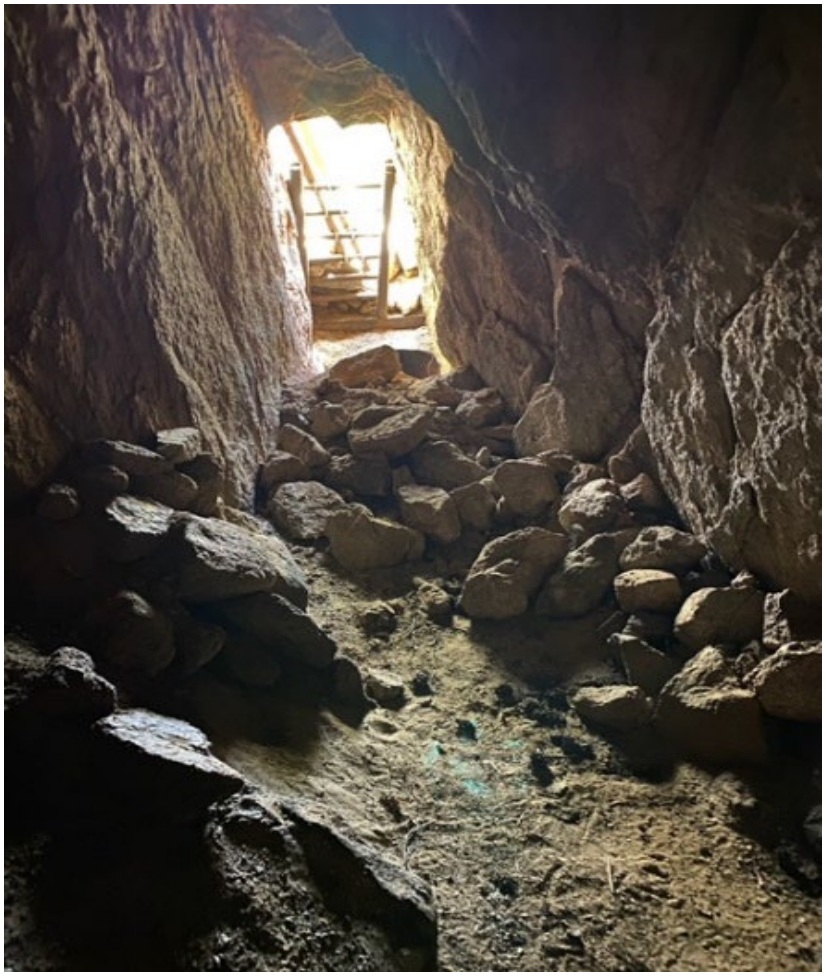


Table of Contents

Attachments

1.0 Introduction

The Silver Lake Ditch & Reservoir Company has identified the critical need to stabilize the Elephant Buttress Tunnel, located approximately 1/2 mile west of Boulder in and above Boulder Canyon, through which the ditch travels. The tunnel walls have experienced significant deterioration since the flooding of 2013, with a marked increase in the past three to four years resulting in continued major flaking, rockfall and associated blockage of the ditch.

The Ditch company has installed temporary supports to mitigate rockfall in the tunnel, however there is a need for a more permanent solution to alleviate the risk to the ditch, as there is no alternative to the tunnel that the ditch can use. Water cannot flow should the tunnel collapse.

2.0 Ditch Background

The Silver Lake Ditch was built in 1888. In addition to its direct flow decree on Boulder Creek it has a storage right in Silver Lake and Island Lake reservoirs in the city of Boulder owned watershed. The water runs down North Boulder Creek to Boulder Creek to its out-take in Boulder Canyon approximately 1 mile west of Boulder. From the out-take the ditch then contours 20-50 feet east above the base of Boulder Canyon/Boulder Creek then generally north along the west edge of the city for about 10 miles to its terminus at Mesa Reservoir on Boulder Valley Ranch, north of the city of Boulder.

Storage/Water Rights/Acreage served: For water year 2023 Silver Lake Ditch had 558.31 acre-feet in storage rights and 247 acres served by the ditch, with approximately 290 individual users on approximately 307 parcels, including agricultural, governmental, and residential landscaping.

Acreage Under Ditch	2023
Total Paid Acres	240.6
Acres in Arrears (2023)	6.35
Total Acres Under Ditch	246.96

By mid to late June in a typical year the direct flow of Boulder Creek falls low enough that all of it is required for more senior rights. While the ditch has a junior direct flow right it has a very senior storage right in Silver and Island Reservoirs in the City of Boulder watershed. When the direct flow decree is no longer in priority the ditch switches to its storage right which is usually sufficient to allow the ditch to run well into September and sometimes October.

3.0 Study Area Description:

Starting at the ditch outtake approximately 1-mile up Boulder Canyon from the city of Boulder, Silver Lake Ditch runs through approximately 1,300 feet of plastic and steel culvert as well as several hundred feet of steel pipe pinned 20-30 feet above the creek along the north face of Boulder Canyon before running through the 180-foot-long Elephant Buttress tunnel, which is the subject of this application.

In the late 1940's the wooden flume carrying the ditch that hung on the north wall above Boulder Canyon to the Elephant Buttress tunnel was replaced with a steel pipe. The steel pipe has been replaced in sections over the past 10 to 20 years, funded through our regular funding process. The tunnel was significantly impacted, and has been deteriorating markedly since the 2013 floods, experiencing substantial rockfall over the past 3 to 4 years. The tunnel must be stabilized to prevent a catastrophic failure, ensure the continued flow through the tunnel, as well as to ensure worker safety.

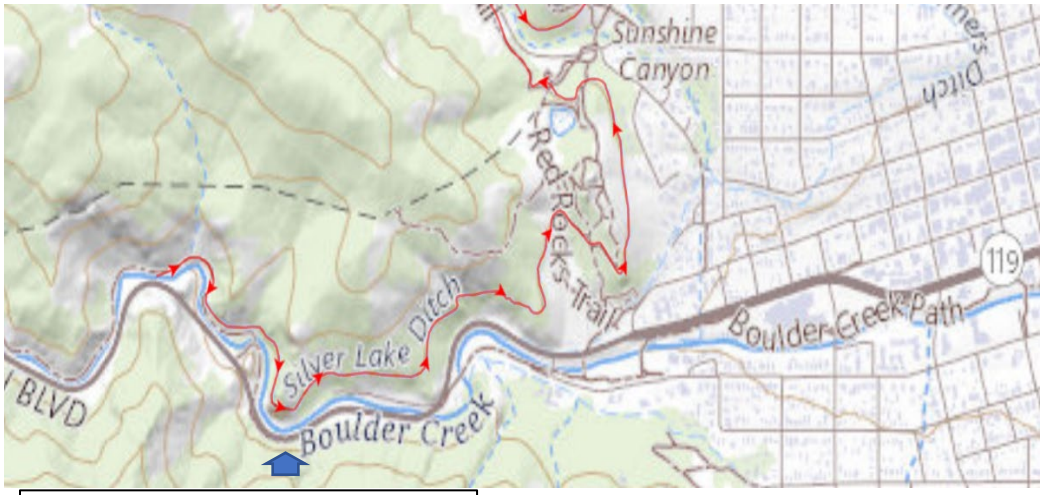


Figure *1: Map of Silver Lake Ditch – Elephant Buttress Tunnel*

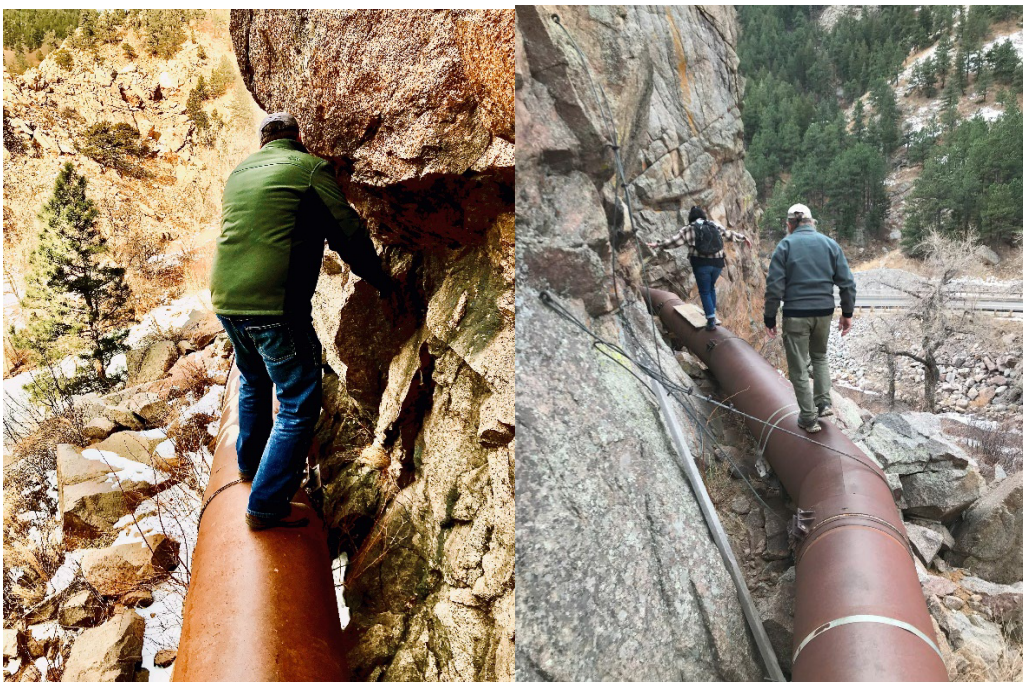


Figure 2 – Accessing the Elephant Buttress Tunnel from the West (Note Boulder Creek in lower right of photo).

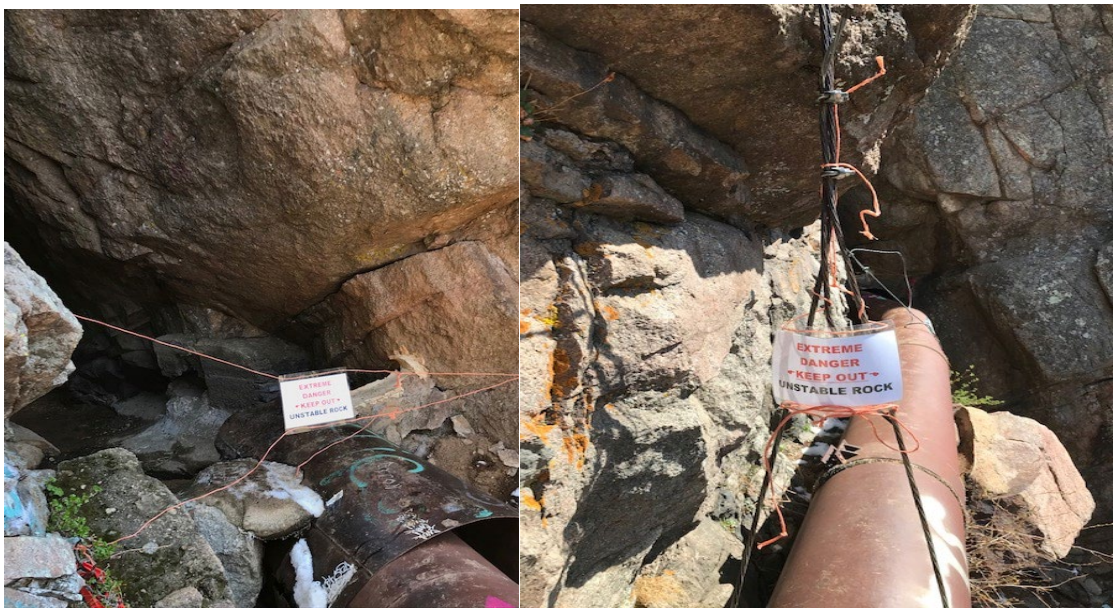
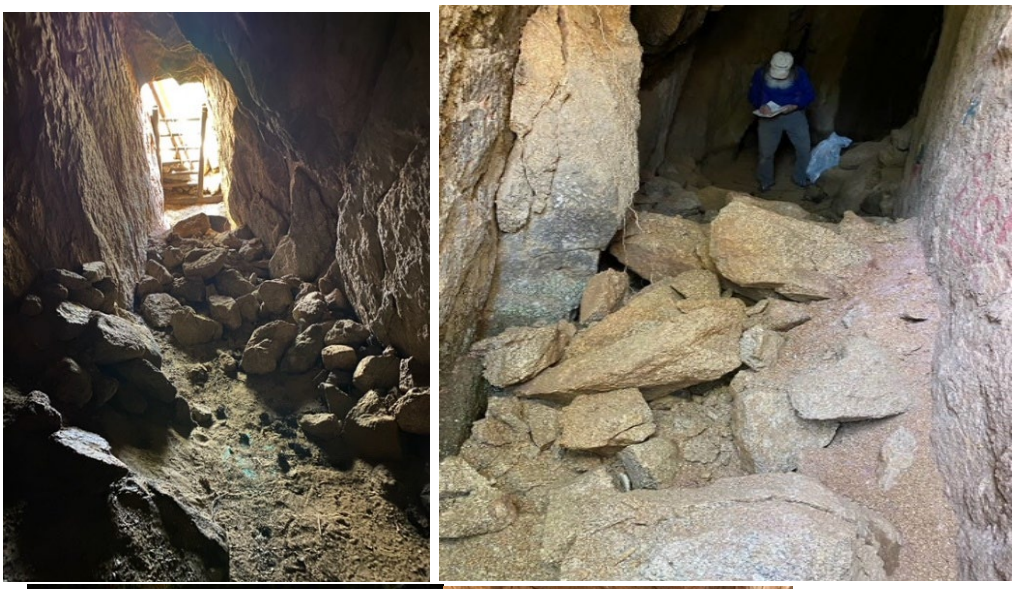


Figure 3 - West Entrance to Elephant Buttress Tunnel

Figure 4 - Photos of Tunnel Interior: Rockfall, Flaking and Temporary Stabilization

Note Fractured Slabs At Risk of Failing and recent rockfall (2022/2023).



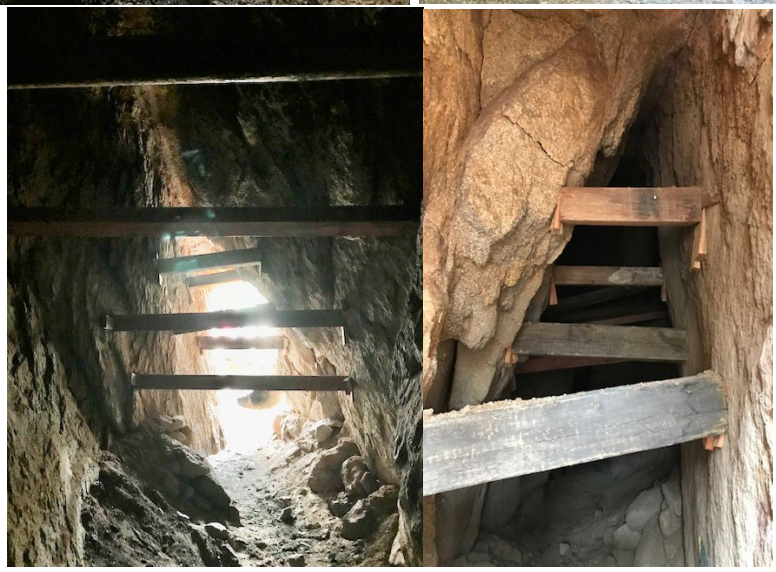


Figure 5: Temporary Stabilization of Flaking Rock 2023 – 2024

4.0 Borrower Information/Project Sponsors

Description of Entity: The Silver Lake Ditch was originally a privately owned operation. By the late 1940s the ditch was so deteriorated that little water reached the users. The users organized to form the Silver Lake Ditch Water Users Association which then purchased the ditch. Since that time the ditch has operated as a mutual ditch company, the Silver Lake Ditch & Reservoir Company. The Silver Lake Ditch Company then proceeded to restore the ditch to its full carrying capacity.

The ditch company consists of approximately 300 shareholders and is run by a board of five directors who are elected each year at an annual meeting of ditch shareholders. The Board consists of President, Vice President, Secretary-Treasurer and two other board members.

Board Members

- James Snow – President
- Mike Merritt – Vice President
- Catherine Long Gates – Secretary /Treasurer
- Cody Oreck – Board Member
- George Gerstle – Board Member

Company Attorney

Madoline Wallace-Gross
Lyons-Gaddis
950 Spruce Street, Suite 1B
Louisville, CO 80027
Email: mwg@lyonsgaddis,com

Professional Engineer for Project

Jason Langer
Manager of Preconstruction Services
Harrison Western
Phone: 720-552-0490
Email: jlanger@harwest.com

The complete list of shareholders, property addresses and shares dated June 24, 2024 is attached.

5.0 2021 - 2024 Budget summary

Loan Repayment Source / Current schedule of assessment

Acreage Under Ditch	2022	2023
Total Paid Acres	238.87	240.61
Acres in Arrears	8.09	6.35
Total Acres Under Ditch	**246.96**	**246.96**
Annual Revenue	**$72,660.92**	**$77,900**

2024 Ditch Assessment Rates	
Minimum Annual Assessment (0.5 acre or less):	$100/year
Annual Assessment per Acre:	$200/year
Tunnel Repair Special Assessment	$100/Acre ($50/minimum)

SILVER LAKE DITCH & RESERVOIR COMPANY BUDGET SUMMARY				Current Budget
RECEIPTS	**2021/22**	**2022/23**	**2023/24**	**2024/25**
Assessments	$41,915.60	$48,180.87	$52,566.50	$52,000.00
Interest	$14.98	$38.31	$731.03	$500.00
Licenses & Fees		$3,000.00		$3,000.00
Contributions	$3,781.71	$6,070.90	$4,554.50	
Refunds/Reimbursements	$8,595.21	$18,257.40	$14,808.89	
Non-Tunnel Related Receipts	**$54,307.50**	**$75,547.48**	**$72,660.92**	**$55,500.00**
Tunnel Related Receipts				
Tunnel Special Assessments				$25,000
Tunnel Donations (as of 7/1/24)				$75,300
Tunnel Special Assessment & Donations				**$100,300**
TOTAL RECEIPTS	**$54,307.50**	**$75,547.48**	**$72,660.92**	**$155,800**

SILVER LAKE DITCH & RESERVOIR COMPANY April 1, 2023 - March 31, 2024				Current Budget
EXPENSES	**2021-22**	**2022-23**	**2023-24**	**2024-25**
Operations and Maintenance	$1,702.90	$2,411.46	$870.18	**$2,000**
Office & Communications	$2,545.49	$1,313.51	$621.80	**$1,000**
Insurance	$3,625.00	$3,757.00	$3,768.00	**$4,000**
Administrative	$4,191.56	$4,818.07	$5,257.15	**$5,200**
Legal & Engineering	$6,718.55	$14,412.50	$23,682.61	**$5,000**
Labor	$21,314.70	$25,562.40	$16,083.02	**$25,000**
Capital improvements (Not tunnel)	$3,065.42	$14,925.81	$23,351.00	**$7,000**
PayPal fees	$310.45	$433.08	$647.45	**$800**
TOTAL DISBURSEMENTS	**$43,474.07**	**$67,633.83**	**$74,281.21**	**$50,000**

RECEIPTS LESS EXPENSESS	**$10,833.43**	**$7,913.65**	**$(1,620.29)**	**$83,400**

FINANCIAL ACCOUNTS-FIRST NATIONAL BANK OF OMAHA			
	2022	**2023**	**2024**
Checking Account	$31,621.82	$39,497.16	$82,733.33
Money Market Account	$49,939.54	$49,977.85	$50,891.91
CASH ASSETS	$81,561.36	$89,475.01	$133,625.24
Note: 2024 Increase in the checking acct. due to tunnel donations received prior to end of fiscal year 3/31/24.			

Financial Status as of 7/1/24: Checking $82,733.33 + Money Market Account $50,891.91
Total Cash Assets: $133,625.24

6.0 Project Description – Analysis of Alternatives/Selected Alternative

Please see the attached memo from contractor Harrison Western summarizing the analysis of alternatives considered and the recommended path forward as well as the formal bid document.

Summary of Recommended Alternative

Western Tunnel Terminus:

a. Scale Loose material above western entrance.
b. Remove existing headwall and replace the tunnel opening with a with 1' thick X 2' tall concrete invert for the full width of the tunnel.

Eastern Tunnel Terminus

a. Install 31 linear feet of a 48" wide by 61-11/16" tall arched liner plate system with brick-and-mortar bulkheads at each end.
b. Following liner plate and bulkhead installation backfill the existing void space surrounding the liner place with expansive geotechnical foam as light weight backfill.
c. Reinforce/adapt the existing gate on the Eastern Portal to serve as a grizzly to deflect rockfall away from the tunnel portal and to prevent unauthorized access to the tunnel.
d. Exterior to the East Portal of the tunnel replace the existing corrugated metal pipe on with a new 54" liner plate that will be buried with compacted in-situ material and reinforcing fabric.
e. Place a cast in place headwall and concrete invert on the entrance and exit sections of the liner plate to create a smooth entrance and exit for the water to flow.
f. The reinforced in-situ material will serve as a barrier to future rock fall and prevent damaging the pipe.

Other Alternatives Considered that were uneconomical or ineffective

a. Stabilize the rock mass utilizing split sets or other ground support methodologies on the interior of the tunnel to prevent rockfalls.

This was deemed unfeasible due to the existing unstable ground conditions. It was HW's opinion that traditional split sets would not extend past the fracture plane to provide the necessary stabilization. Similarly using rock bolts to extend into the rock mass would be challenging for the drilling equipment in the limited space that exists in the tunnel.

b. Install traditional rockfall protection on the exterior rock faces above the east and west tunnel portals.

Traditional rockfall mitigation techniques, such as draped mesh with top anchorage points would not mitigate the concerns over debris blocking water flows into and external to the tunnel, however, would not address rockfall within the tunnel, and would require periodic maintenance and clearing of debris. Such a system would require access to the top of the slope above the tunnel entrance and exit which would be economically prohibitive.

c. Steel casing at tunnel portals.
Installation of steel casing to ensure water conveyance at the tunnel portals in lieu of the liner plate was also considered, however was also eliminated from further consideration because the weight and lengths of steel casings would require helicopters for delivery and staging of the steel casing placement.

7.0 Environmental Impacts

No significant environmental impacts are anticipated as the tunnel stabilization will be internal to the existing tunnel. Transport of the equipment, material and piping to the tunnel will occur using an elevated cable from a truck located at the access road at the base of the hill to a metal eye drilled into the rock. Any rock that is removed from the tunnel will be used to reinforce the ditch bank within the ditch easement.

The environmental impact of failure to address the structural integrity of the Elephant Butte Buttress tunnel would be significant, as the Silver Lake Ditch serves a significant unique ditch riparian ecosystem serving northwest Boulder, as well as Mesa Reservoir. Should the tunnel fail, the environmental implications to northwest Boulder would be significant.

8.0 Economic Analysis and Feasibility

The recommended tunnel stabilization is critical to the ongoing ability of the Silver Lake Ditch to provide water to its shareholders. Should the tunnel fail, there is no alternative alignment or method of delivering water to the users. The measures recommended by our consulting engineers are feasible and will reduce the risk to the ongoing ability of the organization to function.

9.0 Benefits and Costs (# of members/households that benefit)

Approximately 300 users irrigating 247 acres would no longer be able to do so. In addition, the riparian ecosystem adjacent to the ditch serving north Boulder would cease to exist.

Silver Lake Ditch water is used only for agricultural, municipal and residential irrigation purposes, wetland purposes, and is not used as a supply for municipal drinking water. The largest shareholder is Long's Gardens, a Centennial Farm that grows a variety of crops. The city of Boulder Parks and Recreation and Open Space Departments also hold water rights for parks and open space irrigation purposes. There are other smaller agricultural users, while many of the shareholders are irrigating home gardens and residential landscapes.

Please see attached list and map of shareholders.

10.0 Institutional Requirements

No permits or court actions will be necessary to implement this project. City of Boulder Open Space and Mountain Parks and adjacent property owner permission will be necessary for the construction crew to stage their vehicles and equipment. Both the City of Boulder and the property owner have been willing partners in the past and have agreed to allow access through their property. A contract with the implementing contractor would be necessary and has been drafted.

11.0 Special Considerations: The future existence of the Silver Lake Ditch relies on the successful implementation of this project. There is no feasible alternative to use of the Elephant Buttress tunnel, as the ditch would have to be realigned using elevated pipe attached to the side of the canyon wall several hundred feet above Boulder Creek.

12.0 Selected Alternative: Please see the attached engineering analysis and alternative recommended by our consulting engineering firm, Harrison Western.

13.0 Financial Feasibility Analysis

13.1 Loan Amount Requested: 20-year loan of $150,000

13.2 Local Match Committed: $100,300: $75,300 in cash donations and special assessment of $100/acre from Silver Lake Ditch shareholders which will generate $25,000, totaling $100,300 in local match for the loan.

13.3 Revenue and Expenditure Projection: See the spreadsheet documenting our revenue and expenses for the past three years and budget 2024/25.

13.4 Loan Repayment Sources: Annual Dues will be sufficient to ensure repayment of the loan. Should additional funds be necessary, a special assessment will be proposed by the Board for consideration by shareholders. Shareholders have never rejected such a special assessment.

13.5 Financial Impacts on total debt, user assessments, etc.

Existing Debt: The Silver Lake Ditch Company has no existing debt.

User Assessments: The annual budget for the ditch company for the past three years includes receipts ranging from $54,307 in 2021/22 to $75,547 in 2022/23. Member assessments are estimated to generate $55,000 in 2024/25.

Existing Resources: See Account Balance Summary Below

FINANCIAL ACCOUNTS-FIRST NATIONAL BANK OF OMAHA			
Year	**2022**	**2023**	**2024**
Checking Account	$31,621.82	$39,497.16	$82,733.33
Money Market Account	$49,939.54	$49,977.85	$50,891.91
CASH ASSETS	$81,561.36	$89,475.01	$133,625
Note: 2024 Increase in the checking acct. due to tunnel donations received prior to end of fiscal year 3/31/24.			

13.6 Loan Request

Estimated Project Cost (rounded to nearest $1,000)

Contractor Estimate	$251,000
1% loan service fee:	$2,000
Contingency (10%)	$25,000
Total Est, Cost	$278,000
Less Contractor Retainage Fee	$50,000
	$228,000
Less Local Match	$78,000
CWCB Loan Amount	**$150,000**

13.7 Loan Request Analysis

Estimated Project Cost		
	%	$ Amount
Contractor Estimate	90%	$ 251,000
Contingency	10%	$ 25,100
Total Estimated Project Cost		**$ 277,600**
Loan Service Fee	1%	$ 1,500
Less Contractor Retainage Fee (Already Paid)	18%	$ 50,000
Less Local Match (Committed)	28%	$ 78,000
Total Local Match	**47%**	**$ 129,500**

CWCB Loan Request Amount	**$ 150,000**

Loan Analysis			
Loan Amount $ 150,000			
Loan Period	**30 Years**	**20 Years**	**10 Years**
Interest Rate Adjustment		**Reduce by .25%**	**Reduce by .9%**
Interest Rate (Agricultural)	2.05%	1.80%	1.15%
Annual Payment	**$ 6,743.62**	**$ 8,997.41**	**$ 15,965.02**
Total Interest Over Life of Loan	$ 52,308.65	$ 29,948.18	$ 9,650.19

14.0 Tabor

TABOR does not apply to the Silver Lake Ditch Company

15.0 Collateral

Ownership of the tunnel will be transferred to CWCB should a pledge of an assessment increase necessary to cover unanticipated cost over-runs not be approved by the Board.

16.0 Sponsor Creditworthiness

Silver Lake Ditch Company has been operating since 1947 and has never had a default on any credit or obligation. The Company has a long history of maintaining and improving the condition of the ditch. The attachment 'Recent SLD Infrastructure Work' is an example of the company's ability to execute complex and numerous infrastructure improvements while still maintaining and building a reserve fund.

- **Loan Repayment Source / Current schedule of assessment:**

Acreage Under Ditch	2023	2024
Total Paid Acres	238.87	240.61
Acres in Arrears	8.09	6.35
Total Acres Under Ditch	246.96	246.96
Est. Revenue	**72,660.92**	**$77,900**

2024 Assessment Rates

Minimum Annual Assessment (< than 1 acre):	$50/year
Annual Assessment per Acre:	$200/year
Tunnel Repair Special Assessment	$100/Acre ($50/minimum)

17.0 Conclusions/Recommendations

Rehabilitation/stabilization of the Elephant Buttress Tunnel is critical to the ongoing function of Silver Lake Ditch. Should the tunnel collapse, the ditch would not be able to function.

While temporary stabilization has been installed in the tunnel to prevent immediate collapse, more permanent stabilization is required to ensure the ongoing function of the ditch.

The ditch company is committed to carrying out the tunnel stabilization in a responsible manner and has demonstrated this by committing to a $50,000 retainage fee to ensure the timely availability of Harrison Western, generating over $77,000 in local match through donations and a one-time $100/acre special assessment.

The ditch company has been working with Harrison Western to evaluate and develop options to stabilize the tunnel, and has developed the attached proposal, which will address the most critical risks to tunnel collapse in a fiscally and structurally responsible manner.

We are grateful for your consideration and request approval of a 20-year loan of $150,000 to help us structurally reinforce the Elephant Buttress Tunnel.